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У збірнику подано іноземними мовами результати наукових досліджень студентів, аспірантів та молодих науковців у різних галузях економіки, що можуть зацікавити світову наукову спільноту. Регулярні публікації робіт допоможуть виявити талановиту студентську молодь, здатну брати участь у міжнародному професійному, науковому та освітньому обміні та втілювати одержаний досвід у розвиток передових технологій.

Усі матеріали публікуються в авторській редакції.

Зміст

HUMANITIES

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WRITING SKILLS IMPROVMENT OF HIGH SCHOOL STUDENTS

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At present time, the attitude towards teaching pupils to express thoughts on paper has been changing rapidly. It increasingly appears that writing becomes the goal in all types of educational institutions. The knowledge of a foreign language emerges as the norm, and today the English is considered to be the language of international communication. The main aim of language study has developed into the formation of the communicative competence [1, 6], and writing has become its separate component.

It should be clarified that in our work, writing is a mean of a productive kind of speech activity, characterized by a written form of thought expression, when information is transmitted using handwritten or printed signs.The product of this activity is a text.

A famous scientist, *James Van Allen,* said that “the mere process of writing is one of the most powerful tools we have for clarifying our thinking”, thus reasoning one of the essential writing functions. What is more, the great value is the systematizing students' knowledge and skills, their self-control and self-correction. Concisely, 3 main reasons can be differentiated:

- writing maintains concentration and promotes consistency in cognitive thinking;
- it induces to sort information, to distinguish between primary and secondary;
- it is a means of communication with the world.

The tasks to be accomplished in improving the ability of writing include the further development of students' skills in formulating the idea in accordance with the written style, broadening the horizon, mastering the culture and intellectual readiness to create the content of writing. One of the additional skills should be training and improving the use of the printed font. It appears to be mandatory for students who study foreign languages as core languages, specifically, for those who are intended to take part in international examinations and Olympiads, etc.

The final requirements for the development of writing skills comprise the formation of the pragmatic ability to use writing in a foreign language as an instrument of communication and cognition.

Speaking about the stages of improving writing skills at the senior level, the following steps should be mentioned:

– training in various forms of writing (recording basic ideas, key sentences, drawing up a plan, writing out basic words, expanding or shortening texts, drafting theses);

– training of versatile written texts (writing summaries, letters of various nature and purpose, filling out forms, writing articles, reviewing books, films or exhibitions, writing stories about the picture, about events from personal life, writing instructions, reporting, etc. [2, 80]).

Herewith, it should be kept in mind that students must be able to write these texts in their native language [1, 188].

Despite the fact that the role of writing has been much spoken and written about, being a productive kind of foreign speech activity, it still occupies a rather modest place in the lessons. That is why we consider it necessary to dwell upon two last stages (that have been mentioned above) and to suggest some ideas for the development of writing skills among high school students, as well as the formation of an interest in this kind of activity in general.

The important part of written assignments is the planning of writing. It can take various forms:

– mind-map (a powerful graphic technique which provides a universal key to unlock the potential of the brain);

– brainstorming (is used to find a conclusion for a specific problem by gathering a list of ideas);

– list-making and scratch outlining (is used to organize ideas, thoughts, especially when you have a lot of information).

Writing a letter is anappropriate form of multifunctional exercises. To improve the ability of writing at this stage, students are encouraged to write collective letters, thematic letters on the given situations, letters of various types (personal, family, business, etc.), a letter-response to the request or wish of the addressee, initiative letters or response letters for a certain question with a demand for a specific addressee. It is necessary to work on the preparation of questions to the addressee, to determine their place in the letter. It is also planned to establish a collective or individual correspondence by e-mail. Thus, to teach to record oral speech, including how to write personal and business letters, to fill out questionnaires, to write a short and expanded autobiography, job application, etc. – these are the main purposes of teaching writing which also play a supporting role in teaching reading, speaking, grammar, and vocabulary [4, 162].

While developing writing skill it is significant to train imagination. One of the feasible tasks to do begins with the words “Imagine that you are ...”. Such assignments as forming crossword puzzles to the particular topic, writing essays are, by all means, to be applied.

During the holidays, high school students can be asked to keep a diary, where they would briefly describe current events. An interesting form of written creative assignmentis writing of poems.

Writing stories on behalf of any hero, finishing an interrupted story or a famous literary work[3, 120], a mini-essay or an essay on the chosen quotation

stand out to be actually effective assignments. They have a huge learning potential and, in our opinion, can be used in every lesson in a foreign language.

One cannot ignore the practical importance of writing in the sphere of modern means of communication, such as e-mail, the Internet, etc. Hundreds of words have an SMS equivalent nowadays; SMS-language is recognized as the second one for millions of people, especially for English-speaking users. By now, it has become one of the most common ways of communication. It will be interesting for modern schoolchildren to get acquainted with the list of SMS-abbreviations of words and sentences. This will introduce some diversity in the process of studying and increase students' interest in the language, and furthermore will bring them closer to their peers from English-speaking countries. Tasks for encoding and decoding letters in the style of SMS aretwo more creative and innovative exercises to be used in schools.

During the last lessons of each topic, students can be offered to prepare a creative project. While making it, students will inevitably develop writing skills, as the project assumes the availability of visual material, descriptions, interviews, writing out various facts and their presentation.

The fulfillment of a written intention depends on how students are able to vary the style and volume of writing. The formation of this ability is facilitated by the comparison and analysis of different texts. This experience allows students to imitate both formal and colloquial style.

To conclude, we consider it momentous to stress the necessity of the development of writing skills, their purposeful and systematic control and use of the creative approachon the way to language enhancement.

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TECHNIQUES OF WORKING WITH AUTHENTIC VIDEO MATERIALS FOR IMPROVING LISTENING SKILLS

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Listening comprehension is one of the most difficult skills because in real life oral information is usually given fast and without repetitions. Old information is quickly changed into new and there is no time to think it over, which sometimes

leads to misunderstanding. Objective difficulty of listening comprehension does not lead to drawing much attention to it, despite that federal documents and secondary school syllabus have clear requirements to its results.

This situation leads to the necessity of finding new ways in teaching listening comprehension; among them using authentic video materials is the most effective. Audiobooks, films, TV shows, and music – these are examples of authentic materials, but unfortunately they are rarely used at EFL lessons.

That's why authentic materials and the peculiarities of their use for improving listening comprehension will be viewed in this article. The focus will be made on authentic video materials, their role and techniques of their use for fostering listening skills.

Authenticity in methodology

There is such a term in methodology called "authentic", which means "natural". Authentic material is a material that is initially not aimed at teaching a foreign language. There are a lot of ways to identify the term "authentic" and "authentic materials".

H. Widdowson treats authenticity as characteristic of educational process. At the same time he differentiates terms "original" and "authentic". He says that original language is language which is not used in educational purposes, and authenticity, according to him, is quality of educational interaction. The author says that it is not enough to use a foreign article at the lesson, it is better to try to make the process of working with this article authentic. When the teacher makes his children treat the work with the text as authentic communicative activity, he motivates essential interaction at the lesson. In other words, authenticity is not a definite material which was taken from the outside and was set aside for native speakers. Authenticity is created in the process of working with the material and in the interaction between students and teacher.

L. Lier points out the following types of authenticity:

– authenticity of materials;
– pragmatic authenticity;
– personal authenticity.

Having analyzed different points of view on the term "authentic", we have come to the conclusion that authentic material is a material which characteristics are lexical and grammatical originality, socio-cultural intensity, and the adequacy of the language means, which originally was not made for educational aims, but can be used for teaching a FL.

Goals of using authentic video materials at the EFL lesson

Video materials or videos are TV-made stuff (such as news, interview, advertisement, and so on) and feature, documentary or cartoon films, which are recorded to the digital media and used as didactic material, which can be frequent seen, paused, and fast rewinded. Using of video materials at the EFL lesson helps to achieve the following goals:

– to increase educational motives;

– to create comfortable conditions for studying;
– to foster the development of listening skills;
– to raise pupil's cognitive activity.

Techniques of using authentic video materials

There are a lot of different techniques of working with authentic video materials. For example, J. Harmer suggests the following techniques:

– Fast forward. While using this technique the teacher plays the video at the higher speed and there is no sound. After watching it the teacher can ask students about the theme of the video and ask them to suggest what the people have said.

– Silent viewing. While using this technique the teacher plays the video without sound and then asks students to guess what people have said. After that the teacher plays the video one more time and the students find out whether they were right or wrong.

– Freeze frame. While using this technique the teacher plays the video and stops it at the certain moment and then asks students to predict what will happen next.

Milrud R.P. suggests following types of tasks for working with authentic video materials:

– silent viewing;
– freeze frame;
– role-play;
– behavior observations;
– prediction;
– blind viewing;
– cultural comparison.

J.Scriviner divides work with video materials in three stages: before viewing, while viewing and after viewing. For each stage he suggests different types of tasks:

On the before viewing stage the author suggests to use tasks:

– aimed at work with vocabulary and grammar, which is used in the video;
– tasks-predictions which are made with pictures or contain some information;
– discussing the theme which leads students to the main topic of the video.

The tasks at the while watching stage can be different. For example, to watch the video and say how the persons were dressed in the video, what exactly they have said, what is the topic of the video.

At the after watching stage the author suggests to make debates, discussion of the video. It is also possible to perform a role play or to present a part from the video. It is also possible to write a letter from one character of the film to another.

Thus, authentic video materials help to develop listening skills and make the process of studying more interesting and fascinating. They play an important role at the EFL lesson because they have a great educational, evolving and developing

potential. For example, authentic video materials create a FL environment, which makes students tolerant to another culture represented in the video.

Video material combines different aspects of oral communication, that's why it gets the best of audio materials and texts for reading. Video material has visual information, which contributes to a better memorization of the needed information. Video material emotionally influences pupils, which helps to develop educational motives to study English.

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THE KINSHIP TERM «SON» AND ITS DEFINITION ANALYSIS

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In the modern linguistics, up to the present moment there is no common opinion according to the definition of the characteristics of gender oppositions in kinship terminology. Researchers, although they recognize the presence of a gender component in the structure of a lexical unit [1, 53], can not yet determine how far the leading position of this component is relative to other components of the semantic structure of the lexical unit [5, 40].

In the present research, A.V. Kirillova's point of view is taken as the basic point, in which it is recognized the gender component leading positions, especially when studying a lexical group, such as kinship terminology [2, 5].

Taking into account A.V. Kyrillina's point of view, who relates the gender opposition "father-mother" to the top of the gender opposition, we can state that the gender opposition "son-daughter", which includes the term "son", takes the second most important position [1, 6].

In order to reveal the main characteristics inherent in the image of a "son" in the cognitive perception of English speakers, it is necessary to make a definitional analysis of this lexical unit [4, 171] according to the most authoritative lexicographic sources of the studied language.

For the analysis of the lexical unit "son" in English, the following lexicographic sources were selected:

- English: Cambridge English Dictionary, located at http: // dictionary.cambridge.org; Merriam Webster English Dictionary, located at www.merriam-webster.com/dictionary; Collins English Dictionary, located at www.collinsdictionary.com.

These lexicographic sources were selected in accordance with some objective criteria: firstly, they occupy the leading positions in the queries of the main and most authoritative search engines (Google, Yandex, Rambler); secondly, these sources undergo periodic changes due to a fairly frequent; thirdly, according to sociological surveys of English speakers conducted by YouGov in 2016, these lexicographic sources are the most authoritative explanatory dictionaries.

Let’s consider the various interpretations of the lexical unit "son" in each specific lexicographic publication.

So, in the Cambridge English Dictionary [6] the lexical unit "son" is represented as follows: *your male child*. According to this definition, the lexical unit "son" has only one definitional characteristic - a male child. This definition is found in all lexicographic sources studied, so it can be considered as the basic characteristic inherent in the lexical unit "son".

The dictionary Meriam-Webster Dictionary [7] gives more detailed interpretation of the studied lexical unit "son": 1a: a human male offspring especially of human beings; b: a male adopted child; c: a human male descendant. Capitalized: the second person of the Trinity. 3: a person is closely associated with or deriving from a formative agent (such as nation, school, or race).

According to this definition, the lexical unit "son" has five definition characteristics: 1) the human male descendant, 2) the male adolescent child, 3) the male child, 4) the second character of the Trinity, 5) the person closely related or originating from a particular social Institute (nation, school, race).

According to Collins English Dictionary [8], the lexical unit "son" has the following definition characteristics: 1. Someone's male child. 2. A person, especially known in certain circles, in relation to the place of his origin. 3. Appeal, expressing a kind attitude and favor to a person who is younger than the speaker by age.

It should be noted that in the lexicographic source analyzed by us, information is provided on the various uses of the lexical unit "son" in the British and American versions of the English language.

So, in the British variant there are such uses as: 1) a young male, a boy or a man in relation to their parents; 2) a descendant of a male; 3) friendly appelation in relation to a boy, a man; 4) a male representative of a particular country, locality or someone closely associated with a particular social environment; 5) Christian religious tradition - the second character of the Trinity, Jesus Christ.

In the American English version, the following meanings of the lexical unit "son" are presented: 1) a boy or a man in relation to one or to both parents (often used in the context of the animal world); 2) a descendant of a male; 3) a. an adopted

child of a male, b. a male child taken into custody, c. a son-in-law; 4) a male representative brought up under the influence of something or someone; 5) appelation, expressing some kind attitude and favor with respect to a boy or a man, used by a person older in age.

Having analyzed lexicographic sources, it should be noted that the image of a "son" according to the explanatory dictionaries of the English language, is as follows: the son is, firstly and foremost, a male child. This characteristic is laid into the basis of the concept "son" in English. As additional characteristics, the following ones are presented: a son is an adopted child in the family. In connection with the fact that this value is represented in lexicographic publications as the second one, one can state the relevance of this characteristic in the cognitive perception of native English speakers. In the modern society, the situation with adopted children worries many representatives of our society. Many families consider adoption the only way to educate their own children.

The third most important characteristic in lexicographic publications there is the characterization of a "son" - the second character of the Trinity. The image of a son in the Christian religion is one of the main, as firstly, this symbol is associated with the cross - a symbol of faith and sacrifice - a sign of suffering and death for the people sins. The location of this characteristic at the third place according to the relevance of use in the explanatory English dictionaries certifies the importance of the religious component of modern life for native English speakers.

The fourth according to its importance is the characterization: a son is a person having a certain social or geographical origin. This meaning is used by native English speakers to refer to a person who loves his country, who is devoted to its people, ready for sacrifices and feats in the name of his homeland. Also, it is often common to use this lexical unit referring to a person who is devoted to something, sincerely loves something.

The fifth, according to lexicographical sources, represents the meaning - appellative, denoting a good or respectful attitude towards a person younger in age. An interesting fact is that this lexical unit is used without any derivatives, in contrast, for example, the Russian language.

It is noteworthy that in British and American versions of the English language the relevance of using of one or another characteristic of the lexical unit "son" is different. However, it should be noted that the first basic characteristic of the image "son" coincides in both versions of the English language. The only difference is that in the American version there is a clarification on the composition of the family (... in relation to one or both parents). The second characteristic - the descendant of the male sex - is the same for both variants of the English language. At the third place according to the relevance of use in British version of the English language is the characteristic "appellative, denoting a good or respectful attitude to a person younger in age." In American version of English, at the third place there is the characterization of "male adopted child; a male child taken into care. " Regarding the fourth position in British version it is presented the characteristic of "male representative of a certain locality", and in American - "male representative,

brought up under the influence of something, anyone. According to our opinion, this characteristic can be considered the same in both versions of the English language, since it has no fundamental differences. Further, at the last place, in British version of the English language, the characteristic "Christian tradition, the image of Jesus Christ" is presented, in American version - "an appellative expressing a supportive attitude towards a person younger in age"

To sum everything up, according to three lexicographic sources, we can state an extension of the periphery of the conceptual meaning of the image "son" in the English language. The presence of differences in the actualization of the characteristics of the lexical unit "son" in the English language certifies the different perception of this image by the speakers of various variants of the English language, which has its own linguistic and extralinguistic reasons.

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SEMANTIC SUBJECT IN MATHIMATICAL TEXTS

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Due to professionally oriented teaching foreign languages in higher school it's quite necessary to treat very thoroughly linguistic units in a definite brunch of science for selecting adequate methodical organization to be presented to students or in textbooks [1; 3,10-13]. In the article we proceed analyzing ways of expressing a semantic subject in English algebraic texts [2,16-18] . Multinomial structures are considered: their contents and syntactical organization. The term 'semantic subject' is introduced as a word or a word combination meaning a single concept to be stated by the predicate. Due to the character of mathematics requiring the utmost accuracy, the subject may include a number of members and no one can be omitted. Otherwise the statement becomes false or at least approximate. Combinations of words in the function of a subject are built according to modern linguistic rules transforming in accordance with private scientific states [6, 30-35].

All examples are taken from the book by American authors "Intermediate Algebra" [10, 512] .

Let's take the cases where the semantic subject is expressed with a group of words, it includes some linguistic units connected by various syntactic ways forming a single indivisible notional space which doesn't allow any changing. Watching the contents of such constructions shows that both left (pre-positional) and right (post-positional) [5, 226-228] attributes of the central noun or terminological word combination have in their contents different parts of speech and algebraic expressions as well:

– Adjectives: "If the *variable* point (*x, y*) is to be a point on the line…" [10, 302]; "… the *original* system must be dependent." [10, 372]

– Cardinal numerals: "…if *two* variables *x* and *y* are so related that for each value of *x* there corresponds exactly one value of *y*, then *y* is said to be a (single-valued) function of *x*" [10, 410].

– Ordinal numerals: "The *first* coordinate *a* of the coordinates of point *P* is also called the abscissa of *P*, the *second* coordinate *b* of the coordinate of point *P* is also called the ordinate of P" [10, 287] "*Second*-degree polynomials can be factored by trial and error … or by the *ac* test" [10, 109]

– Adverbs: "*Most* of the ideas presented here are quite simple" [10, 20]

– Pronouns: "*These* operations are useful in describing operations related to addition …" [10, 27]; "… *each* point located on the plane can be labeled with a unique pair of real numbers" [10, 287]; "… *either* of the two masses is increased…" [10, 439]; "For example, *both* 5 and -5 are 5 units from 0 …" [10, 28].

– Infinitive: "*To factor* a polynomial means to find factors whose product is the given polynomial"[10, 109].

– Participles: “There are only a *limited* number of integer pairs that meet the first two conditions …” [10, 89]; The *related* form $y = -x^2$ changes the sign of each *y* value in the preceding graph”[10, 318].

– Gerund: “…*graphing* $y = 2x – 4$ would be easy” [10, 289]; “*Grouping* may lead to factoring out common factors” [10, 109].

– Prepositions: “… the equation *of* a vertical line is of the form $x = c$”; “… every point *on* the line has constant *y* coordinates and arbitrary *x* coordinates” [10, 304]; Factors common *to* all terms can be factored out by the distributive law” [10, 109].

– Algebraic expressions: “The graph of a linear inequality $Ax + By < C$ or $Ax + By > C$ with $B \neq 0$, is either the upper half-plane or the lower half-plane (but not both) …” [10, 312]; “There are *n* terms on the right” [10, 497]; The sum $A^2 + B^2$ of two squares cannot be factored unless there are common factors” [10,c.109]

The structures of multinomial semantic subject are varied. The central word, terminological word combination, algebraic expression in such constructions have various attributes [9, 148-150]. As left (pre-positional) non-prepositional attributes we see:

– Adjectives: “*Basic algebraic* terminology as well as equality and inequality relations are reviewed in this section.” [10, 9]; “A *rectangular* lot is to be fenced with 400 feet of wire fencing” [10, 18]; “The *principal conic* sections are circles, parabolas, ellipses, and hyperbolas”[10, 328]

– Pronouns: “… *any* real number will produce 0 when multiplied times 0…” [10, 40]; “*Such* rules are called functions”[10, 401]; “The *same* strategy can be applied to solving certain literal equations…” [10, 60];

– Cardinal numerals: “*Two* equations are interchanged …” [10, 378]; “The 380 work hours … will be used up…” [10, 373]; The other *three* properties are logarithmic versions of the laws of exponents…” [10, 467].

– Ordinal numerals: “Can you guess what the *fifth* and *sixth* terms are?” [10, 500]; “The *first* equation is an ellipse; the *second* is a straight line.” [10, 392].

– Numerical and expressions in letters: “Thus, *(0, 2)* is a solution” [10, 291]; “…(x_1, y_1) must be *m*…”[10, 302].

When combining, all these forms make a word combination and become a single semantic subject involving conjunctions and prepositions:

“…*m and b* are constants.”; “The constant *m and b in* $y = mx + b$ have special geometric meaning” [10, 300]; “If none *of* the combinations had worked …” [10, 92]; “A line *with* a real number associated with each point, and vice versa, … is called a real number line.” [10, 7]; “The solution $x = \leq -2$ or $x \geq 3$ *to* Example 18 can also be described as the interval $(-\infty, -2]$ …” [10, 277].

As right (post-positional) attributes we meet all foregoing parts of speech, numerical and algebraic expressions. Notable is the variety of their combinations both with prepositions and without ones. Let’s look at some of them. Among non-prepositional:

– Noun (= terminological word combination = TWC) + expression in letters: “Appendix A suggests an approach that may be helpful” [10, 53];”… the ordered triplet (x, y, z) becomes (x, 3 – 2x, 1 – x)” [10, 348].

– Noun (= TWC) + mathematical sign: “The symbol ∞ …is not a number” [10, 175]; “ The inequality symbols <, >, ≤, ≥ denote less than, greater than, less than or equal to, and greater or equal to, respectively …”[10, 58]

– Noun + number: “…the number 1 plays the same role…” [10, 24]; “Index 9 and power of radicand 6 have the common factor 3”[10, 224].

– Noun (= TWC) + participle construction: “…terms containing radicals can be combined after they have been expressed in simplest radical form” [10, 230]; “Radical equations involving two radicals are usually easiest to solve…” [10, 372].

– Noun + algebraic expression: “The equation 1/2x – 1/3(x + 3) = 2 – x … is actually a first-degree equation in one variable…”(10, 249).

– Gerund + algebraic expression: “… graphing y = 2x – 4 would be easy” [10, 289].

Prepositional attributes are also widely spread. The most frequent preposition is ‘*of*’ and also *in, on, with, for, between*:

“This joining *of* algebra and geometry has now become known as analytic geometry” (10, 288); “The values *in* the domain can be thought of as input values, those in the range as output. A function *with* domain and range sets *of* real numbers can be graphed by graphing all pairs (*x, y*) …”[10, 447]; “…points *on* a vertical line have constant x coordinates and arbitrary y coordinates …” [10,c.304] ; “The point on the axis midway *between* the focus and the directrix is called a vertex” [10, 335]; “…there are values *for x* and *y* that satisfy Equations (5) and (6)” [10, 356].

Rather often a semantic subject includes a participle or gerund construction, a subordinate clause which explain, define more precisely conditions, place or time [7, 42-46] :

“Any function defined by an equation of the form $f(x) = ax^2 + bx + c \quad a \neq 0$ where *a, b,* and *c* are constant and *x* is a variable, is called a quadratic function.” [10, 420];”The points *when the factors are 0* are called critical points”. [10, 282]; “*Solving quadratic equations by the method of completing of the square* is best illustrated by examples” [10,c.254]; “*A line with a real number associated with each point*, and vice versa, … is called a real number line”[10,c.7]; “Two or more algebraic expressions (each taken as a single entity) joined by plus or minus signs are called terms”. [10,c.10]; “The coefficient of any term after the first can be obtained from the preceding term …”; [10,c.508] “… distance *d* in feet above the ground at the end of t seconds (neglecting air resistance) is given …”[10, 413].

In the last examples arises a question about the level of notional uniting components in multinomial subject, but it’s impossible to deny necessity their presence to keep the state true [8, 26; 4, 27-30].

So, our analysis shows that the ways of expressing the main member of the sentence – the subject – in mathematics from the semantic point of view is

complicated and various phenomenon . There exists common linguistic laws but notable are peculiarities in widening lexical contents and syntactic links required by mathematical accuracy and objectivity in reflecting real relations and quantities.

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COMPUTERVERMITTELTE KOMMUNIKATION

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Man kann sich heute das Leben ohne Computer nicht vorstellen. An dem Arbeitsplatz und zu Hause benutzt man den Computer. Man spielt, bekommt neue Informationen und lernt. Außerdem eröffnet sich dadurch die neue Welt im Bereich der Kommunikation. Mit Hilfe des Computers kann man neue Menschen aus der ganzen Welt kennen lernen. Besonders wichtig ist das für die Menschen, die Fremdsprachen erlernen wollen. Gerade dank der computervermittelten Kommunikation wird es möglich, eine einzigartige Situation der echten Sprachumgebung zu konstruieren, die den Menschen Fremdsprachen erlernen hilft. Allerdings, soll man verstehen, dass die computervermittelte Kommunikation einige Besonderheiten hat.

Erstens, werden mündliche und schriftliche Sprachen in der computervermittelten Kommunikation vermischt. Um die schriftliche computervermittelte Kommunikation so schnell wie die mündliche zu machen, benutzt man verschiedenartige Abkürzungen, wie zum Beispiel BB (bis bald), BM (bis Morgen), FG (freundliche Grüße), FM (freut mich) und so weiter.

Zweitens, werden die Mutter- und Fremdsprachen in der Computervermittelten Kommunikation vermischt. Viele Leute benutzen sehr oft Englisch, weil diese Sprache international ist. Deswegen gibt es viele Abkürzungen auf Englisch, wie zum Beispiel AFAIK (as far as I know), AIUI (as I understand it), ASAP (as soon as possible), AFK (away from keyboard) und so weiter.

Drittens, benutzt man die so genannten numerischen Abkürzungen. Das sind die Abkürzungen, die die Zahlen und die Wörter auf Englisch haben: Gr8 (great), W8 (wait), 2DAY (today).

Außerdem, gibt es Tastaturabkürzungen. Das sind die Abkürzungen, die die Tastatursymbole und die Wörter auf Englisch haben: sk%l (school), ki$$ (kiss) und c%l (cool).

Letztens, benutzt man in der schriftlichen computervermittelten Kommunikation verschiedenartige Smileys und Schriftzeichen für den Ausdruck von Gefühlen. Die Schriftzeichen, die man für den verbalen Ausdruck der eigenen Befindlichkeit benutzt, heißen Emoticons. Von den Emoticons, wie zum Beispiel :-

) (fröhlich), :-((traurig), :-D (lachend), ;-) (zwinkernd), :-/ (skeptisch) und :-o (erschrecken), macht man reichlich Gebrauch [1,105].

Es gibt zwei Formen der computervermittelten Kommunikation: asynchrone und synchrone computervermittelte Kommunikation.

Bei der asynchronen Kommunikation ist keine zeitgleiche Anwesenheit von dem Sender und dem Empfänger notwendig. E-Mail ist einer der ältesten asynchronen computervermittelten Dienste. E-Mail wurde im Jahre 1971 von dem amerikanischen Techniker Ray Tomlinson entwickelt. Heutzutage ist E-Mail zu der wichtigsten Anwendung von der asynchronen computervermittelten Kommunikation geworden. Gerade dank dem elektronischen Mail wird es möglich, neben der Übermittlung einer schriftlichen Nachricht auch Bilder, Videos oder große Textdateien zu verschicken.

Bei der synchronen computervermittelten Kommunikation ist die zeitgleiche Anwesenheit von dem Sender und dem Empfänger notwendig. Dank der synchronen computervermittelten Kommunikation wird es möglich, die Aufmerksamkeit des Empfängers zu kontrollieren. Der Chat ist einer der ältesten synchronen computervermittelten Dienste. Das Wort „Chat“ kommt aus dem Englischen und bedeutet „plaudern“. Der Chat wurde im Jahre 1988 von dem finnischen Studenten Jarkko Oikarinen entwickelt. Heutzutage ist der Chat zu der wichtigsten Anwendung von der synchronen computervermittelten Kommunikation geworden. Die synchrone computervermittelte Kommunikation findet im Chat in der Regel zwischen zwei Personen, aber häufig auch in Gruppen statt [2, 117].

Viele Leute finden die synchrone und die asynchrone computervermittelte Kommunikation sehr interessant, nützlich, spannend und toll. Allerdings, glauben einige Wissenschaftler, dass das lange Benutzen von dem Computern für die Gesundheit nicht günstig ist. Die computervermittelte Kommunikation macht die Menschen psychisch abhängig. Sie chatten mit dem Bildschirmgegenüber am anderen Ende der Welt, während das reale Gegenüber im Nebenzimmer harrt. Es ist nicht zu bestreiten, dass diese Leute an der elektronischen Nadel hängen. Sie brauchen die tägliche Dosis der computervermittelten Kommunikation. Als Ergebnis haben sie viele Probleme nicht nur in der Familie, sondern auch am Arbeitsplatz. Sie haben Verlust des Zeitgefühls, Beziehungskrisen und Entzugserscheinungen. Viele Wissenschaftler und Psychologen vergleichen diese Symptome mit dem Alkoholismus und der Spielsucht. Um diese Probleme zu lösen, bieten sie die Selbsthilfegruppen für die Menschen mit der Computersucht an. Dort können die Online-Abhängigen ihre Probleme besprechen [3, 209].

Das ist nicht zu bestreiten, dass die computervermittelte Kommunikation heutzutage eine große Rolle spielt. Gerade dank der computervermittelten Kommunikation wird es möglich, neue Freunde zu finden, alte Freunde, die nicht in der Nähe wohnen, nicht zu verlieren und etwas Interessantes zu erfahren. Allerdings soll man verstehen, dass die computervermittelte Kommunikation manchmal psychisch abhängig macht. Deswegen ist es sehr wichtig, nicht so viel Zeit vor dem Bildschirmfenster zu verbringen.

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GOVERNMENT PUBLIC RELATIONS: PUBLIC DIPLOMACY OR PROPAGANDA?

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When politicians attempt to communicate their views in the public forum, the practice can be seen as a perquisite of the democratic process.

Public relations are one of many strategies that government can utilize to increase policy dialogue with citizens... But an effort must be made to maintain and promote the ethical practice of public relations to prevent public relations from becoming propaganda.

Public relations is a very broad term because it does not suggest whether there is a two-way communicative process, nor does it imply problem solving for a specific purpose. However, the term public diplomacy implies that there is not only at least a two-way communicative process between organizations and governments, but also a problem solving process extending beyond a country's borders. However, public diplomacy may not even involve social transparency, as it can involve closed-door meetings or even military force.

Government public relations could be considered the idealized version of public diplomacy, at least in the domestic context, because the government is identifying and clarifying arguments with constituents so they can make their own judgments. Ideally, government public relations are used with honesty and sincerity because, as an "ideology factory," several competing ideas must be addressed by the government and constituents alike. Thus, government public relations have to be treated with the utmost care, as it can be used and misused. Government public relations are even more distinctive than public relations or public diplomacy because it specifically identifies the entity that is performing public relations. In particular, government public relations are more specific than public diplomacy for two reasons:

1. It is concentrated in a specific, targeted area where the government has jurisdiction;

2. It implies that the government may not be engaging in a two-way communicative, problem solving process with another area or country. In this

sense, government public relations suggest that the government is focused on solving a problem.

Government public relations are dependent upon citizen dialogue in order to survive. This makes sense, since the government cannot take a stand on a particular issue if there is no awareness or interest among its citizenry. This subsequently creates an ideal environment for the government to start the communicative process on an issue affecting the public. Some believe that, in addition to informing the public, government public relations should also influence public opinion.

Government and public relations are similar, which makes it more likely for a seamless integration of public relations into a government body. The similarities can be grouped together under three reasons. First, each is bound by rules of self-regulation. Political laws to foster ethics and understanding exist at the local, state, national and international levels.

Second, each can represent their own issues. Politicians and government organizations will advocate or condemn policy to advance their organizational goals. Public relations make the goals of a client clear, as it can identify and clarify arguments to promote public discussion. Third, each must declare their interests and avoid any conflicts.

Government public relations can also be considered a part of the democratic process. In the current era of digital media, it is very flexible and cost-efficient for a government to express their strategic, organizational views to a wide variety of constituents.

In a public that is heavily influenced by media of all different types, public relations works to identify, revise and clarify governmental arguments in the face of media scrutiny. With a transparent media environment, this subsequently enhances the democratic exchange of ideas, as well as accountability. When national unity is increased, the global stage is opened to show other countries a model government PR effort. This subsequently can increase public and cultural diplomacy in the form of soft power.

To serve the needs of constituents, the government will always have an agenda. While there will always be partisan debates on the amount of government intervention needed to accomplish policy goals, it is important for the government to remain at the service of its constituents. Public relations are just one of many strategies that the government can utilize to increase policy dialogue with citizens whose needs must be met. Of course, the government must maintain and promote an ethical practice of public relations to avoid devolving into propaganda.

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THE RELEVANCE OF PROFESSIONAL JARGONS' RESEARCHING

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Progress, industrialization and development of modern society has caused the emergence of the special lexicon reflecting features of functioning of different spheres of society life. It seems logical that development of jargons has a historical nature, besides, the professional component is not less important: at a certain stage it becomes necessary to designate concrete concepts of the narrow professional environment which have no analogs in the national lexical system [1, 1]. As V. I. Karasik fairly notes, the person realizes the identity within the ethnic origin and the estimated set of social groups and also in borders of the unique personality [5, 5]. Using at the same time a jargon lexicon, the individual associates himself with a certain social or professional group, showing that he is "at his own" in this environment. With the development of the society the language of this society is also improved, namely the lowered lexicon first of all reacts to the changes of the surrounding social environment. So, it does a problem of substandard lexicon's studying always relevant, in particular the studying of slang as its most mobile part.

A question of the conceptual essence of the term "jargon" is still debatable. The common value of this term revealed by the generalization of dictionary definitions is as follows: jargon is a speech of the group of persons which is socially and professionally closed and that contains the specific words and expressions peculiar just to this group [9, 3-5]. According to V. A. Khomyakov, the term "jargon" is most fully interpreted in the dictionary by O. S. Akhmanova as the language consisting from randomly chosen and altered elements of one or several natural languages and applied by a separate social group for the purpose of language isolation and separation from the main part of linguistic community [12, 60-61]. It should be noted that in our country the term "jargon" to some extent is associated with ordinary parlance, that is the speech of the people who insufficiently have seized standards of the literary language [6, 9-11]. In this regard in mass consciousness this term possesses a negative connotation.

It is necessary to emphasize that nowadays linguists pay special attention to a research of a professional jargon which is characterized by using of expressional synonyms to professional terms [2, 73], and a youth jargon as the most mobile lexical formation.

Modern linguists have no definite approach to the assessment of jargon. A

number of scientists (D. S. Likhachev, V. S. Elistratov, L. I. Skvortsov, etc.) that the jargon doesn't bear in itself "business" function, it is "carnival" language which distorts and simplifies habitual semantics of words. So, according to V. S. Elistratov, the jargon in Russia isn't a mass phenomenon, but it's artificially spread by the scientists, writers and journalists while the jargon is very unpopular in the general public. [3, 53-54]. L. I. Scvortsov states that jargon and colloquial words, inappropriate professionalisms, unnecessary loans litter and impoverishes the language [11, 3-4]. V. Zhivov in the article "Language and the Revolution" pays attention to a tendency of the mass using of rough, vulgar, jargon words and expressions during the 1980-1990th with the purpose to discredit former decency. The author calls this situation "linguistic revolution" which is focused on refusal of national tradition in favor of the orientation to the western samples [4, 189-190].

According to other researchers using of the lowered lexicon, in particular a jargon, allows to communicate freely and to express the thoughts precisely. So, L. V. Petranovskaya notes that the jargon holds a specific place among the languages of microsocieties as a rather developed language subsystem having own norms and allowing to communicate fully on a certain circle of subjects. The author allocates a number of the integral properties of a jargon which characterize its expressive opportunities. There are such properties as the ability to cause feeling of unity; profitability (lack of too extensive lexicon at which people manage to communicate effectively and variously); mobility of a jargon, ability to react quickly to changes of the real world [7, 1-2].

Considering a problem of relevance a jargon's studying as a specific corpus of the lexicon, it is necessary to note a steady and continuous interaction of the literary language and a jargon, an influence of one category to another. The system of language is mobile, so the elements of jargon get into the literary language, gaining at the same time other value and expressional coloring [8, 58]. Including a limited set of lexemes, jargon allows to express what difficult or can't be expressed by means of the literary language. It should be noted that jargons don't exist separately, they form a whole with the national literary language.

Thus, after the proper analysis of the scientific works of modern linguists, it is possible to consider the following statements as a confirmation of the considered problem's relevance:

– A tendency of the active use of jargon lexicon not only among the youth and professional community, but also among the political and business elite in connection with a democratization of modern society.

– Unlike the literary language in which changes happen rather slowly jargon lexicon sensitively reacts to the changes of the social environment.

– The mobility of jargons caused by the development of modern society, emergence of new spheres of professional activity and social communities.

– Switching of the researchers' attention to substandard lexicon as on the poorly studied object of a theoretical and applied lexicography which doesn't have a full reflection on the linguistic map of modern science [10, 3-5].

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KINSHIP TERMS IN THE SUBPRIME FOUNDATION OF THE GERMAN LANGUAGE

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Linguistic research in recent years are focused on the study of language in close connection with the culture of the people speaking this language, his

worldview. In the language not only the objects and phenomena of the real world but the consciousness of the people, national character, worldview are found. Notable features in the worldview are found in language at all levels: lexical, grammatical, derivational, syntactic.

A German doctor and psychologist Willy Hellpach (1877 – 1955) in his book "the German character" allocated among sustainable national traits of the Germans die *Ordnungsliebe* – love of order. In fact, for German culture *Ordnung* is a key concept. Family life, business, government, leisure time, school life, home, jobs at the plant – the whole of human life needs to be in order. The concept of Ordnung – that is what strikes foreigners the Germans. No phrase warms the heart of German: "alles in Ordnung", meaning that everything is in order, everything is as it should be. The categorical imperative, which honors every German is: "Ordnung muss sein" which means: "Order above all".

This feature "Ordnungsliebe" left its mark on the language system. For example, at the level of syntax. In comparison with the Russian language, where word order in the sentence is not so significant, it most often affects the meaning, it's different by the native language of Goethe and Schiller. The most important role in the German sentence is just word order. He is fixed, that is, the sentence must be set strictly in its place, not in a free manner.

The lexical fund of the language is more responsive to the many changes taking place in society, as it does one of its main functions – to be a means of communication, to adequately serve the needs of communicants in the transmission, processing and storage of information. This process is equally relevant for the literary standard and the non-standard national language.

Non-standard or reduced vocabulary reflects the mentality of native speakers most clearly, as it is the closest thing to a live direct communication. Therefore, in our study, we turned to subprime fund of the German language in order to clarify whether there is any deviations from perfectionism, from Ordnungsliebe in the vocabulary of the Germans.

Among the variety of vocabulary, we have opted for the kinship terms, since every culture these words are historically, genetically and culturally among the most ancient ones which playing the role of social markers , reflecting evolutionary changes in the structure of kinship and celebrating the most important family values and benchmarks, developed in a certain culture. Family and relationships are the key benchmarks of human behavior, regardless of their belonging to a particular culture [3]. Through a system of kinship terminology the national identity is manifested, the social roles that influence human behavior can be traced to.

These lexemes have the opportunity to design secondary cultural images [1]. The majority of kinship terms have got some additional semantic fields that are used outside of family relationships. The most semantically variable terms of kinship are a grandfather (a grandpa), a brother, an uncle.

Our attention will be aimed at identifying additional semantic fields and including tacit values of kinship terms in German. In our study, we look at the data tokens through the prism of tacit values.

One of the best specialists and researchers of spoken language, slang and obscene language V. D. Devkin argued that without knowledge of the spoken-painted vocabulary is indispensable, but this vocabulary is quite weighty, quite an integral part of the lexicon of each language. He is also the originator of the German - Russian dictionary of informal language that we use [5].

The lexeme **der Bruder** has a few colloquial meanings. Ex.: in the **Brüder** word form of it has gained the meaning *«das Gesindel, die Bande, die Crew»;* being a part of the phrase **Bruder Hitzig** it has the meaning *«impulsiv Mann»,* **Bruder Liederlich –** «*Schlampe»,* **Bruder Leichtfuß** – *«ausgelassener Mann».*

The term kinship **die Schwester** acquired only one meaning: the appellative to the nurse. Ex.: *Schwester Monika.*

The lexeme **der Vater** has a lot of subprime meanings. Ex.: **der Vater** – Syn. « der Opa»; **Vater Staat** – *« der Heimatstaat, die Regierung»*; **Vater Philipp** – *«die Arrestanstalt»*; **der Vatertag** – «*ein Tag, wenn Männer ohne Frauen fröhlich sind»*, Syn. «*Herrentag»* ; **das Vaterunser** – «*sehr schlanke Menschen»*.

The lexeme die **Mutter** in the phrases acquired only such subprime meanings: ex.: **wie bei Muttern** – «*sehr angenehm, wie zu Hause»*; **Mutter Grün** – *«die Natur»*; **Mutter der Kompanie** – «*der Hauptfeldwebel, der Feldwebel»*; **ich werde Mutter!** – «*Oh, ich kann nicht! Halten Sie mich»*.

Using dictionary of German spoken vocabulary and drawing attention to the presence of examples of one of the oldest thematic layers of language, we concluded that kinship terms have acquired additional semantic fields in the sub-Prime layer of the language. That confirms that at all disapproving attitude towards any manifestation of levity, the Germans allow themselves some emotional retreat from *Ordnungsliebe* in the level of vocabulary.

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TO THE PROBLEM OF LINGUO-STYLISTIC ANALYSIS OF O. HENRY'S SHORT-STORY "THE COP AND THE ANTHEM"

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The Cop and the Anthem is a short story written by O. Henry in 1904. Soapy is the main character of the story and the only one whose name we know. We can see that the name of the character is symbolic. Perhaps, this name reveals one of Soapy's traits: he is slippery. As the story unfolds, we do observe that he avoids getting arrested while breaking the law.

He is a homeless person whose home is a park bench in Madison Square, New York City, and whose goal is to get arrested and spend 3 months on the Island surviving cold winter. In order to spend 3 months in prison he makes attempts to commit different petty crimes. Nevertheless, his wish doesn't come true. Giving up on his idea, Soapy passes by a church and hears the Anthem. In the last scene we can learn some new facts about his past:

And the anthem that the organist played cemented Soapy to the iron fence, for he had known it well in the days when his life contained such things as mothers and roses and ambitions and friends and immaculate thoughts and collars [1]. This Anthem awakens the forgotten memories as it is a symbol of something blissful; furthermore, this Anthem is played in a church. A blessing was bestowed on him, so Soapy decides to start a new life. We can see the inner change in Soapy, his will to become a good man, to be useful for others, to prove himself that he deserves something good in his life: *He would pull himself out of the mire; he would make a man of himself again [...] There was time; he was comparatively young yet; he would resurrect his old eager ambitions and pursue them without faltering. […] He would be somebody in the world* [1].

But Soapy's present is totally different: *He viewed with swift horror the pit into which he had tumbled, the degraded days, unworthy desires, dead hopes, wrecked faculties, and base motives that made up his existence* [1]. His appearance is not suitable for a noble person: *But as Soapy set foot inside the restaurant door the head waiter's eye fell upon his frayed trousers and decadent shoes* [1].

The story takes place in New York, and the author gives us a realistic description of it: detailed, but not too long. Soapy lives on a park bench in Madison Square; it has always been considered as a place for the rich, that Soapy does not belong to. Though he sees those wealthy people, he has no intention to be like them: *He scorned the provisions made in the name of charity for the city's dependents* [1] (through the story there are two descriptions of his tie *presented to him by a lady missionary on Thanksgiving Day* [1], perhaps this gift means a lot to him.) So, we can say that there is a conflict between Soapy and the society. He is a homeless person who can't find a place in life; people like him are not welcomed in the society: *He halted in the district where by night are found the lightest streets,*

hearts, vows and librettos…Women in furs and men in greatcoats moved gaily in the wintry air [1], that is why he has no other choice than to find a way to survive and get arrested to find a warm place and food for the winter colds. Still, he considers himself to be a good-looking man: *He was shaven, and his coat was decent and his neat black, ready-tied four-in-hand had been presented to him by a lady missionary on Thanksgiving Day* [1]. He may have belonged to a noble society in past as his language: *Don't you figure out that I might have had something to do with it?* [1] and his manners reveal it: *A roasted mallard duck, thought Soapy, would be about the thing -with a bottle of Chablis, and then Camembert, a demi-tasse and a cigar. One dollar for the cigar would be enough* [1].

In the end of the story the conflict in the inner world of Soapy shows up, his memories provoked a revolution in his mind; he decides to give up his previous way of living and to change himself.

While analyzing the title of the story, we can remark that it also represents a symbol. Lots of cops are told about (indicated, displayed) in the story. Soapy notices them while they seem not to pay attention to him, and his attempts to get arrested fail until the end of the story, when the last cop arrests him. It happens when Soapy is listening to the Anthem and gets the idea of starting a new life, of changing his life goals. This way, we can suggest that the Cop represents the Soapy's past: his attempts to get arrested and to spend the time in the Island, as long as the Anthem is the symbol of Soapy's possible future, his plans, his inner change.

We can see that the story contains a religious subject, as the Anthem is the symbol of something blissful. It represents some hope for Soapy. It makes Soapy remember his past, when he had a family, friends and job.

The setting plays an important role in revealing the character and depicting the scene as it makes a contrast between the nature: *The moon was above, lustrous and serene; vehicles and pedestrians were few; sparrows twittered sleepily in the eaves—for a little while the scene might have been a country churchyard* [1] and Soapy's state of mind: *The conjunction of Soapy's receptive state of mind and the influences about the old church wrought a sudden and wonderful change in his soul. He viewed with swift horror the pit into which he had tumbled, the degraded days, unworthy desires, dead hopes, wrecked faculties, and base motives that made up his existence* [1]. We can overwatch the revelation of Soapy's thoughts and memories of his past, his change in mind, his intention to start a new life.

The story has a complex narrative structure [2]. First, we see the events unfold in a chronological order, but then at the moment when Soapy hears the Anthem we remark a flashback that reveals some significant memories of his past life and childhood. This flashback is the climax of the story as it shows the important part of Soapy's personality, of his inner world. We can also say that the flashback animates the story. After the climax, the story comes fast to en end, without any denouement. The author makes the ending unexpected in order to make the reader foreshadow the outcome of the story.

The story is told by the third person narrator, who witnesses what happened, but plays no part in the events. The author is omniscient and non-obtrusive, as he doesn't speak to the reader directly, and his knowing is limited as he doesn't reveal all the facts about Soapy [2; p. 55]. The reader sees the events and the other characters from Soapy's viewpoint. Besides, it is important to note that the story is not full of dialogues, so we may suggest that Soapy is a reserved person, living in his own little world.

In my point of view, the story is both funny and sad. As we are looking at Soapy making attempts to get arrested and committing pretty crimes, we are laughing at him being so slippery. But in the end, when he finally arrives at the idea of starting a new life and giving up on getting arrested, his wish comes true as the police officer comes up. We may suggest that the key idea of the story is "our wishes come true when we least expect it". So, we can see that the story is ironical. The ending is open; this way the author makes the reader think about possible ways of Soapy's future life, whether he changes himself or continues living in his inner prison. Thus, this story is to be considered impressive and full of inner sense. It also teaches us some life lessons.

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MAIN ASPECTS OF TEACHING LISTENING

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One of the main reasons for getting students to listen to spoken English is to let them hear different varieties and accents - rather than just the voice of their teacher with its own idiosyncrasies. In today's world, they need to be exposed not only to one variety of English (British English, for example) but also to varieties such as American English, Australian English, Caribbean English, Indian English or West African English. When people of different nationalities speak to each other, they often use English too, so that a Swiss flight attendant might well have to understand a Japanese woman's English variety, just as an Argentinian might need to be able to cope with a Russian's version.

There are, of course, problems associated with the issue of language variety. Within-British-English, for example, there are many different dialects and accents. The differences are not only the pronunciation of sounds ('bath' like 'laugh' 'bath' like 'cat') but also in grammar (the use of 'shall' in northern varieties compared with its use in 'Standard English'- the southern, BBC-type variety;-the grammatically

coherent use of done', e.g. 'I done it' in non-standard English). The same is of course true for American, Indian or West African English.

Despite the desirability of exposing students to many varieties of English, however, common sense is called for. The number of different varieties (and the degree to which they are different from the one students are learning) will be a matter for the teacher to judge, based on the students' level, where the classes are taking place etc. But even if they only hear occasional (and very mild) varieties of English which are different from the teacher's, it will give them a better idea of the world language which English has become. The main method of exposing students to spoken English (after the teacher) is through the use of taped material which can exemplify a wide range of topics such as advertisements, news broadcasts, poetry reading, plays, (pop) songs with lyrics, speeches, telephone conversations and all manner of spoken exchanges. Teachers can imitate these, but good tapes are far more powerful.

The second major reason for teaching listening is because it helps students to acquire language subconsciously even if teachers do not draw attention to its special features exposure to language is a fundamental requirement for anyone wanting to learn it. Listening to appropriate tapes provides such exposure and students get vital information not only about grammar and vocabulary but also about pronunciation, rhythm, intonation, pitch and stress.

Listening is a skill and any help we can give students in performing that skill will help them to be better listeners.

Because of its special characteristics, teachers need to ensure that students are well prepared for listening and that they are clearly able to hear what they listen to. These and other concerns are summarized in the following six principles.

Principle 1: ***The tape recorder is just as important as the tape.*** However good your tape is, it will be useless if the tape recorder has a poor speaker or if the motor speed keeps changing and the tape goes faster or slower. You need to be sure that the tape recorder can be heard all round the classroom.

Another vital feature is a tape counter that is easy to see. When you find the right place on the tape, you can either remember the number which the counter is showing or press the counter at that point so that it now shows 000. In both cases, you can find your way back when you want to play the tape for the second or third time - instead of going backwards and forwards all the time trying to find the right place. With longer tapes, you can also note the counter number for each part or section you may need to return to.

Remember too that if you want to use-your tape recorder for music as well as speech you may need a better machine.

Principle 2: ***Preparation is vital.*** Teachers and students need to be prepared for listening because of the special features we discussed above.

Teachers need to listen to the tape all the way through before they take it into class. That way, they will be prepared for any problems, noises, accents etc., that come up. That way, they can judge whether students will be able to cope with the tape and the tasks that go with it.

Students need to be made ready to listen. This means that they will need to look at pictures, discuss the topic, or read the questions first, for example, to be in a position to predict what is coming. Teachers will do their best to get students engaged with the topic and the task so that they really want to listen.

Principle 3: Once *will not be enough.* There are almost no occasions when the teacher will play a tape only once. Students will want to hear it again to pick up the things they missed the first time. You may well want them to have a chance to study some of the language features on the tape.

The first listening is often used just to give students an idea of what the listening material sounds like (see Principle 5) so that subsequent listening are easier for students. Once students have listened to a tape two or three times, however, they will probably not want to hear it too many times more.

Principle 4: Students *should be encouraged to respond to the content of a listening, not just to the language.* As with reading, the most important part of listening practice is to draw out the meaning, what is intended, what impression it makes on the students. Questions like 'Do you agree?' are just as important as questions like 'What language did she use to invite him?'

Principle 5: *Different listening stages demand different listening tasks.* Because there are different things we want to do with a listening text, we need to set different tasks for different listening stages. This means that, for a first listening, the task needs to be fairly straightforward and general (and almost certainly of the *Activate* type). That way, the students' general understanding and response can be successful - and the stress associated with listening can be neutralized.

Later listening, however, may focus in on detail - of information, language use, pronunciation etc.

Principle 6: *Good teachers exploit listening texts to the full.* If teachers ask students to invest time and emotional energy in a listening task - and if they themselves have spent time choosing and preparing the listening - then it makes sense to use the tape for as many different applications as possible. Thus, after an initial play of a tape, the teacher can play it again for various kinds of study before using the subject matter, situation or typescript for a new activity. The listening then becomes an important event in a teaching sequence rather than just an exercise by itself.

In developing your students listening skills, allow for exposure to English:

- provide plenty to listen to;
- lower stress;
- let your students' brains work while they are doing something else.

Provide meaningful "real life" messages:

- build in response time;
- allow for visibility of the speaker;
- provide background clues;
- allow for redundancies.

Use the three resources for listening comprehension:

– the teacher;
– other speakers of English;
– tapes.

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PHILOSOPHICAL PRINCIPLES OF A MODERN WORLD

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The starting point that should guide ethics in the modern world is the concern to formulate new principles in keeping with the realities that humanity as a whole faces and people's chance to assert themselves in the future.

The principle of communicative rationality can be considered first and foremost, not because it was more important but because it expresses the minimal understanding condition among the subjects. J. Habermas associates ethics with the principle of transparent communication as transparent communication furnishes a model of morality careful to come first through reciprocity and in the absence of violence [1, 115]. This emphasis is particularly relevant in establishing the importance of ethics in a world that, despite the positive effects of globalization, risks globalizing the phenomenon of violence as well.

It is intersubjectivity that, through communication, invites closeness, mutual knowledge and responsibility. This view of intersubjectivity, which allows direct contact between individuals and communities and generates empathy, in-depth understanding for different interests and lifestyles, starts from communicative activity, proposing a non prescriptive morality whose principles are not related to any imposition of rules and regulations but only to the guarantee of inter-understanding.

Thus, a new interpretation of “practical reason” is offered, starting from the accountability of human action through communicative activity. J. Habermas developed a concept of moral consciousness, starting from the communicative activity in contemporary society [2, 207], a theory that does not deny anything in its philosophical character, while renewing an effective and heuristic dialogue with the science.

The principle of privileged otherness is absolutely new in the field of ethical meditation; whereas the term of otherness can create ambiguity.We suggest that it would be preferable to use such formula: the Other's privilege in relation to One's self. It is necessary to point out that starting from Plato, otherness has been used as a synonym for diversity in opposition to identity or for multiplicity in opposition to unity. With modernity, the category of otherness has grown significantly and even changed direction. In its new understanding, otherness is called the Other, when it

is maintained as a pure neutral find, or the other one, when it is recognized as a core of intentional life, irreducible to self-determination.

It is a well-known fact that the moral philosophy of otherness was developed by E. Levinas, who emphasizes the ethic as a break, which he calls ontological egoism [3, 42]. We think that the elements of this concept, truly revolutionary in contemporary ethics, can be summarized in the following way. Assuming one's own destiny is a fact of life and as such, the theorizing of this issue belongs to the ontological. Assuming the Other's destiny belongs to ethics. However, for this to happen, moral theory must investigate the depth of the inter-subjective relationship, discovering that in this way, it outlines the milestones that indicate the privileging of the Other in relation to the self.

Exceeding the Christian moral principle of neighborly love, which requires to consider the other "as yourself", we suggest that the principle of privileged otherness is based on ascertaining, obviously valid only within ethical horizon, the asymmetry of the relationship I – Other: the Other is not equal to me but has all the privileges in relation to myself.

It is true that the contemporary era is facing problems whose solution can be hardly found appealing to the wisdom of the classics. We think that it's time to think a new ethics based on the principle of tolerance as a solution that resonates with a social reality less willing to take moral support in the idea of absolute duty and pure obligation. We are convinced that an ethics based on the principle of tolerance, whose supreme requirement is the obligation to the common future of humanity, may be the solution to smooth the asperities of the globalization process and, consequently, the solution to survive together in a global world, united in diversity.

One cannot deny that until recently, man's moral problems aimed his immediate relations with peers. Today, the danger of extinction facing humanity as a species, because of global risk of conflict, human irresponsibility to the natural environment, the excesses of technology, supports the idea that not only today's humanity, but especially the future one, near or far, is entrusted to our moral attitude. We emphasize that the call for tolerance is the only way to avoid conflicts between peoples, cultures and civilizations, that may endanger the existence of mankind, and as booster for the possibility of building the world of “together”.

To draw the conclusion, one can say that tolerance is based on the assumption that no one is infallible. It ceases to exist where the respect for any person is no longer guaranteed. In politics, tolerance is the expression of that spirit which refrains from verdicts and does not seek ideological justification, but tries to explain and accept the reasons and motives of all participants in social life.

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THE ROLE AND IMPORTANCE OF HUMANITARIAN EDUCATION IN TRAINING SPECIALISTS IN UKRAINE

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In recent years, transformational processes in Ukraine have been taking place in all spheres of society, especially in the educational system. The level of development of the state is determined by the level of education, because it is the basis of the development of personality, society and nations in all developed countries of the world [1, 182].

After the Ukrainian people gained independence, they laid the groundwork for building a modern sovereign state, which should carry out social economic and humanitarian policies in the interests of its citizens. But the systemic crisis inherited from the past negatively affected the reproduction and development of its human potential [2, 1].

Humanitarian development is a model of development aimed at maximizing the disclosure of the potential of each person and society as a whole, creating decent conditions for the realization of all intellectual, cultural and creative possibilities of people and the nation .

The reform strategy involves appeal to the system of values related to national cultural and human traditions; creation of conditions for transition from pedagogy of authoritarian type to personally-oriented pedagogical systems. Positive changes have affected the structure of humanitarian education, the basis for the development of courses, the principles of selection, content and instrumental basis. The teaching process became more diverse, personally oriented. This approach to the problem of humanities promotes a sense of respect for cultural diversity, uniting society, and also prepares students for an active civic position in a multicultural society [3, 215].

Some fundamental moral and ethical qualities should be in the basis of humanitarian education:

− universal values (norms of human common living);

− nationally-oriented values (the idea of national self-determination);

− the values of the modern world (democracy, human rights, freedom of choice), which allow, based on the system of humanitarian education, to determine the cult of a harmoniously developed person − an educated, cultural, physically and

morally healthy, socially oriented creative person with an active social position in society.

Humanitarian education should be aimed at forming moral, legal consciousness, culture, a sense of responsibility for the results of own activities of an individual. Therefore, the priority task of higher education is the preservation and creative development of its humanitarian and fundamental components. Social and humanitarian education includes a lot of disciplines, the list of which is considered not one dozen. In the first stages of humanitarian education includes Ukrainian and foreign languages, historical literature then philosophy, sociology, political science, jurisprudence, and others are added.

In organizing the process of humanitarian education at universities it is necessary to take into account that the whole world as well as the Ukrainian society are dynamically developing in the conditions of a new historical epoch. Humanitarian education should attract, inform and educate young people's social responsibility by encouraging the pluralism of the worldview, analytical thought, ability to navigate through complex social processes, and taking an active part in the civilian life of Ukraine [3, 216].

Humanitarian training should extend the education of specialists, provide them with the maximum inclusion in public relations, make them competitive in the labor market, form a personality and a civic position.

Not only the development of new curricula, but the forms of educational process organization are important for the training future specialists: trainings, discussions, simulation games, which give the opportunity to make the right decision. Almost a third of the knowledge students receive through creative, active communication. Society needs moral, active people who can make decisions. Therefore, a higher education institution should educate a person who can engage in life-long self-education, and not only training specialists who have professional knowledge.

In order to achieve the effectiveness of humanities, new approaches are needed that encourage students to think critically, form their own views and thoughts, and adopt democratic principles and norms.

The society requires professionals who have not only special knowledge, but also a high level of responsibility to the state and civil society, which can't be realized without humanitarian education.

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ACTIVITIES FOR PRACTICING PHRASAL VERBS

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In today's world, oral speech is considered to be of great importance. Indeed, this foreign language is one of the most commonly used languages all over the world. That means that vocabulary plays a big role in teaching English. Phrasal verbs are frequently used, especially in dialogues. They help us to vary our speech very much. That's why while studying English students must use phrasal verbs as much as possible. But it is a well-known fact that they are very difficult to learn. According to Walkova, there are some reasons for it. So, she notices that meanings of these verbs have often been regarded as arbitrary, random and unpredictable [1]. Of course, every teacher would like to know whether there is any systematic structure or organizational system governing the meanings of these lexical units. Because it would make the process of learning them much easier. But traditional approaches to phrasal verbs have not been able to identify any coherent system or structure and have therefore classified them as idiomatic [2].

Now let's consider phrasal verbs themselves. Phrasal verb is a phrase that consists of a verb with a preposition or adverb or both, the meaning of which is different from the meaning of its separate parts: for instance, 'pay for', 'work out', and 'make up for' [3].

According to the statistics there are more than 12000 phrasal verbs in English but to speak fluently students should know just a couple of hundreds of them, and for a perfect written speech they need about one thousand [4].

It goes without saying that any teaching material consists of a definite number of exercises that help students to remember phrasal verbs and to start using them in their speech. But unfortunately, it usually seems to be too boring just to learn something by heart and to do the same exercises. That's why we suggest using different activities in class that will help students learn phrasal verbs more effectively.

The first activity we would like to speak about is familiar to everyone from the childhood. It is called Charade. During this activity your students will have to move around the class that influences the process of learning in a very positive way. So, Charade activity is worth using to teach phrasal verbs that denote some action, for instance, «get out», «get off», «run into», «look for», «get in» etc. Write phrasal verbs you have chosen on separate sheets of paper and put them into a

container. Then make your students one by one take it and show it in the way other students could guess the meaning and say an appropriate phrasal verb [5].

Then we would like to tell you about a quiz game Jeopardy where students guess phrasal verbs from their definitions. Divide your students into 3-4 teams and draw a grid on the board with points at the top and definitions down the side. So, each team must say a phrasal verb having read the definition. If they give incorrect answer, the other team may try. For example, the first team chooses 500 point and reads aloud the definition 'Go inside a car, room, home'. After that they should say the phrasal verb 'Get in'.

	100	200	300	400	500	600
GET	Get out of bed	Manage to survive in spice of difficulties	Recover from an illness	Leave a bus, train, plane or a place	Go inside a car, room, home	Start doing or continue doing an activity
	Get up	Get by	Get over	Get off	Get in	Get on

A team work allows us to develop patience in students and it also helps us to build up a good team [6].

And finally, an activity which is called 'Don't Say It' where students must work in pairs. One of the ways to get your students involved into the interactive activity in class is to have them work in pairs. The first student, let's call him A, takes a card where he sees a sentence with a phrasal verb. The task is to paraphrase the sentence in such a way not using a phrasal verb given there. For example, there is a sentence: She got over very quickly. So, the student A is to describe the meaning of the phrasal verb 'get over' changing it for example into the verb 'recover'. The second student then does the same [7].

Thus, as phrasal verbs are so frequently used in contemporary speech, teachers should really pay a great attention to teaching them. No doubt communicating with native English speakers means you'll hear such verbs at least once, if not several times, during a conversation. So, students must be able to understand what this or that phrasal verb means, although the meaning is often unpredictable. But despite all the difficulties in teaching and learning them, it really makes sense do it. We are sure that phrasal verbs make our speech more interesting, although they can make the conversation confusing and difficult to follow for non-native English speakers that's why we should enrich our students' vocabulary with these verbs.

In this article we have provided the most interesting from our point of view activities which will not only help to remember phrasal verbs more effectively, but also increase students' interest for learning new words that are so important for speaking.

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Krivykh L. D.

THE APPLICATION OF ACTIVE LEARNING METHODS IN THE TEACHING OF ENGLISH TO STUDENTS OF INFORMATION TECHNOLOGY DISCIPLINES

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Accounting of the modern labor market requirements in training of graduates of universities, the desire for a harmonious combination of theory and practice is relevant today as never before.[4,42]

In 2002, scientists at the Massachusetts Institute of Technology in the lead of Professor Crowley faced with the new demands of their main employer "Boeing company". The essence of the requirements was that graduates of the university (even the most advanced in its industry in the world), who knew the theory well, were not ready to work in the production and need long-term training in practical skills in the workplace.

To solve this problem, a new approach to training, called "Think-Design-Implement-Operate" was developed.

The creation and implementation of the CDIO initiative is a turning point in the training of qualified personnel for business, government and other spheres.

Students from the very first days of training should feel that their activity is an important, interesting, exciting process, they must clearly understand what their profession is.

New methods of teaching and learning, in particular active learning-based on an active practical approach, become priorities in higher education.

A whole number of requirements must be traced in these technologies: ability

to dialogue, activity-creative approach, orientation to support the individual development of the student, providing the student with the necessary space for making independent decisions.

Interactive teaching methods meet all of the above requirements and can be easily introduced into the learning process.

The interactive nature of the training allows the trainees to interact with each other, involving in this process a teacher who acts as the organizer of the learning process. Such a strategy is called a student-centered approach and its correct application allows achieving mastering of educational material by 50-90%, depending on the use of interactive methods.

Using of interactive methods helps to increase the effectiveness of the learning process as well as to develop interest in a foreign language in particular for students of non-linguistic specialties [1, 2-4].

It is through the dialogue of different cultures that social realities are determined in content, emotionally differentiated and interpreted in interaction. So, the problem situations proposed for resolution in a foreign language cause both non-adaptive and adaptive activity; in role-playing situations, different role behavior plays out under different social expectations of the speech partners; the solution of communicative tasks sets up a productive activity and motivates the student for the result. The project activity while teaching a foreign language lays the foundations of creative and transforming activity.

Among the most common methods are the method of problematic presentation, the project method, the Case-study method, the Jigsaw method, the brainstorming method, the Sinkwein method, business and role plays, the six-hat method, the blitz survey method, and many others [2, 4-6].

The use of these methods requires detailing the components of their methods, the correct organization of student learning activities in the interactive mode [6, 41].

Experience shows that the language group should be divided into several teams (3-4 people each, depending on the content of interactive activities). Then the teacher, acting as an organizer and consultant, will be able to observe the work of each student in the relevant working groups and prevent possible language and speech errors.

Successful interactive activities are planned and organized in several stages. The preparatory phase may include oral and written assignments aimed at introducing students to different aspects of the problem for the forthcoming discussion and mastering the corresponding colloquial formulas.

Consider the project method of interactive learning on the material of the topic “At the Hotel”.

Project »Dream Hotel»

I. Preparation of the project.

1. Vocabulary: the names of services, categories of rooms, etc.
2. Locality: geographical location (Finland, Thailand, Russia ...)
3. The general view.

4. Concept. (Spa Hotel, Motel ... etc.)

II. Conference on the protection of the project.

Discussion, choice of the ideal project. (Monologues, dialogues, role-playing game)

II. Business plan to attract customers.

Presentation (videos, pictures, photos, etc.)

IV. Essay "Dream Hotel. Which hotel attracts you as a customer and why? "

(Creative task as a control of the mastering of linguistic material)

Мет од анализа ситуаций(Case Study) довольно часто используется на занятиях со студентами 2курса по учебнику “Basic English for Computing”.

Types of Computer

Background (исходные данные) Магазин»Контакт» славится хорошим выбором компьютеров. Служебный персонал помогает покупателям выбрать правильный компьютер и советует приобрести пакет обновлений и аксессуары.

Task: Work in groups of 4. Two students-sellers. two buyers. 1.Every seller talks to one of the buyers and helps him choose a computer.2. The sellers meet and discuss what kind of computer they sold and why .Buyers meet and discuss what kind of computer they bought and why. Themes for discussion are different: viruses, printer problems, etc.

The effectiveness of interactive methods is obvious foreverybody: for teachers and students alike, they develop the most important competencies required by a modern engineer and specialist.

- Apply the knowledge gained by working in organizations
- the ability to think creatively, the ability to solve real problems,
- the ability to systematically think, understand the relationship
- between disciplines and knowledge
- the ability to work alone and in a team, the ability to be
- leader and communicate effectively within the team/

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AGGREGATION DER TRADITIONELLEN LANDWIRTSCHAFT UND FERNERKUNDUNG DER ERDE IN FORM EINES GEOINFORMATIONSSYSTEM (GIS)

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Die Geschichte zur Entwicklung der Landwirtschaft ist untrennbar mit der historischen Entwicklung der menschlichen Gnosis verbunden. Die Landwirtschaft ist nicht unbeweglich von allein, sie verändert sich in logischerweise definierten Formen, die den Formen menschlicher Gnosis ähnlich sind. Mit den niedrigeren, primitiven Formen rationaler Gnosis beginnend, geht die Landwirtschaft nach und nach in immer höhere Formen über und endet in der Form wissenschaftlicher Gnosis.

Die Landwirtschaft differenzierte sich in den ersten Stadien nach dem Beobachtungsgrundsatz, was zur Anhäufung einer großen theoretischen Erfahrung im Anbau von Nutzpflanzen beitrug, die die Menschen zuerst mündlich, dann in schriftlichen Quellen von einer Generation zur anderen übertrugen. Kenntnisse wurden auf Kosten von Versuch und Irrtum verfeinert und erweitert [6].

Astronomische, geometrische und andere Kenntnisse der Chaldäer und Ägypter, die für die Landwirtschaft so notwendig waren, betrugen das Berufsgeheimnis des Kophtas. Diese Wissenschaftsansätze wurden zuerst von den Phöniziern und dann von den alten Griechen akzeptiert [2].

Die Philosophen des antiken Griechenlands (Aristoteles und andere) und Roms (Mark Porcius, Mark Terentius Varro, Plinius der Ältere, Junius Moderatus Columella) generalisierten das theoretische Material zusammen, das in den Regeln und Rezepten für die Aufzucht von Feldfrüchten gesammelt wurde. Es war von großer Bedeutung für die Entwicklung der Landwirtschaft. Die Wissenschaftler des Altertums spekulierten immerhin ihre Denkergebnissen auf der Grundlage deduktiver Methodologie, die sich in Ansicht von universellen Aussagen ausdrückten [4].

Die wissenschaftliche Landwirtschaft hätte in den alten Jahrhunderten nicht entstehen können, da die Naturwissenschaften in ihrer Entstehung begriffen waren und nicht in einzelne Disziplinen unterteilt waren. Die Entwicklung der

Naturwissenschaften der Antike war idealistische Natur. Aber diese Periode der Wissenschaftsentwicklung ist wichtig wie eine Phase der Akkumulation von Fakten.

Das Mittelalter ist durch eine starke Sammlung auf die innere Welt des Menschen und seine Selbstverbesserung gekennzeichnet, was wiederum die Entwicklung der Wissenschaften verlangsamte, insbesondere die Entwicklung der Landwirtschaft und der agronomischen Wissenschaft.

Die meisten westlichen Autoren des Mittelalters (Peter Crescent, Albert der Große, Bernard Palissy), die über Landwirtschaft schrieben, waren einfache Kompilator, die alles, was in der antiken griechischen und römischen Agrarliteratur bekannt war, wiederholten.

Agronomische Wissenschaft und Landwirtschaft waren in einem Zustand des Niedergangs vor der Wiedergeburt oder Renaissance vom XIV bis zum XVI Jahrhundert. Die Große Häresie, das pazifizierende Mouvement und das Papsttum der Renaissance bahnten die Reformation an, die die Einheit der christlichen Welt und die scholastische Regierungstheorie zerstörte, in deren das Zentrum der Papst stand. Neue Kenntnisse über die Antike und die Form der Erde brachten in der Renaissance ein Gefühl der Müdigkeit von den Systemen hervor, die nun als geistliches Gefängnis wahrgenommen werden sollten. Die Kopernikus-Astronomie hat die Erde und den Menschen dem Ptolemäussystem gegenüber bescheidener hingesetzt. Um die deduktive Erfassung neuer Fakten unter den Wissenschaftlern zu ersetzen, verbreitete sich die induktive Tendenz nach Argumentation, Analyse und Systematisierung [7].

Erst im XVII Jahrhundert fang man an, progressiven Gedanken zuzuhören. Während dieser Zeit wurden die reifsten Aussagen über das Wesen der Wissenschaft von dem Engländer Francis Bacon gemacht. Im Jahre 1605 wandte er sich in seiner Abhandlung «Über den Wohlstand der Wissenschaft» deduktive Methode der Erkenntnis, gegen die induktive Methode, und 1620 erklärt er in «Neues Werkzeug oder Ausdeutung über die Natur und das Kommen des Reiches des Menschen», das Experiment zur wichtigsten Methode zur Erkenntnis der Natur. In der Folgezeit verkündete Francis Bacon die Einheit der deduktiven und induktiven Methoden der Gnosis [2].

Auf diese Art endete die Epoche der visuell-spekulativen Landwirtschaft. Aus einem Traum erwachte das wissenschaftliche agronomische Denken Mitte des 18. Jahrhunderts, als ein Experiment zur Verifizierung der theoretischen Kenntnisse eingesetzt wurde. Die ersten Pflanzenexperimente waren sehr primitiv, da die Methoden ihrer Durchführung nur entwickelt wurden (Van Helmot, Malpighi, Woodward, Zeiger). Während dieser Zeit wurden auch chemische Forschungsmethoden entwickelt. Herausragende Ergebnisse erzielten die französischen Chemiker A. Lavoisier, J. Senebier sowie der Engländer Joseph Priestley.

Somit waren die Experimente zu Beginn der Entwicklung der wissenschaftlichen Agronomie selten und ungenau, und die erhaltenen Daten waren

unzuverlässig. Dies kann nur dadurch erklärt werden, dass die Forschungsmethoden selbst Gegenstand der Forschung waren.

Die Wissenschaftler des XVIII-XIX Jahrhunderts waren Einzelgängers, die auf Begeisterung und auf eigene Kosten arbeiteten. Die Agronomie begann sich mit stürmischen Schritten zu entwickeln, nachdem die Wissenschaft kollektiv geworden war und wissenschaftliche Einrichtungen entstanden waren. Erst nach der Organisation von Versuchsfeldern und Stationen machte der Staat die Entwicklung der Wissenschaft mit.

Als Begründer der kollektiven agronomischen Wissenschaft gilt der Engländer Loz, der 1843 ins Werk die Rotamsteder experimentelle Station setzte. Die Entdeckung von Versuchsstationen trug zu einem Anstieg der Anzahl der Wissenschaftler, des Forschungsvolumens, der wissenschaftlichen Fakten sowie der Akzentuierung der angewandten agronomischen Wissenschaften bei: Ackerbau, Futterproduktion, Wiesenbau, Obstanbau, Gemüseanbau usw. Dies wurde im 20. Jahrhundert zu einem wichtigen methodologischen Prinzip [6].

Die Akkumulation von wissenschaftlichen Fakten hat natürlich zur Differenzierung der agronomischen Wissenschaften beigetragen, nämlich der Identifizierung verschiedener Richtungen (Pflanzenphysiologie und Agrochemie).

Am Ende des 19. Jahrhunderts wurden die Hauptschädlinge landwirtschaftlicher Nutzpflanzen untersucht, und es erschien eine neue Wissenschaft der Insektenkunde. Die Zweigwissenschaften zeichnen sich nach der Gründung staatlicher industriezweigeigener Versuchsstationen aus.

So wurde die Agronomie zu Beginn des 20. Jahrhunderts zu einer komplexmäßigen Wissenschaft und erreichte dadurch den Höhepunkt ihrer logischen Entwicklung, sah sich jedoch mit dem folgenden Problem konfrontiert: der operativen Darstellung von Informationen über die Beschaffenheit großer Teile der Erdoberfläche. Um dieses Problem zu lösen, kommen Methoden zur Fernerkundung der Erde hinzu.

Fernerkundungsmethoden werden in der Erdforschung seit sehr langer Zeit verwendet. Am Anfang wurden Zeichnungsbilder verwendet, die den räumlichen Ort der zu untersuchenden Objekte festlegten. Mit der Erfindung der Fotografie im 19. Jahrhundert entstand die Aufnahme mit dem Fototheodolit. Die Entwicklung der Luftfahrt verbürgte für den Erwerb von Luftbildern, die das Gelände von oben, im Plan, zeigten. Dies bewaffnete die Erdwissenschaften mit einem leistungsstarken Mittel der Forschung nämlich Luftmethoden [1].

In den sechziger Jahren des 20. Jahrhunderts nach dem Aufkommen von Weltraumraketen und Satelliten, ging die Fernerkundung in den Weltraum. Eine neue Ära der Fernerkundung ist mit der bemannten Raumfahrt verbunden.

Der erste meteorologische Satellit wurde am 1. April 1960 in den Vereinigten Staaten von Amerika gestartet. Es wurde für die Vorhersage des Wetters, die Überwachung der Bewegung von Zyklonen und andere ähnliche Aufgaben verwendet. Der erste unter den Satelliten, die für regelmäßige Untersuchungen großer Teile der Erdoberfläche verwendet wurden, war TIROS-1.

Der erste spezialisierte Satellit wurde 1972 gestartet und ERTS-1 genannt. Er wurde hauptsächlich für landwirtschaftliche Zwecke verwendet. Derzeit heißen die Satelliten dieser Serie Landsat. Sie sind für die regelmäßige Multi-Zonen-Vermessung von Gebieten mit mittlerer Auflösung ausgelegt.

Die breite Anwendung von Weltraum-Bilddaten hat neue Aspekte für die Überwachung des Zustands landwirtschaftlicher Flächen eröffnet.

Verschiedene Vegetationstypen unterscheiden sich in Struktur, Vegetationsperiode und anderen Merkmalen, die sich in Raumbildern unterschiedlich manifestieren. Einige dieser Merkmale werden verwendet um Anbauflächen zu schätzen, Pflanzen zu prognostizieren und den Zustand der Vegetation zu bestimmen. Ein guter Indikator für die Reifezahl von Kulturpflanzen ist insbesondere das Verhältnis der spektralen Helligkeit im nahen infraroten und roten Bereich [1].

Da die Betriebsfläche die Haupteinkommensquelle sowie das Aktiv des Agrarunternehmens sind, hat diese Tätigkeit einen räumlichen Charakter.

Die Funktionsweise moderner landwirtschaftlicher Betriebe ist unmöglich ohne Kombination und Analyse räumlich verteilter Informationen, die sowohl in der traditionellen Landwirtschaft als auch in der Fernerkundung der Erde gewonnen werden. Die Anwendung moderner Geoinformationssysteme (GIS) ermöglicht die Implementierung eines systemischen interdisziplinären Ansatzes zur integrierten Untersuchung und Anwendung der gewonnenen Daten [3].

Beispiele für solche Systeme sind die nationalen Systeme zur Überwachung landwirtschaftlicher Ressourcen – die Europäische Union (MARS), die Vereinigten Staaten von Amerika (NASS) und die Volksrepublik China (CHARMS) [8]. Auch kommerzielles Service zur Überwachung landwirtschaftlicher Nutzpflanzen, deren Ergebnisse an den Endanwender nämlich an das Agrarunternehmen gerichtet sind entwickeln sich aktiv [5].

Die Notwendigkeit der Nutzung von Geoinformationstechnologien auf dem Land wird durch den allgemeinen Fortschritt in der Produktion von Pflanzenproduktion bestimmt und zwar die Entwicklung von adaptiver Landschafts-, Präzisionslandwirtschaft, die Reorganisation der Landnutzung, revolutionäre Veränderungen in Theorie und Praxis, sowohl in der traditionellen Landwirtschaft als auch in der Fernerkundung der Erde.

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NON-TRADITIONAL LEARNING ACTIVITIES AS A NECESSITY IN HIGH SCHOOL FOREIGN LANGUAGE CLASSROOMS

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High school age is the initial stage of physical maturity and at the same time a final stage of gender (sexual) development.

In the high school age learning is one of the main types of human activity. High school students begin to understand what they learn and what they want to achieve in their lives. In this regard, learning objectives are evenly distributed among different fields of knowledge or focused on one particular area, while others focus on one specific science.

Due to the opening opportunities for high school students, responsibility to parents, friends, teachers, to themselves, as well as great physical and mental stress the age crisis of 17 comes inevitably. As noted by D. B. Elkonin, this is the most serious crisis, along with age crises of 3 and 11.

It is extremely important to help students and direct them taking up the most of their opportunities. This is the task for parents and teachers. It is also important for a student to have a different kind of relaxation, both physical and psychological. Children can get physical discharge in PE classes and during breaks, but the psychological relaxation should be provided by the teacher during any kind of lesson. Moreover, it can be not only physical activity, but non-standard forms of lessons, e.g. game-lesson, lesson-trip, lesson-quiz, etc. Involving students in the learning process by means of game activity, it is possible to increase not only their learning motivation, but also enlarge work tempo and ensure good study material perception.

The lesson is the main form of organization of teaching at school, the purpose of which is to make students master a set of knowledge, skills and competences in the study area that is taught. Each lesson provides a solution of specific educational problems. In particular, teaching of a foreign language nowadays plays an important role in the formation of communicative competence that includes linguistic, socio-cultural, speech competence, compensatory and educational and cognitive competence. One of the most important of them is socio-cultural competence, because it is impossible to form communicative competence without knowledge of culture, customs and traditions of the country of studied language and the ability to apply this knowledge in practice, as well as the ability to represent one's own country.

To make a good lesson is not an easy task. Schools put forward specific social and pedagogical requirements, the main condition of which is their successful implementation. Practical, educational and developing tasks also have to be implemented in the lesson. Practical (communicative) tasks are aimed at developing students' speech activity. The educational aim is the formation of certain communicative skills such as the ability to start, maintain and end a conversation showing interest and attention to the interlocutor. A great role is played by pedagogical problems that are aimed at creating students' understanding of the culture of the foreign language. This in turn implies teaching of world outlook, positive attitudes towards the language, tolerance and patriotism and a careful attitude to their native country. With regard to developmental aims, here we are speaking about the development of motivational and emotional spheres of students' personality and their willingness to develop independently while learning a foreign language.

The foreign language lesson has its own special, individual characteristics, and the teacher has to take them into account. Nowadays, learning objective in a foreign language classroom is exposure to culture, traditions and customs of countries speaking this particular language that are often very different from the culture of the native country. The teacher should pay special attention to this and draw a parallel to solidify knowledge about the native country, as well as new knowledge about the country whose language is studied. This goal is achieved by the formation of students' ability to intercultural communication. The training organized on the basis of communicative tasks and techniques is a hallmark of foreign language classes.

Some different ways of working are possible: group, pair, individual and front work. To attract the attention of each student and the whole class teachers has to develop and improve their skills in lesson planning.

As mentioned above, another important detail of a successful language class is the choice of its form. Nowadays, many types of non-traditional lessons exist, such as lesson-discussion, lesson-excursion, lesson-quiz, concert, etc., which allows to enhance the study process, to attract students` attention, to develop their cognitive and creative abilities, and to increase the motivation to learning a foreign language.

It is necessary for teachers to set objectives, which require good knowledge alongside with implementation of all-round development of personality of each student. Ways and methods of implementation of these goals need to be innovative and effective, so that every student could try taking up different roles to have fun during the lesson and increase interest in learning a foreign language.

Non-traditional lessons are often given after completing a topic and involve assessment of students' knowledge of the studied material using various new technologies. These are not typical for conventional lessons. Such changes to the usual educational environment help students to overcome various fears. They are not afraid to make a mistake and actively participate in the lesson and all the students in the same class are involved in the process.

Thus, the lesson, its form and organization play a crucial part in mastering a foreign language. The problem of interest is the main in high school teaching. Thanks to the interest the process of acquiring knowledge becomes the driving force of intellectual, moral and emotional development of students. Understanding of importance of the education, involving students in the process of independent search for knowledge, a variety of educational activities, the brightness of the study material, the emotional response and the interest of the teacher are the main indicators for the stable learning motivation. But the traditional types of lessons do not provide a comprehensive implementation of these conditions. This is the main reason that motivates teachers to seek new, non-traditional approaches to the organization of a school lesson.

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BAST SHOES AS A SYMBOL OF RUSSIA’S NATIONAL IDENTITY

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The history of footwear is as old as the history of human culture itself. When a primitive man had to stand on two legs and take the first steps on a rocky, wet and

cold ground, the idea of protecting feet become relevant. The more a man has adjusted to difficult and hostile environmental conditions, the more ingenuity he showed.

Probably it all started when a piece of wood, leather or leaf of any plant of appropriate size stuck to the foot of the ancient hunter. Man appreciated it and, armed with the simplest tools and using available materials, tried to consolidate this saving interlayer, so it held on his leg.

When we are trying to remember what kind of shoes our ancestors – Slavs wore, perhaps the first thing that comes to our mind is bast shoes.

It was interesting to know what is already known about the shoes in general and about Russian bast shoes in particular? What material was used for producing these shoes and how difficult is it to weave the shoes?

We decided to explore the history of weaving bast shoes as a part of the national culture of Russia. We've made an attempt to find and explore information on this issue; to describe the history of bast shoes, their types, methods of manufacture; to find reflections of bast shoes as a subject in Russian folklore and culture; to make one type of bast shoes. In the given work such research methods were used as: interviewing, analysis of literary and the Internet sources along with the exploring of exhibits of our school museum.

During the survey of local residents – Maria Ivanovna Starikova, who was born in 1923 – underlined that on the territory of Kursk province bast shoes wove of linden bast, elm and cattail. In our area people wore bast shoes called «шестерики», «семерики» by number of lanes of bast, which were used in weaving. Mechenkova Alexandra Ivanovna told that bast shoes «семерички» are bast shoes with narrow strips of bast, and «пятерички» with wide strips of bast. Bast shoes were called by the number of strips that were used in weaving. Bast shoes with seven strips of bast («семерики») were weaved for winter. «Семерики» had higher walls and backdrop than «шестерики».

Winter shoes are dense-weaved, summer shoes are rare-weaved – «рачки» - not to held water, that was important on the haymaking and when walking through the swamp. Cattail grows in our area and it's easy to prepare for weaving.

Bast shoe, as well as a hat «ушанка» and nesting doll or Matryoshka is one of the symbols of Russia, which proves the talent of Russian people and rich distinctive culture of our country. Already for a long time nobody wears bast shoes, but there are sayings about bast shoes, and they live in centuries. There are some proverbs and sayings in the Russian language. For example, «bast shoe» means simpleton, uneducated person.

Let's have a look at the proverbs with this word:

«Это тебе не лапти плести» means that the matter is not so simple and understandable;

«Чай не лаптем щи хлебаем» means that nobody has to explain us how to do something;

«Ободрать как липку» means «select all»;

«Мы тоже не лыком шиты» it means that we have our own dignity;

«Ободрал как липку» - he took a heavy price;

«Только и родни, что лапти одни» - for a very lonely man;

«Обуть в лапти» - to make a fool out of a man.

We've described only a small quantity of proverbs and sayings used nowadays. A lot of them have already forgotten. The number of sayings about bast shoes shows us that they served the Russian man very well.

During the investigation we came to the following conclusions, such as: bast shoes were made from linden, elm, cattail and they were the most accessible, cheap and comfortable shoes for the peasants; Everyone in the family could weave bast shoes and this footwear was popular throughout Russia. We may also point out that bast shoes are mentioned in Russian songs, tales, proverbs, sayings and has served for centuries.

We may conclude that bast shoes are Russian national footwear. It is impossible to imagine Russian life and Russian village until the beginning of the 20th century without bast shoes.

Thus we can see that the history of bast shoes is linked with the history of Russia, reflecting the cultural identity of the Russian people. Russian bast shoes are one of the most important symbols of the traditional national life.

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LINGUISTIC PARTICULARITIES OF THE SETTING IN THE SHORT STORY 'THE COP AND THE ANTHEM' BY O. HENRY

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Literature is one of various means of understanding the reality. Modern world contains more than 3000 languages and cultures. Fortunately, thanks to the translation, people all over the world are able to read the same book in their native language, but only the linguistic analysis let us penetrate into the spiritual world of the literary work, that is why it is very important from the linguistic point of view.

O. Henry is the pen name of the famous American writer William Sydney Porter, well known thanks to his fascinating, witty short stories about American life. It is interesting that he had never wanted to be a writer, and had plenty of

different jobs before he had started writing. Accused of embezzlement, he gets imprisoned and starts creating short stories to support his young daughter Margaret, using a pseudonym "Olivier Henry" only once, and then changes his pen name to O. Henry not wanting his readers to know he was a prisoner.

We have chosen "The Cop and the Anthem" to make a linguistic analysis, because this story is very interesting from the point of view of the setting. The story is about a homeless person called Soapy: winter is coming, it is getting colder and the man needs to find a warm place for 3 months. In his opinion, the best residence is jail: "…it is better to be a guest of the law, which, though conducted by rules, does not meddle unduly with a gentleman's private affairs" [1]. His multiple attempts to find a sheltercreate a humorous and at the same time ironic effect, making this story so attractive for the reader.He does his best to get imprisoned: he breaks a shop's display case, does not pay for dinner at the restaurant, he pretends being drunk, he tries to steal an umbrella and so on, but the cops do not even pay attention to him.In the end, Soapy hears the church anthem and decides to change his life for the better, but accidentally a policeman arrestshim and takes to the Police Court.

The story is set in 1900's, the setting is very realistic. The author describes real places in New York City, like Madison Square, for example: "Jack is kind to the regular denizens of Madison Square, and gives fair warning of his annual call. At the corners of four streets he hands his pasteboard to the North Wind, footman of the mansion of All Outdoors, so that the inhabitants thereofmay make ready"[1].It serves to add the authenticity to the story, it creates the atmosphere of late autumn in America, it reflects the prevailing mood and reinforces the emotions felt by Soapy (desperation provoked by cold and absence of home, and his best hopes for getting into prison): "On the previous night three Sabbath newspapers, distributed beneath his coat, about his ankles and over his lap, had failed to repulse the cold as he slept on his bench near the spurting fountain in the ancient square. So the Island loomed big and timely in Soapy's mind"[1].The social setting draws the contrast between the main character and wealthy people eating in fancy restaurants, wearing luxurious clothes and enjoying expensive entertainments: "Women in furs and men in greatcoats moved gaily in the wintry air", "Up Broadway he turned, and halted at a glittering café, where are gathered together nightly the choicest products of the grape, the silkworm and the protoplasm" [1].We get the impression that New York is all parks, shops, restaurants and busy streets; but the passage: "The moon was above, lustrous and serene; vehicles and pedestrians were few; sparrows twittered sleepily in the eaves – for a little while the scene might have been a country churchyard" [1] makes us see another side of this famous city.

Moreover, I may suppose that the setting is a kind of antagonist in this case, because with the help of the setting we can observe Soapy's conflicts: inside conflict based on the strife between his inaction and his intention of immediate changes in his life: "He viewed with swift horror the pit into which he had tumbled, the degraded days, unworthy desires, dead hopes, wrecked faculties and base motives that made up his existence"[1]; and the outside conflict with the

circumstances and the society: “It seemed that his route to the coveted island was not to be an epicurean one”, “Soapy, with disgust in his heart, loafed along, twice unsuccessful”, “He muttered against the men who wear helmets and carry clubs”[1].

As for the plot, the story is presented in chronological order. Firstly, we read the exposition: homeless Soapy realizes that the winter is coming and he needs to find a warm place to survive: “Soapy’s mind became cognizant of the fact that the time had come for him to resolve himself into a singular Committee of Ways and Means to provide against the coming rigor”[1].Then the complications come: the protagonist cannotget arrested: “The policeman’s mind refused to accept Soapy even as a clue. A policeman who stood before a drug store two doors away laughed and walked down the street”[1].Almost in the end of the story, when the main character hears the anthem and gets inspired to change his life, is the climax: “And also in a moment his heart responded thrillingly to this novel mood. An instantaneous and strong impulse moved him to battle with his desperate fate”[1].The unexpected ending follows immediately. Just in a couple of sentences we understand that Soapy is arrested and will pass 3 months in jail: “«Three months on the Island,» said the Magistrate in the Police Court the next morning”[1]. The author does not really give us time to feel any suspense, because the events change very quickly. I think suspense comes in between the complications and the climax. Moreover, there is a short flashback, when Soapy hears the anthem: “…for he had known it well in the days when his life contained such things as mothers and roses and ambitions and friends and immaculate thoughts and collars”[1]. Thanks to this inner monologue, we learn some new facts about his past.

In my opinion, Soapy is a flat, dynamic character, because at the end of the story we can see some changes of his state of mind. His name also has a symbolic aspect: Soapy means that the name’s owner is slippery and can slip out of getting arrested, for example, even if he wants to be imprisoned. Unfortunately, it does not happen.

Coming back to the setting, I would like to add that the author created the integral setting.The setting is extremely important for the story: there is a direct proportionality between the attention given to the setting and it’s role in the whole work. In the case of ‘The Cop and the Anthem’ we can observe the setting which is highly developed and fully described (time and place) and, thanks to the accomplished linguistic analysis, used for more profound purposes such as: reflecting prevailing mood and reinforcing character’s emotions, adding authenticity to the story, creating particular atmosphere, drawing the contrast and revealing antagonist’s conflicts; which help the reader to penetrate into the story and to experience the spiritual world created by O. Henry.

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Panina T. S., Golovina I. V.

DIE ENTWICKLUNG DES KRITISCHEN DENKENS DER SCHÜLER IM FREMDSPRACHENUNTERRICHT IN DEN OBEREN KLASSEN DER MITTELSCHULEN

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Das kritische Denken bedeutet die Fähigkeit einer Person zu denken und richtige Entscheidungen selbständig zu treffen. Aus wissenschaftlicher Sicht ist dieses Modell des Denkens ein System, das die gültigen Schlussfolgerungen analysieren und formulieren hilft. Außerdem, hilft dieses System den Menschen die eigene Einschätzung der Wirklichkeit geben. Es ist nicht zu bestreiten, dass das kritische Denken das Denken des hohen Niveaus ist, das die Informationen zu hinterfragen ermöglicht. Darüber hinaus wird es als “reflexives Denken” definiert.

Heute ist die Verbesserung des kritischen Denkens eine der wichtigsten Aufgaben der Lehrer. Es steht außer Zweifel, dass das kritische Denken für alle Oberschüler wichtig und nützlich ist. Es ermöglicht den Schülern nicht nur zu reflektieren, sondern auch fördert die Entwicklung von solchen Fähigkeiten wie Lesen, Sprechen und Schreiben [3, 13]. Außerdem, ist diese Notwendigkeit mit den altersbedingten Besonderheiten der Schüler der oberen Klassen verbunden. Die Verbesserung des Selbstbewusstseins ist für sie charakteristisch. Darüber hinaus entwickelt sich bei Oberschülern das Bedürfnis selbständig zu denken. Die Schüler bemühen sich, ihre eigene Meinung, die Ansichten und die Urteile über eine Reihe von Fragen zu zeigen, sie sind für Streitigkeiten und Einwände in einer sehr kategorischen Form anfällig [1,119]. Deshalb ist es sehr wichtig, ihr kritisches Denken in die wahrhafte Richtung zu lenken und die Schüler die korrekte Strategie der Argumentation zu lehren.

Es lässt sich nicht vermeiden, dass das Material und die Form der Arbeit mit der führenden Art der Tätigkeit in diesem Alter übereinstimmen sollen. Die führende Aktivität ist schulisch-professionell. Die Schüler stehen kurz davor, den zukünftigen Beruf zu wählen, ein aktiver Prozess der Selbstbestimmung ist im Gange. Die Materialien aus verschiedenen Bereichen passen den Schülern mehr. Es ist nicht zu bestreiten, dass dieses Material problematisch und ein guter Diskussionsgrund sein soll. In diesem Fall ist die Authentizität der Materialien ein wesentlicher Faktor in der Entwicklung des kritischen Denkens im Unterricht.

Die authentischen Materialien sind Materialien, die von Muttersprachlern für Muttersprachler zu außerschulischen Zwecken erstellt werden [2, 20]. Dazu

gehören echte literarische, volkskundliche, künstlerische, musikalische Werke. Im Sprachunterricht können verschiedene Arten von authentischem Material genutzt werden. Zum Beispiel, können Zeitungs- und Zeitschriftenartikel, originelle literarische Werke, Filme als guter Bereich für Diskussionen dienen. Es lässt sich nicht vermeiden, dass die Wahl des richtigen Materials nur die Hälfte des Erfolges bei der Entwicklung des kritischen Denkens beträgt.

Der zweite Faktor ist die Vorbereitung der richtigen Übungen, die sich auf die mechanische Durcharbeitung des Materials nicht beschränken. Es steht außer Zweifel, dass die Aufgaben die Schüler zu den Reflexionen und zur Kreativität des Denkens anregen sollen.

Die Gespräche im Unterricht sind eine gute Möglichkeit zur Förderung der Aufgeschlossenheit und der Kreativität. Die Lehrer sollen die Schüler “warum?” so viel wie möglich fragen. Ein wichtiger Teil des kritischen Denkens besteht auch darin, dass man gute und schlechte Informationsquellen unterscheiden soll. Es gibt viele nützliche Tipps zum Organisieren einer Diskussion in einem Sprachunterricht [4]:

1) Es ist sehr effektiv, offene Fragen zu stellen. Offene Fragen sind Fragen, die mehr als eine Antwort haben. Betonen Sie den Schülern, dass es keine richtigen oder falschen Antworten gibt. Die Hauptidee ist, dass diese Methode den Schülern ermöglicht, kritisch und kreativ zu denken. Darüber hinaus haben sie keine Angst, etwas falsch zu machen.

2) Geben Sie den Schülern Zeit, die Dinge zu durchdenken. Das schmale Denken ist oft das Ergebnis der Eile, wenn man eine Antwort geben will. Für Diskussionen im Unterricht geben Sie den Schülern ein paar Minuten, damit sie denken, bevor sie ihre Ideen vorschlagen.

3) Es ist sehr wichtig, die Liste der Vor-und Nachteile eines jeglichen Problems machen zu können, weil es keinen solchen Kontrast wie "gut" oder "schlecht" gibt. Es ist sehr nützlich, in der Lage zu sein, um Argumente zur Verteidigung seiner Ansichten zu stellen.

4) Erklären Sie den Schülern den Unterschied zwischen Meinungen und Aussagen bei.

5) Es ist wichtig, die Schüler zu lehren, bei Diskussionen offen zu sein und die Meinung des Gesprächspartners zu respektieren.

Die Diskussion kann auf der Grundlage von gelesenem Text, gesehenen Video usw. organisiert werden.

Neben der Diskussion gibt es andere Übungen für die Bildung des kritischen Denkens. Dazu gehören das Schreiben von Essays, das Erstellen von individuellen oder Gruppen-Projekten zu aktuellen Themen, die Führung des Klassenblogs.

So können wir schließen, dass die Entwicklung des kritischen Denkens ein wichtiger Bestandteil der Ausbildung in der Oberschule, darunter auch im Sprachunterricht ist. Die Entwicklung vom kritischen Denken hilft bei der beruflichen Selbstbestimmung, ermöglicht Prioritäten zu setzen, formt die Verantwortung für die Wahl und entwickelt die Fähigkeiten des kulturellen Dialogs.

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EINSATZ VON VIDEOMATERIALIEN ZUR VERANSCHAULICHUNG DER HÖR- UND SPRACHFÄHIGKEITEN IN DER SEKUNDARSTUFE I

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Der Fremdsprachenunterricht in der modernen Welt ist ohne den Einsatz der modernen Informations- und Kommunikationstechnologien nicht möglich. Für den heutigen Lernprozess ist es wichtig, Fremdsprachen praktisch zu beherrschen. Der Fremdsprachenunterricht soll den realen Situationen des Kommunikationsprozesses entsprechen. In diesem Zusammenhang hat man ein großes Interesse für den Prozess des Erlernens einer Fremdsprache, und zwar fürs Training von Hören und Sprechen. Sie sind ein wichtiger Teil des Kommunikationsprozesses.

Wie jedoch die Praxis zeigt, haben die Schüler niedriges Niveau der Hörverstehen- und Sprachkompetenz. Folglich ist es in gewisser Weise notwendig, ein intensiveres und effektiveres Erlernen dieser Sprachkompetenzen zu fördern. Zu den erfolgreichsten Voraussetzungen für das Erlernen einer Fremdsprache gehört das Sprachumfeld. Um jedoch die entsprechenden Sprachbedingungen zu schaffen, ist es notwendig, viel Zeit dem Kompetenztraining zuzuweisen, die im Curriculum oft fehlen kann. Deswegen kann es sehr schwierig sein, typische deutsche Alltagssituationen situativ mit den Kursbuchthemen zu verbinden.

Trotzdem ist die Verwendung von Videosequenzen in der Ausbildung ein sehr modernes und wichtiges Lernwerkzeug, das in gewissem Maße dazu beiträgt, neue Zugänge zu den umgangssprachlichen Themen zu gewähren.

Allerdings enthalten nicht alle modernen Lehrbücher Übungen zur Verwendung von Videosequenzen. Die Lehrbücher können die Übungen zum Hörverstehen in Audioformat bieten, die ohne zusätzliche visuelle Darstellung sind.

Deswegen können Beispiele der Aufgaben mit den Videosequenzen für Schüler der Sekundarstufe interessant sein, weil die digitalen Medien eine beliebte

Freizeitbeschäftigung der Schüler sind. Die Thematik für die Aufgaben war dem Lehrbuch entnommen und zwar dem Lehrbuch von I. Bim "Deutsch 8" für die 8. Klasse. Dieses Lehrwerk hat einen inhaltsreichen Plan, in dem es neben den entsprechenden Kommunikationssituationen zu bestimmten Themen eine Reihe der kommunikativen Aufgaben und Übungen gibt. Zu den Themen gehören: Sommerurlaub in Deutschland, Wie ich den Sommer verbrachte, Urlaubsorte für den Urlaub, Schulsystem in Deutschland, Alternative Schulen in Deutschland, Lieblingslehrer, Lieblingsfächer in der Schule, Stadt Köln, Reisen, Städte in Deutschland: München, Berlin, Der Rhein, Meine Reise, Urlaub in Deutschland, Im Restaurant usw. [1, c. 236-239].

Laut dem Lehrerhandbuch, zusammengestellt von I. Bim, gibt es folgende Prinzipien des Erlernens dieser Sprachkompetenzen.

Der Prozess des Erlernens des Sprechens besteht aus der Entwicklung von dialogischer und monologischer Gesprächsformen. Um dialogische Rede zu entwickeln, kann man Übungen wie der Musterdialog, Fragen/Antwortrepliken, etc. empfehlen. Die Entwicklung von Fertigkeiten in der monologischen Rede wird durch monologische Äußerungen von Auszubildenden realisiert. Als Impulse für diese Monologe können mustergültige Konstruktionen gegeben werden: Schlüsselwörter, Plan, logisches Schema und vieles andere. [3, c. 141-147]

Beim Fertigkeitentraining, insbesondere beim Üben des Hörens werden im Lehrbuch von I. Bim "Deutsch 8" für die 8. Klasse Texte wie Interviews, persönliche Briefe und andere zur Umsetzung im Unterricht empfohlen. Außerdem kann man zusätzliche Texte zum Hörverstehen sowohl den Büchern zum Lesen als auch den Lehrbüchern aus den Blöcken für das Lesen entnehmen. Als motivierende Aufgaben zur Sprechfertigkeit und zum Training des Hörverstehens bieten wir abwechslungsreiche Videosequenzen nach entsprechenden Themen geordnet.

Die Arbeit mit den Filmen kann als eine der nicht standardisierten Arbeitsformen eines Deutschlehrers bezeichnet werden, weil sie zu einer Steigerung der Hör- und Sprechfertigkeiten der Auszubildenden beitragen kann, weil die visuelle Unterstützung dem Verständnis von fremdsprachlichen Audiotexten verhelfen kann. [2, c. 31] Deswegen wurde ein Trainingsvideofilm in Form einer typischen Jugendserie "Extra Deutsch" als Basis der nachfolgenden Übungen erstellt, der für Jugendliche interessant sein kann.

Als Unterrichtsmaterialien für die 8. Klasse schlagen wir eine Videosequenz zum Thema "Sommerferien" vor. Sie wurde anhand der 11. Episode der Trainingsreihe "Extra Deutsch", die "Ferienzeit" [4] entwickelt.

Übungen zum Hörverstehen.

1 Stufe:

Der Lehrer gibt den Schülern die Anweisung über das bevorstehende Betrachten von Videofragmenten und informiert über die Geschwindigkeit des Audiotextes:

Kinder! Wollen wir ein bisschen dieses Video sehen! Ich denke, es kann für euch genug interessant und spannend sein. Die Menschen werden dort nicht so

schnell sprechen, deshalb habt ihr keine Angst, sie können alles verstehen. Ich gebe euch auch eine Liste mit den Wörtern. Sie zeigen die Hauptgedanken dieses Films.

6 T-Shirts, 3 Paar Jeans, 3 Pullover, 2 Röcke, 4 Hosen, 2 Nachthemden, 3 Paar Turnschuhe, 4 Paar Stiefel, 2 Paar hohe Schuhe zum Ausgehen, 3 Zahnbürsten, 2 Kosmetiktaschen, 5 Gürtel, 2 Jacken, zweimal Haarspray und ein Abendkleid.

Der Lehrer informiert die Schüler über den Titel des Videos und stellt dann die wichtigsten Fragen über die bevorstehende Betrachtung. Dies kann helfen, einen logische Empfindung von Kindern zu entwickeln:

Ich schreibe an die Tafel den Titel dieser Serie («Ferienzeit»). Kinder! Sagen Sie mir, bitte, was denken sie über den Inhalt der Serie? Was kann man dort zeigen, worüber können die handelnden Personen sprechen?

Stufe 2: Man hört die Audiodatei an, führt Testaufgaben durch. Diese Etappe zielt darauf ab, die selektive Hörerfahrung der Schüler zu entwickeln und Informationen aus dem Kontext zu isolieren.

Ein Beispiel für solch eine Aufgabe ist das Ausfüllen einer Tabelle.

Freunde diskutieren über die beste Erholungsmöglichkeit. Wählen Sie die richtige Antwort in den folgenden Fragen für die Szene.

Welche Aussagen treffen auf die einzelnen Charaktere zu? Füllen Sie die Tabelle aus

Sam	Anna	Sascha	Nick

Beispiele der Antworten:

Anna

hat den Ferienbericht im Fernsehen gesehen, will nach Kapstadt fahren

Sam

hat den ganzen Tag gesehen, wie die Menschen in den Urlaub fahren; möchte England besuchen; ist mit den Eltern schon nach London geflogen; machte Shopping in England; kann Reiseführer in England sein, weil er gut Englisch spricht

Sascha

muss 24 Stunden am Tag arbeiten; liebt ihre Arbeit; ist total k.o. (das bedeutet: sehr müde sein); will auf Mauritius fahren; will unbedingt mit der Königsfamilie Tee trinken

Nick

Versteht nicht, warum Sascha ihre Arbeit nicht kündigen will; will Las Vegas besuchen; will englische Girls (junge Mädchen) kennenlernen

Stufe 3: Analyse und Interpretation der gesehen gehörten Informationen, die Erschaffung des wahrgenommenen Videos der eigenen Aussagen.

Sprechen. Aufgabe 1: Zusammenstellung von monologischen Sprache mithilfe von dem gegebenen Vokabular

In einem der Ausschnitte des Videos sammeln Freunde Dinge für den Sommerurlaub. Sie können diese Liste unten sehen. Jetzt stellen Sie sich vor, dass Sie nach London gehen. Erzählen Sie anhand dieser Liste, was Sie mitnehmen können. Nutzen Sie auch Ihren Wortschatz.

6 T-Shirts, 3 Paar Jeans, 3 Pullover, 2 Röcke, 4 Hosen, 2 Nachthemden, 3 Paar Turnschuhe, 4 Paar Stiefel, 2 Paar hohe Schuhe zum Ausgehen, 3 Zahnbürsten, 2 Kosmetiktaschen, 5 Gürtel, 2 Jacken, zweimal Haarspray und ein Abendkleid; Die Tickets, das Geld, der Pass

Aufgabe 2: Dialogsprache nach einem vorgegebenen Muster zusammenstellen

Sie haben einen Dialog zwischen einer englischen Kellnerin und Reisenden aus Deutschland gesehen und gehört. Stellen Sie sich vor, Sie sind nach Deutschland gegangen und möchten etwas zum Essen bestellen. Verwenden Sie die Titel der Gerichte aus dem Dialog und füge ihre eigenen hinzu.

WAITRESS: Was möchten Sie trinken?

ANNA: Oh. Eine Cola bitte.

SASCHA: Für mich auch eine Cola.

NIC: Nein, man sollte sich immer der Kultur des Reiselandes anpassen. Now, I would like to have a nice cup of tea, please!

SAM: Was für einen Tee möchtest du?

NIC: Keine Ahnung – äh – was für Tee gibt es denn hier?

WAITRESS: We've got: Darjeeling, Keynan, English Breakfast, Earl Grey, Lady Grey, camomile, peppermint, Imperial, Oolong, jasmin, Indian, Green and Yellow – tea. (eng.)

NIC: Ich hätte gern 'ne Cola.

WAITRESS: Möchten Sie etwas zu essen?

SAM: Ja, welche Angebote haben Sie?

SAM: Eier mit Pommes, Würstchen mit Pommes, Fisch mit Pommes, Käse mit Pommes, Pastete mit Pommes und auch Torte.

Zum Schluss soll man betonen, dass die Lernfilme den realen Situationen des Kommunikationsprozesses entsprechen sollen, ihre Umsetzung im Fremdsprachenunterricht fördert ein intensiveres und effektiveres Erlernen der Sprachkompetenzen. Die Phasen der Arbeit mit dem Video wurden mit dem Ziel ausgearbeitet um den Lernprozess spannend zu machen und die neu gewonnenen Sprachkompetenzen effizient zu aktivieren. Diese neuen abwechslungsreichen Übungen fördern den Lernprozess und sprechen die jugendlichen Lernenden an. Sie tragen zur schnelleren Aktivierung der folgenden Kompetenzen bei: sie trainieren das Hör-Seh-Verstehen, fördern die Schreib- und Lesekompetenz, motivieren die Lernenden durch interessante audiovisuelle Darstellungen.

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THE CITY MIRRORED IN THE ENGLISH ARCHITECTURAL METAPHOR

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The role of the metaphor as a universal tool fixing links between new knowledge and what has been already learned and built in the experience grows when two languages (architectural and verbal) interact. In the research [1] a miltiaspect analysis is undertaken to find out correlation between the word and the visual image and investigate into potential links between visual and verbal metaphoricity in the segment that is determined by a natural language. The author declares these links by recognizing the phenomenon of “prototrope” that explains the birth of similar metaphors in visual and verbal arts during the same historic period. This results in evolving “intermedian orientation” of verbal and visual arts that manifests itself in “natural intervention of scientific notions about the word into the science of art” [1, 19].

Concept “SUSNAINABILITY” can serve as an example of such “intervention”. The concept is projected from philosophical discourse into urban architecture and then verbalized by metaphor “sustainable architecture” that is rather frequent both in architectural texts and in visual architectural forms such as biomorthic structures, ecovillages etc.

The Oxford English Dictionary gives the following definitions for “*sustainable*:

1. Able to continue over a period of time.

2. Causing little or no damage to the environment and therefore able to continue for a long time” [5, 1246].

It should be noted that this term is widely used in various areas, namely, in economics, sociology, philosophy. As applied to architecture the idea of sustainable development relates to eco-friendly approach to urban planning. The research into semantics of verbal architectural metaphors as tools for verbalization of the professional concept SUSTAINABILITY can be one of perspectives for understanding and evaluation of sustainable urban development.

We see the English architectural metaphor with the core component “city” as the study subject because the metaphor reflects extra linguistic phenomena in the

most compressive, emotional and substantive way, therefore the semantics of metaphors with the lexeme “city” is likely to give the key to understanding how the image of the contemporary city is represented in the linguistic consciousness of the English-speaking architect.

The sources of architectural metaphors were architectural journals, including online media. The total number of metaphors comprises 100 units. Table 1 presents some of the selected English architectural metaphors.

Table 1

Architectural metaphors	**Sources of the metaphors**
Cities face great odds	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99. – №10.
City is a complex organism	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Cities are able to concentrate on the actions	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.
Cities are resilient	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99. – №10.
Cities are able to anticipate	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.
Cities cope with shocks	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99.
We work with cities, towns and regions	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Wisdom of a city	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Projects in partnership with cities	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Individual cities	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99.
Host city	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99.
Help cities solicit the opinions	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.
Treat each city	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.
Cities act as urban laboratories	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99. – №10.

Cities undertake this journey	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Each city`s successes	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
City approved	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99. – №10.
City has designed	Architect. – Washington, DC: Hanley Wood, 2010. – Volume 99. – №10.
The city's neighborhoods	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.
City initiative	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Smart city	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Competing cities	Understanding Sustainable Architecture. – London: Spon Press. – 2002.
Intellectual city	Landscape architecture magazine. – The magazine of the American landscape architects, 2011. – Volume 101. – №4.

Perception and emotional evaluation of architectural forms generate definite verbal images in the linguistic consciousness of the architect. The linguistic consciousness of the English-speaking architect contains the image of the city that is characterized by a number of associations linking urban architecture and the living being, primarily, the human. The English-speaking architect typically endues the city with anthropomorphic features and properties: e.g. *wisdom of a city, individual cities, city initiative, competing cities, intellectual city*.

Thus, within the paradigm of sustainable urban development the city acquires new meanings in the professional verbal discourse of architects due to anthropomorphic code of the architectural metaphor. The fact that among English architectural metaphors with the lexeme "city" there are many predicate metaphors is worth attention. Anthropomorphic predicate metaphors contribute to contemporary trends in urban planning to view the city as an active performer capable of self-developing and modernization: e.g. *city has designed, cities are able to concentrate, cities cope with shocks, cities undertake this journey, city approved*. All the examples are from British and American architectural journals and altogether they make up a fragment of the coherent metaphoric worldview of the contemporary city as viewed by English-speaking architects.

Architectural metaphors incorporated in the macro context of urban culture serve both as cohesive tools for establishing intersemiotic links and as a mechanism that gives rise to new knowledge. Thus, a verbal architectural text can be considered as a metatext as related to the semiotics of architecture. Consequently, a

verbal architectural metaphor can be viewed as a metasemiotic tool to fix professional knowledge of urban architecture. Perceptional properties of the denotatum are reflected in the semantics of architectural verbal metaphors.

Metaphors from professional discourse of English-speaking architects point to specific professional vision of the contemporary city. Such vision is characterized by blurring of lines between the architect as the creator and the structure as the product of creation and by tendency to endue artificial architectural environment with properties of animated nature capable of self-organization and autonomous transformation.

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DIE ZENTRALE ROLLE DES LEHRWERKS IN DER FREMDSPRACHENAUSBILDUNG (IM RAHMEN EINES DER SCHWERPUNKTE DER INTERNATIONALEN WISSENSCHAFTLICHEN ZUSAMMENARBEIT ZWISCHEN DEM SPRACHENZENTRUM DER OTTO – VON – GUERICKE – UNIVERSITÄT MAGDEBURG UND DEM LEHRSTUHL FREMDSPRACHEN DER NATIONALEN TECHNISCHEN UNIVERSITÄT „CHARKOWER POLYTECHNISCHES INSTITUT“)

Nationale Technische Universität „Charkower Polytechnisches Institut“

Trotz wechselnder, einander ausschließender oder ergänzender Lehrmeinungen über die Ziele, Inhalte und vor allem über die Methoden der Sprachausbildung (direkt – indirekt, imitativ drillbetont – produktiv handlungsbetont, objektbezogen – verfahrensbezogen – systembezogen etc.) bleibt die zentrale Rolle des Lehrwerks im Fremdsprachenunterricht unbestritten. Das bestätigten in letzter Zeit unter anderem Berichte über wissenschaftliche Konferenzen und Diskussionsbeiträge von Theoretikern und Praktikern.

Die im Wesentlichen übereinstimmenden Standpunkte, die auch mit unseren Einsichten korrespondieren, lassen sich wie folgt zusammenfassen: das Lehrwerk

stellt das Mikromodell des gesamten Unterrichtssystems dar. Gehen wir auf die Hauptfunktionen des Lehrwerkes ein.

Unter der Voraussetzung eines gültigen Lehrprogramms, unabhängig ob von einer staatlichen Institution generell oder von Lehrkräften speziell für einen Kurs festgelegt, funktioniert das Lehrwerk als das wesentliche organisierende Mittel des Unterrichts (oder zumindest als eines der wesentlichsten dieser Mittel). Als umfassendste und zentrale Zusammenstellung des Lehrmaterials erfüllt das Fremdsprachenlehrwerk vor allem die folgenden Aufgaben:

– es enthält den in der Regel für einen bestimmten Lehrabschnitt bemessenen und nach pädagogischen Prinzipien geordneten Lehrstoff in seiner gesamten Breite;

– es gibt (vorwiegend in den Texten) das entsprechende Material der Fremdsprache, die stoffliche Grundlage des Unterrichts als Vorbild als Muster;

– es trainiert die für die Sprachtätigkeit erforderlichen systemhaften Regelmäßigkeiten und Normen der Fremdsprache;

– es führt mit Hilfe planvoll ausgewählter und zweckmäßig gestalteter Aufgaben und Übungsmuster von der einfachen imitativen Sprachhandlung über wichtige Zwischenstufen, die als eine Vielzahl unterschiedlicher Operationen erscheinen, zu möglichst selbstständigen kommunikativen Sprachtätigkeiten.

Dem Sprachlehrer wird aber auch die Möglichkeit gegeben, im Sprachunterricht – neben der Arbeit mit dem eingeführten Lehrwerk zusätzliche Lern- und Lehrmaterialien, kleinere oder umfangreichere Aufgaben zur Entwicklung produktiver sprachlicher Fähigkeiten einzusetzen, z.B. das Thema „Zukunft der Arbeit“ kann durch zusätzliche Informationen über die Arbeit von morgen, neue Berufe, Erwerbstätige nach Sektoren in Deutschland und ihre Anteile in Prozent ergänzt werden:

Erwerbstätige nach Sektoren:	**Anteile in Prozent:**		
– Land –und Forstwirtschaft	2,9 %	1,8 %	…%
– Waren produzierendes Gewerbe	35,5%	29,4%	…%
– Dienstleistungen	61,5%	68,7%	…%
	2010	2015	2020

Aufgrund dieser Informationen und Angaben sowie anhand der entsprechenden Redemittel müssen die Lernenden die Situation auf dem Arbeitsmarkt bewerten, Schlussfolgerungen ziehen und für die nächsten Jahre prognostizieren.

Dadurch wird die Bedeutung des Lehrwerks selbst jedoch keineswegs eingeschränkt, da das Buch in diesem Fall als Kern des komplexen Lehr- und Lernmaterials wirkt und als organisierendes Zentrum noch an Bedeutung gewinnt.

Es sei aber auch unterstrichen, dass die Studierenden dabei

visuell, auditiv, kommunikativ orientiert lernen müssen [1].

Deshalb muss das Lehrwerk durch unterschiedliche Lehr- und Lernmittel ergänzt (durch audio-visuelle Mittel, Redemittel zum „Schriftlichen Ausdruck“ und „Mündlichen Ausdruck“, Lösungsvorschläge, u.a.).

Ausgehend von oben genannten Stichpunkten und Verordnungen wurde von den Lehrkräften des Lehrstuhls im Rahmen der internationalen wissenschaftlichen Zusammenarbeit zwischen dem Sprachenzentrum der Universität Magdeburg und dem Lehrstuhl Fremdsprachen der Nationalen Technischen Universität Charkow das Lehrwerk „Der Mensch im Netz und seine Umgebung“ geschaffen und herausgegeben.

Das Lehrwerk stellt einen Modellzatz mit den in dieser Sammlung vereinigten Texten und typischen Aufgaben dar, der das Ziel verfolgt, allen Interessenten zu helfen, sich auf die Deutsche Sprachprüfung für den Hochschulzugang (DSH) vorzubereiten und diese Prüfung erfolgreich zu bestehen. Besonders aktuell ist dieses Lehrwerk für die Studenten, Master und Aspiranten der Nationalen Technischen Universität „Charkower Polytechnisches Institut“, die ein Teilstudium an der Otto-von-Guericke Universität Magdeburg (Deutschland) absolvieren, denn die Studierenden, die über entsprechende Deutschkenntnisse verfügen, erhalten die Möglichkeit, im Sprachenzentrum der Otto-von-Guericke Universität Magdeburg an einem auf die DSH vorbereitenden Kurs teilzunehmen und die DSH abzulegen. Deshalb ist das Lehrwerk auf der Basis der Anforderungen des Gemeinsamen Referenzrahmens des Bologna-Prozesses entwickelt, die das Ziel der Angleichung akademischer Abschlüsse voraussehen.

Das Lehrwerk eignet sich als Kursmaterial und ist für fortgeschrittene Lerner/Innen sowie für das Selbststudium und die Aneignung der Lehrmaterialien und Aufgaben bei der Vorbereitung auf die DSH angelegt.

Thematisch umfasst dieses Lehrwerk den wichtigsten Problemkreis, der für die gegenwärtige Gesellschaft besonders aktuell ist, sowie große Akzeptanzprobleme, die unsere globalisierte Informationsgesellschaft kennzeichnen, wo elektronische Informationssysteme die moderne Welt durchdringen, Risikotechniken und Gentechnologien herrschen, z.B. „Der globale Konflikt des 21. Jahrhunderts“, „Technikängste“, „Technik der Zukunft“, „Die Sucht nach dem Internet – ein Zeichen für die Flucht vor der Realität“, „Computer gegen Bücher“, „Die Gefahr des mikrobiellen Gau“, „Wassermangel und Wasserpolitik“ u.a.m.

Das Lehrwerk enthält die authentischen thematisch angeordneten Lesetexte von verschiedenen Arten und Typen mit dem bestimmten (C1) lexikalischen und grammatikalischen Lehrstoff (jeweils gibt es Texterläuterungen), Hörtexte als authentische Vorbilder der monologischen und dialogischen Rede mit typischen Aufgaben zum Hörverstehen, verschiedenartige Aufgaben (mit der Bewertung in Punkten) sowie Redemittel zum schriftlichen und mündlichen Ausdruck zur komplexen und integrativen Entwicklung von grundlegenden Sprachtätigkeiten Sprechen und Schreiben.

Die Aufgaben sind durch Lösungsvorschläge zur Selbstkontrolle ergänzt.

Die Struktur jedes Abschnitts ist durch die folgenden Grundprinzipien bestimmt: Umfang und Schwierigkeitsgrad des grammatikalischen und lexikalischen Stoffes, Arten der Sprachtätigkeit (C1), was zur kompetenten Sprachverwendung führt.

Bei der Arbeit an den in dieser Sammlung vereinigten Aufgaben steht nicht die bereits produzierte sprachliche Äußerung, der Text, sondern eine bestimmte Kommunikationsaufgabe. Die sprachliche Äußerung ist also das Ergebnis der selbständigen Arbeit des Studenten.

Bei der Konzipierung der Aufgaben wurde davon ausgegangen, dass eine auf Lebensnähe und Praxiswirksamkeit ausgerichtete Fremdsprachenausbildung die Gesetzmäßigkeiten der realen sprachlich – kommunikativen Tätigkeit berücksichtigen sollte, besonders die Erkenntnis, dass die Erfüllung einer Kommunikationsaufgabe und die Verwirklichung der aus der Aufgabe und aus der Situation abgeleiteten Kommunikationsabsichten des Sprechers/Schreibers den Vollzug bestimmter geistig – sprachlicher Operationen, der sogenannten Kommunikationsverfahren, erforderlich machen.

Es wurden darüber hinaus solche Kommunikationsverfahren ausgewählt, die in der realen Kommunikation bei der Leitungstätigkeit eine wichtige Rolle spielen: Berichten, Klassifizieren, Vergleichen, Wiedergeben grafischer/tabellarischer Darstellungen, Beschreiben, Charakterisieren, Beurteilen, und die im Abschnitt „Redemittel zum schriftlichen und mündlichen Ausdruck“ angeführt werden, z.B.

Bezug Text – Grafik:

– ***Thema und Inhalt der Grafik***

– *Gegenstand der Grafik ist/sind …*

– *Die Grafik informiert uns über… /bietet (enthält)Informationen zu...*

– *In der Grafik ist/sind… zusammengestellt…*

– ***Die Grafik bestätigt die Aussagen des Textes/widerspricht den Aussagen des Textes***

– *Eine beigefügte Grafik bestätigt diese Aussagen.*

– *Ersichtlich sind diese Fakten (in ähnlicher Form) auch aus einer angefügten Grafik.*

– ***Beschreibung von Entwicklungsdiagrammen***

– *Die Grafik zeigt, wie sich…von… bis…entwickelt (hat).*

– *Anhand der Grafik lässt sich die Entwicklung von…*

– ***Überleitungen zwischen Grafikanalyse/Widergabe und Stellungnahme***

– *Nach der Wiedergabe von Text und Grafik…*

– *Aufbauend auf den in Text und Schaubild angesprochenen Fakten…*

– *Auf der Basis von Text und Grafik…*

– ***Begründungen geben***

– *Dies liegt daran, dass…*

– *Der Grund ist…*

– *Dazu trägt bei, dass…*

– ***Die eigene Meinung äußern und einen Schluss formulieren [2]***
– *Ich finde /meine /glaube, dass…*
– *Meiner Meinung/Auffassung nach…*
– *Bei einem Vergleich mit…sieht man, dass…*

Nach diesen Verfahren sind die Aufgaben gruppiert: d.h., die Erfüllung der jeweiligen Aufgabe setzt die Realisierung des betreffenden Kommunikationsverfahrens voraus. Der Vorzug einer solchen „Verfahrensbezogenheit“ dürfte vor allem darin bestehen, dass die sprachlichen Mittel, die für die Realisierung dieses oder jenes Verfahrens in Betracht kommen, unter funktional – kommunikativem Aspekt vereinigt und somit für die Lehre und für die Anwendung in der realen Kommunikation verfügbar gemacht werden.

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KULTUR IM FREMDSPRACHENUNTERRICHT

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Kultur ist in allen Bereichen unseres Lebens ein umstrittener Begriff. Er ist in dem Sinn umstritten, dass nicht alle Menschen – Kulturträger – ganz deutlich diesen Begriff verstehen, oder sogar nicht wissen, wie sie damit umgehen müssen. Muss man seine Kultur hochschätzen, aber nicht hervorheben, oder muss man sich von seiner Kultur abkehren und ganz besonders in die anderen vertiefen?

Die Wahrnehmnug von Kulturunterschieden ist jedenfalls, ebenso wie das historische Bewusstsein, ein neues Phänomen. Kultur als Gegensatz zur Natur oder als “unsere zweite Natur” umfasst die Gesetze, nach denen menschliches Leben geregelt ist. Diese Gesetze machten die Aufklärer – auch unter dem Begriff “Sitten” – zum Gegenstand ihres Studiums. Dabei findet man stellenweise quasi proto-soziologische Einsichten. [1, 73]

Der Bergriff der Kultur ist äußerst mehrdeutig, was er mit vielen soziel-wissenschaftlichen Begriffen einschließlich des Begriffs “Gesellschaft“ teilt. Zwei Aspekte lassen sich explizit oder implizot in vielen Definitionen quer durch die Disziplinen wieder entdecken: (a) der symbolische Charakter, (b) die Orientierung von Kultur. Dieser Funktionsbestimmung entspricht, dass Werte und Normem

allgemen als elementare Bestandteile von Kultur verstanden werden. Dabei darf man sich nicht vorstellen, dass diese immer nach Art der Zehn Gebote kodifiziert sein müssen. Viele kommen eher in den stillschweigenden Verhaltenserwartungen des Alltags zur Geltung. Auch der symbolische Charakter von Kultur beschränkt sich nicht auf literarische und musikalische Produktionen oder bildende Kunst. Die kulturelle Praxis umfasst vielmehr die symbolische Seite der gesellschaftlichen Praxis, wo Sinn und Bedeutung auch rein technicher Vorgänge und instrumenteler Handlungen produziert, repräsentiert und kommuniziert werden. Man spricht daher vom "kulturellen Moment" an der Produktion und Reproduktion der Lebensverhältnisse, welches die " kollektive Aktivität der Bedeutungsgebung" betrifft. Die symbolische Verwendungsweise von Dingen im Alltagsleben ist Teil kultureller Praxis.

Die kulturellen Symbole dienen der Verständigung, der Darstellung "nach außen", aber auch, wie an der Sprache deutlich wird, dazu, dass wir uns selbst etwas vorstellen, uns Bedeutung symbolisch vergewissern. Daher lässt sich die Kultur als unser Repertoire an Kommunikations- und Repräsentationsmitteln definieren. Nicht zuletzt dienen symbolische Mittel wie die Kleidung der Repräsentation unserer selbst.

Was die Funktionen der Kultur angeht, so kann man neben der Orientierungsfunktion eine Identitätsfunktion von Kulturen feststellen, sofern man sie nicht unter die Orientierungsfunktion subsimieren will. Einige Wissenschaftler konzentrieren sich auf die identitätsstiftende Funktion, weil sie vom diskursiven Eingebettetseinder Subjekte ausgehen. Aber auch andere betonen, dass die kulturelle Bedeutungsgebeung der sozialen Verortung dient. Generell werden innerhalb einer Kultur immer auch Differenzen – und damit Identitäten – diskursiv verhandelt. Nah liegend ist hier der Hinweis auf die "Distinktionsfunktion" von Kulturen, die der Soziologe Bourdieu in seiner Analyse der „feinen Unterschiede" zwischen den Klassen der französischen Gesellschaft herausgearbeitet hat. Letztlich dient auch die sublime Markierung der Unterschiede, durch Wohnstile etwa, der Orientierung.

Die Kultur dient also der Deutung des gesellschaftlichen Lebens damit der Orientierung des Handelns. [1, 74-75]

Die Migrationssoziologie hat verschiedene Fromen und Stufen der Akkulturation oder Assimilation von Zuwanderern unterschieden und im Weiteren auch die Frage nach den dafür maßgebenden individuellen und soyialen Bediengungen gestellt.

Die bisher aus der Austauschforschung vorliegenden Stufen- oder Phrasenmodelle interkulturellen Lernens sind wohl erfahrungsgeschützt, aber nicht empirisch überprüft. Winter unterscheidet vier Stufen: Auf der ersten Stufe eignet sich der Lernende das grundlegende Orientierungswissen über soziale Umgangsformen etc. an. Die Übernahem von Handlungsmustern, z.B. Begrüßungsritualen, verbleibt hier noch auf einer äußeren Ebene. Im Gegensatz dazu werden auf der zweiten Stufe internale Handlungsvoraussetzungen wie Werthaltungen, Normen erfasst, und zwar so, wie sie der Lernende der Majorität

der Einheimischen zuschreibt. Auf der dritten Stufe wird dann aufgrund der angemessenen Interpretation des fremden Verhalten und der Koordination der Handlungsschemata ein situationsangemessenes Interagieren ermöglicht. Eine vierte Stufe würde nach Winter mit einem generalisierten Kulturlernen, vor allem im Fall wiederholter interkultureller Kontakte, erreicht.

Die von Thomas vorgelegte Definition "interkulturellen Lernens" inmpliziert verschiedene Stufen oder Grade der Akkulturation an die Fremdkultur vom Verstehen bis zur Übernahme von Orientierungsmustern und zur selektiven Anwendung: „Interkulturelles Lernen findet statt, wenn eine Person bestrebt ist, im Umgang mit Menschen einer anderen Kultur deren spezifisches Orientierungsszstem der Wahrnehmung, des Denkens, Wertens und Handelns zu verstehen, in das eigenkulturelle Orientierungssystem zu integrieren und auf ihr Denken und Handeln im fremdkulturellenHandlungsfeld anzuwenden. Interkulturelles Lernen bedingt neben dem Verstehen fremdkultureller Orientierungssysteme eine Reflexion des eigenkulturellen Orientierungssystems." [2, 14]

Wie kann aber Kultur im Sprachunterricht erscheinen? Laut dem Staatlichen Bundesausbildungsgesetz ist die Kultur in Russland ein integrierender Bestandteil des Unterrichts, und besonders des Frendsprachenunterrichts. Der Fremdsprachenunterricht enthält in sich mehrere Kompetenzen, durch die er bedient wird. Einer von diesen, die für uns besonders interessant ist, ist soziokulturelle Kompetenz oder soziokulturelles Lernen. Dieser Begriff und Ansatz entstanden in Russland sowie in den europäischen Ländern in 90-ern Jahren des XX Jahrhunderts im Rahmen des gemeineuropäischen Projekts "Fremdsprachen lernen und lehren für das Erhalten der Europäischen Staatsangehörigkeit." Das Ziel des soziokulturelles Lernen ist die Herausbildung, und danach auch dynamische Entwicklung der polyfunktionellen, soziokulturellen Kompetenz, die der Person hilft, sich in diversen Kultur- und Zvilisationstypen und damit in Enklang stehenden kommunikativen Normen zurechtzufinden, adäquat kulturelle Erscheinungen und Tatsachen (inkl. Redekultur) zu interpretieren und diese Kennungsmarken bei der Wahl der Zusammenwirkenstrategien in der Lösung von persönlichen und auch beruflich wichtigen Aufgaben und Problemen in unterschiedlichen Typen der modernen interkullturellen Kommunikation zu verwenden. [6, 29]

In der modernen Methodik des Fremdsprachenunterrichts gibt es unterschiedliche methodische Konzeptionen, die das Co-Lernen von Sprache und Kultur in den Vordergrund ausschieben. Dazu gehören linguakulturelle, kommunikativ-ethnografische und auch soziokulturelle Ansätze. Wenn die erste zwei Aspekte mit der Lexik und dem Wortbestand und auch den nationalen Besonderheiten des sprachlichen Verhaltens verbunden sind, so ist der soziokulturelle Aspekt auf die kulturellen Erscheinungen orientiert, die auf der nationalen, ethnischen und sozialen Ebene zum Vorschein kommen.

Deswegen gilt die Fremdsprache als Unterricht als allgemein passendes Mittel, da es die Möglichkeit gibt, die Frgaen aus der Geschichte, Religion, Umweltschutz, Wirtschaft, schöngeistigen Literatur zu streifen.

Kulturologische Ausbildung hat ihren Widerschein in erster Linie im authentischen Stoff. Gerade aus den authentischen Quellen und Texten können die Lernenden Kenntnisse über die erlernenden Sozien und Kulturen, Verhaltensnormen und Umgangsregeln erhalten, die in diesem oder jenem Land aufgenommen sind. Der betreffende Stoff hat einen unumstößlichen Werte in Bezug auf seine praktische Verwendung, da er die größte Konyentration von soziokulturellen Realia und Tatsachen im Vergleich zum jeglichen Lehrstoff.

Aber auf jeden Fall müssen die Lehrer eine deutliche Vorstellung haben, worüber sie verfügen, das heißt, wie sie den Lehrstoff, den sie haben, möglichst produktiv verwenden können. Dafür müssen wir die zur Verwendung im Sprachunterricht zugelassenen Lehrbücher und methodischen Komplexen einer Analyse unterziehen. Als Beispiel nehmen wir zwei zugelassene Serien von Lehrbüchern für die Grundschule und vergleichen, wie die Themen beleuchtet werden und ob die soziokulturellen Komponenten vorhanden sind.

In der 2-en Klasse sind die methodischen Komplexen von zwei Verlägen “Proswetschenie“ und „Drofa“ zugelassen. Ein Lehrbuch dient als methodischer Komplex zum erweiterten Fremdsprachenunterricht (Deutsch, Galskova N.D., Goes N. I., „Drofa“), und eines davon – zum allgemeinen.

Wenn man präziser diese zwei Lehrbücher betrachtet, so kann man herausfinden, dass sie sich grundsätzlich voneinander unterscheiden. Der thematische Inhalt ist relativ gleich, aber die Art und Weise der Stoffgestaltung ist unterschiedlich. Im Lehrbuch für den erweiterten Fremdsprachenunterricht gibt es beispielweise sehr wenig Russisch, die meisten Aufgaben sind in der Form eines Hörverstehens gestaltet. Aber was besonders interessant ist, dass man ziemlich oft unterschiedliche Sprichwörter sehen kann, die bestimmten Aktivitäten zuvorkommen. Zum Beispiel vor den schriftlichen Übungen – Übung macht den Meister usw. Zu jedem Thema gibt es entweder Gedichte oder Lieder. Die authentischen Texte können nocht nicht verwendet werden, deswegen sieht man authentisches Material nur in diesen Formen. Am Ende des Lehrbuchs gibt es auch Abzählversen und Zungenbrecher mit Audiofolien. Am Ende kann man auch den Wortschatz finden, weil es während des Unterrichts nicht gegeben wird. Was aber wir negativ einschätzen können, ist der Mangel an russischen Realia, die eigentlich vorgesehen sein sollen, damit das soziokulturelle Prinzip voll funktionieren kann. Alle Namen und Situationen sind einseitig dargestellt.

Was das zweite Lehrbuch von Bim I.L. Rijowa L.I. “Proswetschenije” angeht, das für den allgemeinen Fremdsprachenunterricht vorgesehen ist, so sind alle Anweisungen und Aufgaben auf Russisch geschrieben. Alles, was auf Deutsch gegeben wird, hören die Schüler entweder im Unterricht vom Lehrer oder zu Hause in der Form eines Audiotracks. Alle Themen sind gleich gestaltet, zuerst kommt neuer Stoff und in allen weiteren Stunden wird er wiederholt. Die neuen Wörter werden in Tabellen gegeben, aber das sind meistens Phrasen, keine Wörter. Aber

dazu haben alle Namen und fast alle entstehenden Situationen irgendwelche Verbindung mit der russischen Kultur und helfen den Kindern in das für sie neue Schulfach einfließen.

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Starodubtseva I. I.

DEVELPMENT OF CREATIVE POTENTIAL AT THE ENGLISH LESSONS THROUGH THE PERSONAL APPROACH

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Every person has his own aim to expess his personality. This aim pushes the person to be creative. To develop creativity in a child it is nessessary to encourage him to make something new, to teach him to estimate his success and the results of his activity. The constantly changing world demands to be creative and be ready to improve the personality. The level of the development of the child can be measured by:

- Readiness to discover new knowledge;
- Emerge of new motives;
- Possesing new algorithms of activity;
- Readiness to come to the conclusion very quickly.

There is a great range of special techniques to discover, measure and develop creative abilities of a child based on free choice (according to I.P. Volkov). Conceptual idea of the creative learning is teaching in equal two ways: learning the same basic programme ang creative activity of students oriented on specific product. The specific product at english lessons can be creative writing, drama,

creative stories, participation in olympiads and contests, blogs and sites in the internet.

The first stage in development creativity is preliminary diagnosis of the level of creative abilities. It is not a test but a kind of a process. The teacher can get an idea about creative ability of a child working with this child for a long period of time. Even small children apply given knowledge differently. The child expresses individuality and creativity broadening the school carriculum, using new words and expressions in familiar grammar structures, using non-verbal methods of communication.

The next element of creative development is motivation. Students motivation to be creative is an individual process. This process is personally oriented to every child. A diplom can be enough for one student, others are collecting their achievements to use them in the further education in high schools.

The main component of this technique is creation of special conditions which help students to show their views and express their individuality. Using unusual tasks in teaching English leads to making creative students' decisions. Nonstandard exercises are easily remembered and executed by the students. The examples of such exercises can be virtual and real excursions. They can be conducted at school, in the street, museums, and libraries. The students conduct such excursions themselves using English as the main language of communication. The content of excursions matches the school curricular and corresponds with students' interests.

Participating in different contests and competitions is another way of encouraging students' creative activity and development of their creative abilities. It is important to involve all the participants of learning English to prepare to these contests. Their motto should be – more freedom. The teacher's role is to guide and to direct, to be near the student, to give advice but not to manage. The competitions can concern different spheres of education. The topics should be interpreted by the students, adopted according to their interests and levels. Studying the topic "Politics" high school students can record a video film for the world leaders with the appeal to stop wars and disagreement or express their ideas how to stop pollution. The students make presentations about people of different countries where they tell facts about life style and habits of children abroad. It can be interesting for students to make short films about different spheres of life in their native cities. These films are especially interesting when the main characters are the students themselves. They make reviews from the streets of their city or homes like real journalists. Students tell about their homes, relatives or pets with great desire and enthusiasm. These films can be useful for foreigners who are going to visit the country and want to learn more before the visit. Such tips for visitors become reasonable from the students' point of view when they downloaded to the websites or show to the viewers. The most popular topics for discussions in the chat are "Features of the national cuisine" or "Features of the national hobbies". A lot of modern students have blogs in the internet. To be more popular they can make their blog English-speaking. Students-bloggers shoot videos about traditional dishes of

their families or share the recipes of their favorite dishes. They show the process of cooking tasty things step by step using English to enlarge the number of the subscribers of the blog. Travelling with the camera in the native city or in the country the students can show the landmarks and tell the viewers interesting stories. These blogs demand very careful preparation and take a lot of time. But they are worth doing. They are considered to be stylish among teenagers and help express creativity. Moreover, the blog is a way out to apply English not having language environment.

These techniques can be applied during after school classes individually but what can be done at the lessons. The main difficulty is the different levels of all students present at the lesson. The teacher is limited in time and the amount of the material in the school programme. How to teach creativity? Multi-level tasks can be a good solution of this problem. These tasks are aimed to teach all students with all abilities and interests but with different speed and with different complexity levels. Multi-level approach can be applied with the help of modern information technologies and multimedia projects. The teacher sets the topic of the project taking into account students' individual interests encouraging them to show their creative abilities. In this case the students have the opportunity to express their potential choosing the form of presenting the project, the way to work and the succession of its presentation.

The examples of multi-level tasks can be:

1. Handouts which contain key-words, grammar tables, schemes;
2. Alternative tasks for voluntary work;
3. Handouts with execution algorithm;
4. Multi-level homework.

The volume of the material, the number of words and grammar rules can be different for students with different abilities. Creative students can do more.

One more important question should be discussed in this article too. It is the way of grading students. How to determine the level of students' success, how to put marks? There are different ways to grade students:

– Individual method to grade (each student has an assessment sheet where only his modern success is compared with the previous experience);

– Comparable method of grading (student's activity is compared with the same activity of other students);

– Standard way of grading (student's results are compared with standard models).

Creative tasks at the lessons and as home tasks are an integral part of teaching creativity. The examples of such tasks:

- To make up the end of the story;
- To make up a story using the pictures;
- To illustrate the story;
- To retell the story from the character;
- To translate the poem;
- To make up the situation using the idiom.

In conclusion, it should be mentioned that development of students' creativity is realized through the personal approach. Learning English is carried through the system of unusual tasks and exercises which are aimed at the interests of every child. Such experience will help a person to solve professional problems, avoid setbacks and make all activity successful.

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Sverhun O. A.

BENEFITS OF LEARNING BUSINESS ENGLISH FOR BANKING AND FINANCE

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As English is considered to be the main communication tool in today's business world, the ability to communicate with confidence and effectively is essential in banking and finance sectors. You might have the best idea in the world, but if you can't express it clearly, it will never be realized. You might be the most competent person in your field, but if you can't talk effectively with your team and your supervisors, no one will ever know that. In this age of globalized businesses, there are many career opportunities out there where business English proficiency is required for success. Business English is the general term used for English related to international commerce, finance and industry. In the global environment, it has become common for non-native English speakers to study business English as a specific tool, with the aim of interacting with English-speaking countries, or with companies that use English. More and more young specialists learn business English to improve their chances of finding a job at home, career prospects and to be able to work in English speaking countries. For these reasons, business English is what one is required in order to join, communicate and compete in the international market.

To have good command in business English is very important nowadays, especially in banking and finance sectors. Many countries have their banks that open accounts overseas. These countries have their clients all over the globe and therefore it is important for their staff to learn good and fluent English, so that they can better serve their English-speaking clients. This is one more facet that helps in

bringing more clients, making the career in banking and finance grow, being more lucrative and successful. Moreover, many companies employ virtual teams who work together across borders almost entirely by email and its members have to know business etiquette, how to build and develop a relationship, have good written communication skills to avoid misunderstanding.

According to the information provided by the National Bank of Ukraine, there are 88 banks in our country including 25 institutions that belong to foreign banking groups [1]. These banks with foreign capital are looking for specialists with excellent business English communication skills. If you aim to work in a large international bank, realize yourself and build career, you have to improve your skills.

There are top-5 Ukrainian banks with foreign capital, where English is necessary for career prospects (table 1):

Table 1. – Top-5 Ukrainian Banks with Foreign Capital

№	**Bank**	**Country**
1	RAIFFEISEN BANK AVAL JSC	Austria
2	CREDIT AGRICOLE BANK PJSC	France
3	UKRSIBBANK JSC	France
4	PROCREDIT BANK JSC	Germany
5	ALFA-BANK PJSC	Luxembourg

Learning business English has many benefits: an employee can have more job opportunities, an easier time getting promotions, a chance to work or train abroad and it can give an applicant an important advantage when applying for a job.

Specialists in banking and finance have to know business and specialist vocabulary and terminology for these sectors, have excellent spoken and written communication skills. For example, bank tellers are responsible for communication with clients. They are typically the first point of interaction for customers as they enter the bank. Tellers verify the identity of customers and process requests for deposits to and withdrawals from accounts, generate certified checks and money orders according to the specifications of customers, exchange currencies, answer questions about bank products and services and direct customers to other staff for more complex bank transactions. It’s important for them to know business English to deal with English-speaking customers. Managers should be able to make telephone calls, manage and take part in meetings, make effective presentations, deal with complaints, resolve conflicts, negotiate strategically in formal and informal settings; identify and resolve customer issues; evaluate and compare services and features of different products, make reports, write business letters etc.

Specialist workshops and refresher courses are available to training so that everyone will be able to continue to develop professionally. There are some free Internet-helpers for expanding banking vocabulary such as: the Banker, a global English-language magazine owned by The Financial Times Ltd [2]; the Street, an internet-magazine that provides international banking news and helps to be informed on investment decisions and discover new business opportunities [3]; CNBC News, an American business news TV-channel [4] etc.

Therefore, the knowledge of business English is very important in banking and finance sectors and has a lot of benefits. Improving your communication skills of business English can have an impact on your career, whether you are just at the beginning of it and start learning or whether you want to improve your already existing skills.

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BLOG AS A PARTICULAR GENRE OF INTERNET COMMUNICATION

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In the modern world computer and informational technologies rapidly increase their influence on all spheres of human life including the media sphere. Today, one of the most popular and widespread sources of information is the Internet. The Internet is also a way of connecting people across borders, that is why Internet communication through blogs, wiki pages, Skype, etc. has quickly become a part of everyday life.

Such source of information exchange as blog is actively developing and becoming especially popular. The definition given in the Oxford English Dictionary Online states that "blog is a regularly updated website or web page, typically one run by an individual or small group, that is written in an informal or conversational style" [7].

The themes of the texts of blogs are very diverse. Blogs inform readers about the personal life of the author, about interesting events in the community locally and globally. Moreover, such realities as healthy lifestyle and food, traveling, fashion, etc. can be considered in blogs. Different images, pictures and other

multimedia objects may be presented in blogs too. Records in reverse chronological order are typical for blogs. These records are published with the help of a computer and other means of communication having access to the Internet.

Nowadays, there is an active discussion about the genre of a blog among the researchers of its status in modern text linguistics. Linguists pay special attention to the genre specifics of blogs. A large number of scientific articles authored by Pozhidaeva I. V., Bardachevich J. A., Alexeev A. V. are devoted to this issue. Alongside with Russian scientists, foreign specialists address this issue as well: Miller H., Nowson S., Burnett R. The analysis of the relevant literature makes us conclude that the researchers of this problem tend to believe that the blog has a special status among the genres of Internet communication. Internet communication denotes a special kind of communication, which is carried out by means of a computer via the Internet.

Blog, as a special communicative environment, has a qualitative heterogeneity in the aspect of discourse theory [1]. The blog consists not only of posts in chronological order, but of readers' comments to these posts. In addition, bloggers, i.e. people leading blogs, actively comment on entries, with reference to one another, thus creating their own subculture.

Studying belonging of the blog to a specific genre, such scientists as Kharchenko V. K., Pozhidaeva I. V. and Herring S. point out several similarities of the blog with the traditional diary, which is considered by these linguists as a genre model, forming the basis for the blog formation. Thus, "classical diary" is regarded as "a systematic, sequential recording of the happening events with a central figure of the author of the text leading to understanding and imprinting of the personality in the system of lived events with the exact dates of the events and deliberately double addressing" [4, 49-50].

The blog, like the traditional diary, is characterized by the chronological order and regular updates of the author's posts, however, there are features that are not peculiar to the traditional diary. That is why, some linguists regard the blog as a network diary. The main difference of the blog from the classic diary is its intentional structure that is aimed at achieving publicity. The term "intention" was introduced into modern linguistics by the followers of J. Austin, who is one of the founders of the theory of speech acts. For example, logic G. Grice defines intention as a desire of the speakers to inform something and transmit specific, subjective signification in their statement. A. Zaliznyak in his work "Diary: to the definition of a genre" defines the main feature of the network diary, which is the "successor" of the classic diary, as "the public intimacy". While for the classic diary auto communication is typical, the text of the blog is focused on a lot of readers. The authors of blogs are waiting for the rapid reaction and response on their posts.

The blog as a special type of Internet communication has the following structure. As a sort of the network diary it includes the following elements:

– A headline - a text located at the top of the web page and reflects the theme of the blog.

– A column of the navigation with hyperlinks with the help of which it is easy to navigate sections of the site.

– A section with a personal information about the creator of the blog.

– Text of the post of the network diary that contains information about the date and time of the published post. Moreover, here is a link to the author's profile and information about the number of comments to each post.

– The section of the comments is located under the record in the dairy. Here readers actively express their opinions about the publication, also enter into the communication process with the author and other users.

Moreover, it is worth noting that blogs have a dual nature: on the one hand, blogs can be seen as a monologue that sets a specific theme. It is represented by a post of the author, however, actively developing comments provide a potential dialogic interaction between users who share their experiences, express their own opinions on the post of the author, but do not deviate from the given topic. The main characteristics of the dialogue in the blog are spontaneity, emotional concern, mediation, informal or neutral style of communication.

Thereby, we can conclude that the blog is a particular genre of discourse. It has a diary-type structure, however, the communicative goal of the blog is radically different from the communicative goal of the traditional dairy because the blog focuses on the public. Moreover, the blog combines the features of monologue and dialogue, thus creating a special communicative environment.

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A PERSON WHO OWNS ENGLISH OWNS THE WORLD

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The relevance of the chosen topic is determined by the fact that Russia is a representative of the union in which countries are ready to cooperate in the following areas, such as politics, science, technology, business, culture and trade. One of these unions is the bloc of BRICS countries. We want to pay special attention to the language communications of Russia and India. The common language in these countries is English, but there are contradictions in the use and usage of this language. The problem of this study is the difference between the established principles of English language and the specific language in a particular country.

V.B. Benevolenskiy, J. Hart and other linguists in Russia and India scientific linguistic bases. Their studies allow us to explore changes in English. The aim is a broad study of phonetic, morphological peculiarities and vocabulary. In the given article we try to analyze special peculiarities of English used in Russia and India.

The analysis of researchers' works shows that they contain the necessary theoretical foundation for broad research, describes the achievements of domestic and foreign scientists in the field of general linguistics and Stylistics.

The study material is taken from various sources: from the Internet, special educational literature, literary and artistic texts, from periodical press and dictionaries.

In our opinion the topic of study will be interesting for foreign language teachers. It is based on comparison of linguistic features of two representatives from BRICS (Russia and India).

BRICS is a group of five rapidly developing countries: Brazil, Russia, India, China, South Africa. The abbreviation of BRIC was first proposed by Jim O'Neill, an analyst at Goldman Sachs, in November 2001 in the Bank's analytical note. Later in 2011 the acronym BRIC was used in relation to the organization. When South Africa joined to BRIC, the group started to be called BRICS [8, 1-2].

Now, we would like to pay your attention to the distribution of English language in Russia and India. Linguistics is a science that learns natural language in general and as its individual representative. One of its sections is language linguistics and speech linguistics. Thus, the English language is connected with all

branches of human activity. It is necessary to take into account the background and the history of language in a country.

The founders of English language in India are the British. Their conquests in the XVI century made English as the language of the colonial power. When India got the independence of the country in 1947, it proclaimed English and Hindi as national languages, but Hindi took in the first place for use. In formal situations they use English, but and in the spheres of informal and personal communication dominates the native language or Hindi. Indian English is called Indlish in literature. Mahatma Gandhi the former ruler of India, told that officials must have the ability to easily learn the language; Language should serve as a means of religious, economic and political relations throughout India; it should be the spoken language of the majority of Indians [1,143-145].

The situation in Russia was different. The famous visit of Peter the Great to London in 1698 opened a new page in the diplomatic and cultural-economic spheres. The activity of Peter I in education gave a stimulus to study English in Russia.

The history of origin and the background of the English language in Russia and India can be distinguished by common features of these countries' language. They are as follows: English in Russia and India belongs to Germanic languages; it's the second official language in Russia and India; there is British English version in both countries, which has similar features with Australian English language [3, 204-205].

If you look at the modern Russian and Indian society, Russia wins in terms of English language development. There are a lot of various training programs and courses (they are available to all people) in Russia. In India the population is divided into castes. Caste defines the level of permissible knowledge and the future profession for every Indian. The higher strata of the population have enough privileges in the society, starting from the housing conditions to education. Wealthy Indians can afford to learn any foreign language at a high level. But this cannot be done by the people of the lower castes. Education is limited for them. Only 2% of the lower caste Indians receive good education [2]. According to the analysis foreign students prefer to study English at Indian universities. Because it is easy to enter the university after passing a simple test determining the level of knowledge, students are divided into groups. And each group is trained according to its own program.

But admission to higher educational institutions in Russia needs diligence, work, real knowledge and work on themselves. Russian Language Schools provide a wide range of language programs. Classes are held from two to seven people. Analyzing different sources, we underline the following schools:

– "English Plus" offers 4 basic courses of English designed for different age categories and developed according to the age peculiarities of students and their level of knowledge. Flexible schedule allows students to choose the most convenient time and duration.

– There are courses for people who need to prepare for the interview in English; English for IT professionals.

– Also, there are lots of courses for those who want to read technical literature freely.

And for those who want to speak and write English fluently. It is possible to learn English more effective using special psychological methods [6].

As for India the situation of studying English is quite different. For example, there are schools for deeper learning of the language in Goa. About 80% of the Goa's population speaks English fluently [6].

Programs of this school give general knowledge of English: Grammar, well-set phonetics and average vocabulary; unites studying, cookery and yoga classes; combine spoken English; Business English; Spoken French; Academic English, IELTS preparation, TOEFL; English through Yoga; spoken Hindi.

The significant differences in English language of Russia and India in vocabulary are shown in table 1 [4].

Английский в России	Индлиш	Значение выражения
Life must be the same as coca-cola»;	"Life ho to aisii!"	слоган компании Coca-Cola – "Жизнь должна быть такой как она!" (имеется в виду бутылка кока-колы)
Today is a very important day!	"Aj ka din bahot important hai!"	"Сегодня очень важный день!"
Never to be late!	"Kabhi late na ho!"	"Никогда не опаздывай!"
Общие фразы		
Good night	Шубх ратри	Спокойной ночи
My name is ...	Мера нам (...) хэ	Меня зовут (имя)
What time is it?	Китнэ бадже?	Который час?
What is your name?	Ап ка шубх наам кья хэ?	Как тебя зовут?
Thank you	Дханьявад	Спасибо
How are you?	Ап кейсе хэ?	Как дела?
no	Нэхи	Нет
yes	Ха	Да
bad	Бура	Плохо
Good day, good bye	Намасте	Здравствуйте, до свидания

To sum up, knowledge of foreign languages is important and it's possible to learn them in any country.

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THE DEVELOPMENT OF THE TOURISM INDUSTRY IN UKRAINE

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The role of international tourism within global economy is constantly growing. The experience of many countries demonstrates the great potential and high profitability of tourism (Bhatia, 2002; Smeral, 2001). Today the Ukrainian tourism industry confidently has entered the world tourist market. Tourism in Ukraine has been recognized and is an important economic factor. There is a good reason for this change. Therefore, the constant support for international tourism from the state must be one of strategic directions of socioeconomic development of Ukraine. International tourism has a positive impact on the sociocultural development of Ukraine, stimulating the growth of the related sectors, and having a positive impact in shaping the image of Ukraine as a tourist state (Voroshylova, 2012).

The potential of international tourism development in Ukraine is really significant. Ukraine has all the prerequisites for intensive development of both international and domestic tourism, related primarily to our historical and cultural heritage (monuments of national and international importance), natural environment – the presence of sea coasts of the Black and Azov Seas, landscapes,

especially the geographical location and favorable climate etc. The UNESCO World Heritage is also a component of the tourist attractiveness of Ukraine. As of January 2014, there are 981 object of the world cultural and natural heritage from the UNESCO list of which 7 are located in Ukraine (UNESCO World Heritage Centre) [1, 170].

Daily profit from one foreign tourist in Ukraine equals income from exporting nine tons of Ukrainian coal. A tourist sector of the economy serves as a major source of currency for 38% of countries in the world. It's all a matter of priorities and one that many countries in the world choose to emphasize. In the present day we can see that things are beginning to change in the Ukraine's tourist industry. The Cabinet of Ministers and the President, adopted several important decrees on tourism, "The Program of Development of Tourism up to the year 2010" has already been launched. In October 1997, Ukraine became a Full Member of the World Tourism Organization (WTO). The World Tourism Organization has placed Ukraine in the top 25 most visited countries in the world [2].

Rural tourism can be developed practically in all the regions of Ukraine, but the most prospective are the western regions in which up to sixty or seventy percent of the local population could be involved in it. On the one hand, such tourism will let people see and explore the beauties of the land, and on the other hand, it will promote mountain skiing and health-improvement centres and resorts. Also, such tourism will boost local initiative and will be a good incentive. The transport corridor Lisbon-Kyiv that will be created in the near future will provide a better access to the western regions of Ukraine both for the Kyivans and Western Europeans. It will be beneficial for the development of the Western Ukrainian tourist market [2].

There are wide opportunities for the development of various kinds of international tourism in Ukraine. Scientific and industrial potential of Ukraine is the basis for the development of scientific and business travel. A significant contribution to shaping the image of Ukraine as a tourist state is made by the holding of finals of the football championship "EURO-2012", which took place on the territory of the two host countries Poland and Ukraine in June 2012. Preparation of Ukraine for the EURO-2012 served as a powerful incentive for large-scale reconstruction of transport infrastructure. In the period of preparations to "EURO-2012", such international hotel business operators as Radisson, Intercontinental, Hyatt International, Hilton, Accor Group, Holiday Inn, Ramada Encor entered the Ukrainian market [1, 170].

These conditions are the centers of gravity that attract tourists and create a potential tourism sector in Ukraine, contribute to the formation of the investment climate and stimulate the inflow of public, private and foreign investments into the renovation and construction of tourist infrastructure facilities in order to profit from international tourism [1, 170].

Ukraine objectively has a huge tourism potential which unfortunately is not used very effectively. The reasons of this is a hard socio-economic situation in the country, not adjusted policy regarding to machinery of stimulating tourism

industry, the lack of an effective strategy for the development of the industry at both the national and regional levels. The situation in the tourism sector in recent years requires the active search for ways to overcome the crisis and improve manufacturing tourism product with the required quality [2].

Government of Ukraine should think that the tourism resources of Ukraine - a source of revenue to the state budget finances. Anyway, it is necessary to change the Ukrainian market of tourist services and move towards international standards, which will undoubtedly affect the budget increase. Ukraine has rich tourist resources, and it is important to develop tourism as it can "bump" the economy in the country. The state must do everything to facilitate international cooperation and build strong economic and institutional international relations to improve Ukraine's economy through the development of the tourism industry.

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SIGNIFICANCE OF FOREIGN LANGUAGES FOR EMPLOYEES IN ECONOMIC SECTOR

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The relevance of the topic: is in training to fluency in a foreign language, because it is an important task, which the employer and the employee. The formation of such a specialist more associated with deep learning, both native, and foreign language, which is one of the components of the professional culture and competence of a future professional. So in my opinion the theme of my research is relevant.

Statement of the problem: present conditions significantly influence all spheres of public life, this creates new demands on workflow. Today to future professional is placed a certain number of requirements which it must comply, among them are: to be competitive in the labour market, to be a qualified worker, are competent in their field, fluent in their profession, to be able to effectively carry out their work with a degree at the level of world standards and be fluent in at least one foreign language.

The main material: Good command of professional foreign language specialists in Economics and Finance is one of the conditions for successful work

and career growth. The Ukrainian business is increasingly integrated into the world economy, and knowledge of a foreign language, at least one, as a basic skill as the ability to work on the computer. Businesses and companies are trying to abandon the interpreters, at least with European languages, and more willing to hire employees with foreign language skills and is able to translate narrow literature and documentation.

Understanding a foreign language is often not enough to loose orientation in the business and professional information for effective communication with foreign experts in the sphere of economy and Finance. In the globalized economy, knowledge of a foreign language, especially English, gives you the opportunity to own an important information product, it helps to objectively assess the situation in the global economy, to develop a strategy for increasing economic efficiency for your business.

In the daily professional activities of specialists in Economics and Finance foreign language required for:

• study of the theory and practice of foreign economic activity, international business;

• possession of a dictionary of economic terms, the expansion of knowledge in the field of economic science (all modern textbooks are written mostly in English);

• reading of special literature and materials with the extraction of necessary information, acquisition of skills for abstracting, annotating;

• processing large amounts of information in a foreign language;

• fluent professional communication with colleagues in Ukraine and abroad;

• for business correspondence, documentation;

• intercultural communication, broaden their horizons, the convergence of cultures of different peoples.

In Economics and Finance there are many specialties and specializations of higher education, which implies an increased level of teaching foreign languages. For example, in the program of training in the specialty "World economy" includes even two foreign languages, and graduates have the qualification "economist with knowledge of foreign languages". Can not do without the knowledge of a foreign language at a good level in such majors, as accounting, analysis and control of foreign trade; Commerce on foreign market of goods and services; international statistics; investment and business.

A graduate in Economics and Finance with good knowledge of foreign languages, have all chances to get a job in an international company on the position of economist, financial Manager and analyst. The other option of employment is the representative of a foreign company in Ukraine, as 2/3 of the Ukrainian companies have foreign partners. Knowledge of a foreign language adds to the size of the salary of a specialist in this area on average 20%.

To improve their level of knowledge of professional foreign language in the sphere of economy and Finance in Ukraine in various courses. In the Ukrainian economy, by far the most popular is English. The second study German. It is

possible to recommend such interesting training program, "international banking and Finance, English in insurance", "English for Bank employees and middle managers", etc. Courses are designed for business people, lawyers, auditors, financiers, analysts, investors, accountants, Bank employees, for all who are in any way associated in the work with finances. In the program: working out the jargon in real-life situations, documentation and compilation of financial statements.

Conclusion: Thus we can say that knowledge of a foreign language has a positive effect on the future work of the specialist. An in-depth study will give the opportunity to more carefully navigate foreign documentation and situation in the world.

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SOME FACTORS OF LABOR MIGRATION OF UKRAINIANS

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The essence of the term "labor migration" is the movement of a person for temporary employment, accompanied by an intersection of the state border or between the administrative-territorial units of Ukraine (internal labor migration) [3, p. 474-475] At the present stage, the issue of labor migration of Ukrainians to the countries of the European Union is very painful. As statistics show, most of the active population of Ukraine wants to emigrate to work abroad. This, first of all, is associated with an unstable economic situation in the country. The volume of labor migration depends on the demographic situation in the country, namely on the provision of the labor market by the working-age population. Starting from 1991, according to the State Statistics Service, the population in Ukraine continues to decline, mortality exceeds fertility. At the end of 2017, the total number of permanent residents is 42.2 million people, of which 18 million (62.2%) are economically active people aged 15-70 years and only 45% have been employed.

More than half of the employed population are people over the age of 40, which indicates an aging workforce. An unfavorable demographic situation in Ukraine will not reduce the rate of emigration, but rather increase immigration. The situation in the world, in particular in the industrialized countries, is as follows: as a

result of fertility reduction and the aging of the population, imbalances are created on the labor markets and they are in need of a foreign labor force. This contributes to an increase in the number of migrant workers from Ukraine. The second factor is the labor market situation, in particular the unemployment rate and the number of jobs available. The dynamics of unemployment during 2010 - 2016 is depicted in Fig. 1.

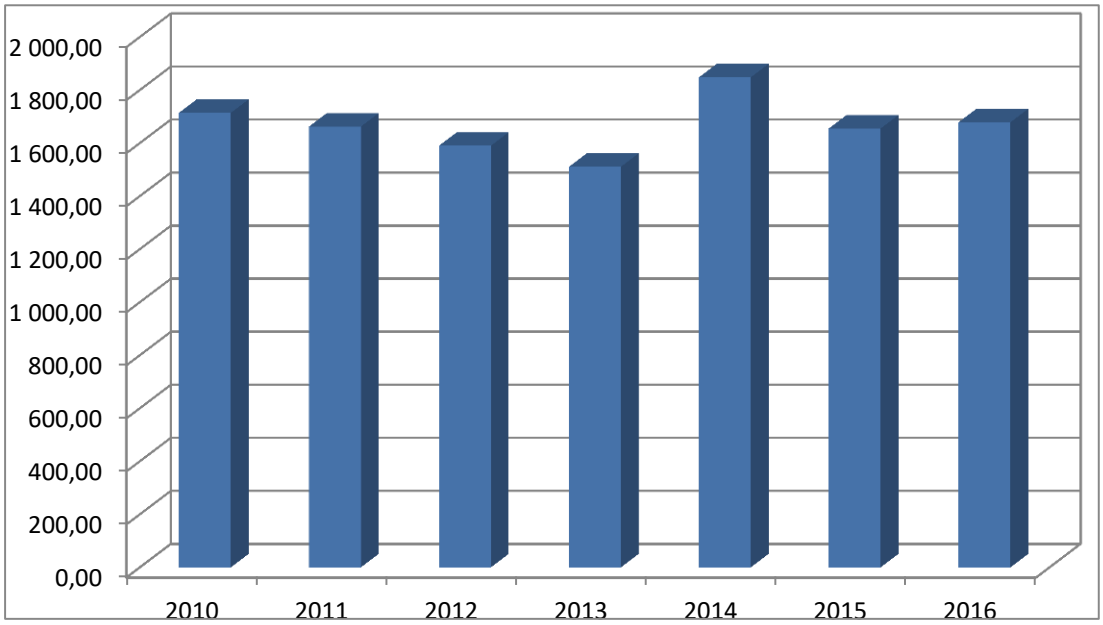

Figure 1. The dynamics of unemployment during 2010–2016

At the end of 2017, there are 177 thousand unemployed citizens registered at the State Employment Service. 11 vacancies apply for 1 job. Of the total number of unemployed, 42% were young people under the age of 35. However, according to domestic analysts, today's information provided by the State Statistics Service lowers the actual level of unemployment by about 5 times. The reason for this is the presence of a multivariate hidden unemployment.

Unfortunately, the situation in our country is quite tense, and there are also additional military actions in the east of Ukraine. Therefore, the indicator of labor migration is increasing. Ukraine occupies a leading place in education in the world, but our compatriots who have received high-quality education go to work abroad. Understanding the situation, we need to find solutions immediately, because we invest a lot in development and education, and we have migration of labor potential, and in this connection, there are still many economic problems.

There are many ways to overcome it. First of all, it is necessary to raise the pension, as pensioners occupy many positions, to allow young people to hold their positions. Increasing pensions can lead to increasing vacancies. Secondly, it is necessary to create comfortable working conditions. For some people, wages are not the most important factor when choosing a profession.

We also need transparency in employment, because corruption does not allow us to keep pace with time. And still the driving force is the opening of new

jobs. The country should increase the costs of lending to small and medium-sized businesses, as well as reduce taxes for them so that enterprises can hire more employees. The most important way of solving the problem of labor migration is to desire, if people have a desire and a goal, it is already half of the success, and if the state is interested in it, they are doomed to succeed.

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ECOLOGY

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FUTURE PERSPECTIVES OF ENVIRONMENTALLY FRIENDLY AIR

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The Nazis used exhaust fumes to kill people in gas chambers, but modern people are changing their habitat into a gas chamber on their own will. The European scientists are sounding an alarm. The influence of exhaust fumes on human health has become extremely dangerous. People do not only for ill but even die because of the exhaust fumes. It is rather clear that the time for alternative cars has already come [3]. And it is an urgent problem which is pursued seen not only by ecologists.

More than two hundred chemical compounds get into the air from an exhaust pipe of a car. The list of dangerous components is much more formidable. All of them increase the risk of cancer. The most dangerous is carbon monoxide.

Carbon monoxide is mortally dangerous as it forms strong connection with hemoglobin blocking up the transportation of oxygen and breath of cells. It is enough one tenth of a percent of carbon monoxide present in the air and an hour for a human, to breathe it is chough to lose his life [4].

Ten times more dangerous than carbon monoxide is nitrous oxide. It is one of the most powerful poison which irritates, like carbon monoxide, the respiratory tract, causes bronchitis, decreases the ability of the human body to resist respiratory diseases and it leads to the toxic pulmonary edema in high concentration.

Hydrocarbon in combination with nitrous oxide under the influence of sun rays oxidizes and turns into smelly and poisonous compounds [1]. That is why careful housewives are so aggressive to the dust because it is an integral part of the exhaust fumes which causes a lot of different diseases of the mucous membrane and respiratory tract.

It is clear that the Nazis were not interested in the influence of the exhaust fumes on a human body. They were only a cheap weapon for mass killing of people for them. People in the Nazis concentration camps were too exhausted to spend bullets to kill them. So they created special trucks which had gas chambers [2]. Those trucks looked like ordinary vans but during the start of the engine the exhaust fumes got into the closed truck body killing everyone there during 15 minutes.

The scale of influence of the exhaust fumes on people became obvious after the publication of research results made by scientists of one of the oldest Swiss universities in Basel [5]. According to this research, 40 thousand Europeans die every year from diseases caused by the traffic exhaust fumes. It means that 6 per cent from total deaths, according to the Swiss scientist, is caused by environmental pollution. Except 40 per cent of premature deaths because of high level of air pollution by traffic fumes, 20 thousand Europeans suffer from chronic bronchitis and a number of asthma attacks exceeds 500 thousand incidents a year. The researches were conducted in Switzerland, Austria and France where the number of cars doubles the number of citizens [2].

The scientists think that it is necessary to introduce strict measures on regulation of traffic fumes emissions. First of all, it is the increase of taxes for car ownership. Then, the public transport and the effective systems of purification of the exhaust fumes should be widely developed.

This problem has been worked out in Europe for a long period. And there are special laws concerning air pollution. After long discussions European governments have come to the solution to decrease the amount of traffic exhaust fumes in 3 times. By 2020 a European car will emit no more than 95 grams of carbon dioxide per one kilometer. Now the maximum allowable level is 130 grams per kilometer [6].

Hereby, we believe that car manufacturers will also take part in the creation of an environmentally sound future. The financial benefits are already set out for those manufactures, who will makeon attempt to mass-produce ecological electric cars. For example, Germany has already announced its preparedness to invest in to the production of such vehicles, which plans to develop the production of electric cars in the amount at least 1 million per year to 2020.

It is a little-known fact that the electric car was invented long before the internal combustion engine, but it has become popular only recently, as a result of prices' permanent growth of prices for oil and environmental ever-worsening [7]. The first and the main edge over internal combustion engine is lack of noxious exhaust. Moreover, the energy, which is produced by different power plants, is much cheaper than petroleum or hydrogen fuel. With such a technology it will be possible to charge a car from a power outlet and the noise from cars on the streets will almost disappear. Instead of petrol stations, the infrastructure for battery charging will be developed and it is well known that due to their size it will be possible to place charging stations in more convenient localities in comprison to petrol stations.

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SECONDARY USE OF WASTES OF THE METALLURGICAL INDUSTRY BY CONSTRUCTION OF AUTOMOTIVE ROADS

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One of the development directions of the state, which seeks for a balanced nature management, can be reuse of resources in industrial production. In the first place, this will help to reduce the use of exhaustive natural resources, as well as reduce the amount of existing waste volumes through their secondary use.

Studies on the introduction of slag materials in asphalt concrete mixtures were conducted by many scientists including Tulaev (1986), Koganzon (1997) [2].

The main direction of reducing the volume of production waste is their re-use in various branches of the national economy, for example, in the construction industry.

Mineral and raw material waste is used in the production of building materials, as well as in the construction of highways.

The metallurgical industry is considered to be one of the main “suppliers” of raw materials for the building materials industry. The slag of the metallurgical industry can be conditionally divided into slag of ferrous and non-ferrous metallurgy. In turn, slag of ferrous metallurgy are subdivided into steel-casting, open-hearth cupola furnace and blast-furnace ones.

Blast-furnace slag is the main representative of slag in ferrous metallurgy. They are formed when smelting cast iron in blast furnaces. According to statistics, we get 1 tonne of cast iron and 0.7 tonne of blast furnace slag from 2 tonnes of iron ore and fluxes. In road construction, crushed stone from blast-furnace slag is more suitable for use in asphalt-concrete coatings. Crushed steel smelting slag and

asphalt concrete on it should have high resistance to wear and have the necessary properties, providing the coating with the required coefficient of adhesion [1].

By chemical composition, blast-furnace slag is divided into basic, neutral and sour. Main ones include slag with a module of basicity > 1 and acidic ones include slag with a module of basicity <1.

More than 50% of blast furnace slag is processed into granular one.

Approximate chemical composition of blast furnace slag is as follows:

SiO2-30-40%, CaO -30-50% AI2O3 -4-20%, MnO-0.5-2%, FeO-0.1-2%, SO3 -0.4-2.5%.

Compared with slag of ferrous metallurgy, slag of non-ferrous metallurgy is a more valuable raw material for obtaining a whole complex of metals, which remain after the removal of the main product. They are more heat and electrically conductive, about 70 % is used in road construction for the construction of crushed stone bases and the preparation of asphalt-concrete mixtures based on crushed stone and sand from slag of copper-nickel production [3]. In non-ferrous metallurgy, the composition of slag is almost free of manganese oxide, and magnesium oxide is much less. But they contain up to 50% of ferrous oxide, so they have a high real density (2.8-4.9 g / cm3).

But in spite of their universality, it is necessary to determine the areas of their application based on the nature of the slag melts.

For the preparation of asphalt-concrete mixture with a large aggregate in the form of slag, it must comply with the norms of DSTU Б В.2.7-149: 2008. also There are also two types of asphalt concrete with slag filler, they can be hot and cold, depending on the temperature of laying.

Samodurov and Krasykov established some features of the preparation, laying and compaction of asphalt concrete with slag filler. They found that the temperature regime for the preparation of such mixtures is in the range 110-130 ° C, and their laying is possible at a temperature of 70-80 ° C, their compaction temperature is in the range 50-70 ° C. From this we can conclude that such asphalt concretes can be attributed to something average between hot and cold types of asphalt concrete.

Irish scientists studied the efficiency of replacing a large aggregate with slag. They replaced 0%, 25%, 50%, 75% and 100% of mineral material with slag of steelmaking production. Determining the efficiency of replacing large aggregate, they relied on a number of indicators: tensile indexes, modulus of elasticity, etc. Consequently, it was found that 25% is the optimal level of replacement, and the permissible replacement of a large aggregate with slag is 75%, this amount of filler improved the physical and mechanical properties of asphalt concrete [2].

According to statistics, annual waste from the industry of ferrous metallurgy, slag namely, is about 15-20 annually. 12.5 million tons of asphalt concrete mixtures were produced in 2015 in Ukraine. In the construction of highways, only 0.7 million tons from 1 million tons of formed slag are used for the preparation of asphalt concrete mixture.

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REALIZATION OF EFFICIENT LEVEL OF USING THE NATURAL-RESOURCE POTENTIAL OF UKRAINE IN THE ASPECT OF SUSTAINABLE DEVELOPMENT

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Ukraine’s natural resources are strategically important. First of all, they are needed for economic development in such fields as mining, the metallurgical sector, mechanical engineering, aerospace, shipbuilding as well as in the petroleum and energy industry. Secondly, they are a significant source of export income. Thirdly, Ukraine’s natural sources can ensure increasing the country’s independence from external energy suppliers (especially considering natural gas), that is equally important to guarantee national security. In a situation where the demand for resources is increasing and their number is steadily decreasing, the efficiency of the functioning of production systems can only be ensured through the rational use of resources and their preservation [1, 256]. The lack of an effective management system in the field of environmental protection and the slow implementation of structural reforms and the modernization of technological processes in the conditions of national economy growth leads to an increase in pollution levels and predetermines the support of old, ineffective approaches to the use of energy and natural resources [3].

The purpose of the article is to study the current trends of the national policy of Ukraine in the field of efficient use of natural resources and to identify appropriate initiatives aimed at realizing the effective use of natural resources for sustainable development at the national level.

In Ukraine, the main tasks and directions of the state environmental policy are defined by the Law of Ukraine "On the Basic Principles (Strategy) of the State Environmental Policy of Ukraine for the Period up to 2020 (hereinafter – the

Strategy)" dated from December 21, 2010, No. 2818-VI. The strategic goal of the national environmental policy is to stabilize and improve the state of the natural environment of Ukraine by gradually achieving its goals, guaranteeing an environmentally safe natural environment for the life and health of the population and introducing an ecologically balanced system of nature management and conservation of natural ecosystems [2].

The experience of the advanced countries shows that effective management of environmental activities, as well as the integration of environmental policy in all sectors of the economy, provides an opportunity for further socio-economic development with minimal impact on the natural environment [4, 68–77]. The UN World Conference on Environment and Development adopted a declaration and recognized the concept of sustainable development as the dominant ideology of civilization in the 21st century.

Analyzing the effectiveness of the state environmental policy, it should be noted that the environmental component has not yet become an obligatory part of the developed state target programs, the National Action Plan on Environmental Protection, etc. Socio-economic reforms in the country also occur without sufficient consideration of the resource factor, which leads to further weakening of environmental policy and institutions, slowing down the necessary changes in legislation, etc. All these factors lead to a significant reduction in the efficiency of management in the field of environmental protection at the state and regional levels. The Strategy and the National Action Plan for the Protection of the Environment have identified the need to improve regional environmental policy.

In order to ensure the harmonization of economic and environmental development, optimal distribution of production resources is needed, development management involves a combination of market mechanisms and levers of state regulation in the field of natural resources, integration of economic, social and environmental policies [1, 260–264].

In summary, it should be noted that sustainable development is a managed development. The basis of its controllability is the system approach and modern information technologies, which allow to model very quickly various options for development directions, to predict with high accuracy their results and to choose the most optimal ones. In the course of the work, trends of the national policy of Ukraine in the sphere of effective use of natural resources in the aspect of sustainable development management were considered. Problems and contradictions in the state environmental policy were identified. Measures have been suggested for the effective use of the potential of natural resources for sustainable development at the national level.

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BASIC FEATURES OF ENVIRONMENTAL SAFETY

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A man by nature tends to the state of security and wants to make his existence as comfortable as possible. On the other hand, we constantly live in the world of risks. The threat comes from both criminogenic elements and from the government that is capable of pursuing unpredictable policies. There is a risk of contracting an infectious disease, the risk of the military conflict, the risk of an accident. Today, all this is perceived naturally and does not seem to be something far-fetched, because all these events that threaten our security are quite likely and, moreover, have already happened in our memory. Therefore, preventive measures are taken to reduce these risks, and everyone is able to name them.

Recently, the threat to the safety and comfort of a person begins to come from an unfavourable state of the environment. First of all, this is a health risk. Now there is no doubt that pollution of the environment can be the reasont a number of environmentally caused diseases and, in general, leads to a reduction in the average life expectancy of people affected by environmentally unfavorable factors.

Note also that the concept of "environmental safety" is applicable to many realities. For example, environmental safety of the city's population or even of a whole state, there is an environmental safety of technologies and industries.

Environmental safety concerns industry, rural and communal services, services, and international relations. In other words, environmental safety is firmly embedded in our lives, and its importance and urgency is growing year by year.

Meanwhile, the modern ecological state of the territory of Ukraine can be defined as critical, and in some regions it has become an ecological disaster. People should realize that environmental degradation poses a much greater threat to their

future than even military aggression. Thus, over the next few decades, mankind is able to eliminate poverty and hunger, get rid of social defects, revive culture and restore architectural monuments, if funds are available for this, but to restore the destroyed nature, some money is not enough. It will take centuries to stop its further destruction and push aside the approach of an ecological catastrophe.

This course of events must be countered by an effective environmental policy, a new ecological thinking. This means that everyone should take care of providing a healthy environment for themselves, children, grandchildren; constantly protect the plant and animal life, air, water and soil from the harmful effects of economic activity.

Therefore, the supply of young people with the necessary knowledge of environmental safety is timely and extremely necessary.

The presence in the programs of the Belarusian Railways section "Environmental safety" meets the requirements of the state educational standard. The study of this section should contribute to improving environmental literacy, forming an ecological outlook among students.

For successful mastering of the educational material, it is necessary to have certain knowledge of biology, ecology, socio-economic and natural disciplines.

The objects of ecological safety are everything that is of vital importance for security subjects: spiritual needs, values and interests of the individual, society and the state, natural resources and the environment as a material basis for state and social development.

Subjects of environmental safety are an individual, society, biosphere, a state.

The most important environmental problem of the earth, are the holes in the ozone layer of the earth, were caused by people and we are the only ones who are able to solve the problems. We must begin to realize that our actions can lead to environmental damage. First of all, many people still think that they can do little to help the environment. They are sure that it is the responsibility of the government and large companies to make our planet cleaner: waste and material disposal, protection of rare animals and plants, establish toxicity of exhaust gases of equipment, etc. But they are wrong, everyone should take part in reducing pollution.

The natural environment - a set of natural conditions for the existence of human society, animals, plant and other organisms, which, however, is constantly affected by the direct or indirect influence of mankind, which is associated with economic activity, is little changed by the action of the anthropogenic factor.

Health (a person) is a state of complete physical, spiritual, biological and mental well-being, in which the functions of all organs and systems of the human body are balanced with the environment, no diseases or illnesses or physical defects.

According to the definition of the term "safety" as a state of human and environmental security, the goal of the security process is to achieve the most

favorable indicators of human health and high environmental quality. Thus, health is one of the most important normative indicators of the state of hazards.

Careless human activities lead to deplorable consequences, namely the danger of environmental degradation.

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INFLUENCE OF AUTOMOBILE TRANSPORT ON ECOLOGY OF CITIES

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Nature is a holistic system with balanced relationships. The violation of the relationships leads to changes in the circulation of material and energy in nature causing the current ecological crisis, high level and rapid increase of anthropogenic load on the environment.

The objective of this paper is to analyse the influence of automotive transport on the environment. The object of the research is an ecological state of cities. The subject of the research is the influence of automobile transport on ecology. The research is topical as most ecologists tell us over and over again about deterioration of the environment.

The increase of technogenic impact on the natural environment has caused a number of environmental problems. The most acute problems are connected with the state of the atmosphere, the hydrosphere and the lithosphere. Changes such as air or water pollution can directly affect the health and vital functions of the body, carbon dioxide emissions affect the climate, which, in turn, affects the production of food; shifts in the concentration of nutrients lead to the death of some populations and the rapid replication of others. As a result of accumulation of various contaminants in the atmosphere, primarily freon, there is a destruction of the ozone layer, which protects the earth's surface from solar radiation. Pollution, entering the atmosphere, with sediments returns to Earth and enter the water and soil. The sewage of industrial and agricultural enterprises contaminates rivers, lakes and seas. It is believed that more than 500 thousand tons of water are lost. Heavy metals such as lead, mercury, zinc, copper and cadmium, which are found in water, are actively absorbed by animals and fish that perish themselves and poison people who use them in food. At present, the reduction of atmospheric air pollution by toxic substances released by industrial enterprises and road transport is one of the

most important problems. The damage that is caused by air pollution is difficult to assess, but even incomplete data are large enough [1].

Pollution of the urban environment is caused by various reasons. The share of emissions from industrial enterprises and utilities in various cities ranges from 50 to 10%; the rest of the pollution is generated by motor vehicles that are a main negative factor in the urban pollution. In the global balance of atmospheric pollution, the share of motor vehicles is 13.3% [2]. The main sources of atmospheric pollution are vehicles with internal combustion engines. Therefore, the main cause of air pollution is incomplete and uneven combustion of fuel. The efficiency of automotive vehicles is 15%; the 85% of fuel 'flies to the wind'. The main components emitted into the atmosphere from different types of engine fuel are carbon dioxide and water vapour. In addition, harmful substances such as carbon monoxide, sulfur oxides, nitrogen, lead compounds, soot, hydrocarbons, including carcinogenic benzopyrene, unburned fuel particles and others are emitted into the atmosphere. The car burns out a significant amount of oxygen and emits an equivalent amount of carbon dioxide into the atmosphere. The exhaust gas contains about 300 harmful substances. The main polluting substances are carbon monoxide, hydrocarbons, nitrogen oxides, carbon black, lead and sulfur dioxide. Among the hydrocarbons, the most dangerous are benzopyrene, formaldehyde and benzene [3].

There is also a rubber dust that is formed as a result of abrasion of tires. When using gasoline with lead compounds, the vehicle contaminates the soil with this heavy metal. There is also pollution of reservoirs when washing cars and changing the waste engine oil. The production of the vehicle consumes a lot of energy and resources, many of which are non-renewable. The greatest damage is caused by personal cars, as the pollution of the environment when travelling by bus is much smaller per capita.

Vehicles are a source of noise pollution. A strong city noise constantly strains the auditory analyzer. This results in an increase in the threshold of hearing (10 dB for most people with normal hearing) by 10-25 dB. Noise in big cities reduces the life span of a person. According to Austrian researchers, this contraction fluctuates within 8-12 years. Excessive noise can cause nervous exhaustion, mental depression, vegetative neurosis, ulcer disease, endocrine and cardiovascular disorders. Noise prevents people from working and relaxing, reducing productivity. The level of street noise is due to the intensity, speed and character of the traffic flow. In the zone of the greatest influence of noise, there are districts located along the city-highways. The acoustic characteristics of the traffic flow are determined by indicators of vehicle noise. The noise produced by transport depends on many factors: power and engine operating conditions, the training of a crew, the quality of the road surface and the speed of movement. In recent years, the average noise generated by transport has increased by 12-14 dB.

Reducing the negative impact of the car on the environment is an important task of urban ecologists. The most radical way to solve the problem is to reduce the number of cars. However, the number of private cars still continues to increase all over the world. Over the last 5 years, the number of cars in Ukraine has increased

by 29%; the average number of cars per 1000 people has reached 80. Compare: in Moscow – about 150 cars, in the USA – 590, in Sweden – 420, in Japan – 285, in Israel – 145, in South Korea – 27, in China – 2 cars.

Thus, the most realistic option to reduce pollution is to reduce fuel consumption. Atmospheric pollution by vehicles decreases when replacing gasoline with liquefied gas. Scientists carry out research to create ceramics engines which will increase the temperature of burning fuel and reduce the amount of exhaust gases. The best way to improve the environment is to have green cars.

Further research should be aimed at the design of green cars.

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PROBLEMS OF ECOLOGY: ALTERNATIVE FUEL AND UTILTZATION OF TIRES

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In this article I would like to talk about the problem of environmental pollution associated with cars. This topic seems to me especially relevant in connection with the increase of ozone holes in the atmosphere and the increase of the average annual temperature of the ground. There is no secret that the environment suffers from a large number of exhausts and not recycled tires. Looking to the future and taking into account existing environmental problems, car manufacturers tend to regularly produce models with alternative fuels. In addition, the demand for them increases from year to year.

I'd like to consider the types of alternative energy sources, their pros and cons

Electricity

Today, electric cars can not be called a rarity. Almost every giant manufacturer regularly produce this kind of car. There is believe that the future is behind them, as there are plenty of sources of electricity on the planet.

Advantages:

• Absence of exhaust gases;
• charging of batteries from a regular mains;
• Low noise level;
• High engine efficiency.

Disadvantages:

• The price of such cars is still high compared to conventional cars;

• Poorly developed service, as there is a shortage of qualified personnel.

Methane and propane-butane

Cars on gas - one more alternative to gasoline and diesel, meet quite often. An increasing number of drivers are trying to convert their cars to this type of fuel.

Advantages:

• toxicity of exhaust gases is lower than that of gasoline and diesel;
• saving money on fuel costs;
• Reducing the wear of machinery.

Disadvantages:

• high price for conversion;
• long registration procedure;
• Insufficient number of refills.

Methanol (methyl alcohol)

Methyl alcohol is added to gasoline to increase the octane number. It is widely used in racing cars. In the USA, China and Japan, gasoline-methanol mixtures M85, M92 and M100 began to be intensively introduced, where the number indicates the proportion of methyl alcohol in the composition.

Advantages:

• Significantly reduces the toxicity of exhausts;
• the engine power is increased;
• the motor life is extended.

Disadvantages:

• Methanol is a poisonous substance, ingestion of it or prolonged exposure to fumes can lead to death;
• requires the conversion of the engine and fuel system.

Hydrogen

Hydrogen is one of the most environmentally friendly fuels, as the product of its combustion is ordinary water. Many automotive giants are working to launch this kind of model to the masses, but not all the nuances are studied, tests are being conducted.

Advantages:

• there are practically no harmful exhausts;
• there is no need to change the engine design;
• the motor life increases.

Disadvantages:

• high price;
• Explosion hazard;
• The lack of a common standard for fuel cells between manufacturers.

Biofuel (biodiesel)

Boiler fuel is a fuel created on the basis of vegetable oils and other organic substances. Usually it is made from soy, rapeseed, sunflower, and also from processed animal fat. Without the conversion of biofuel, you can refuel cars running on the solaris.

Advantages:

• ecological compatibility;

• saving money on the difference in value;
• Longer engine life.

Disadvantages:

• The shelf life of biodiesel does not exceed 3 months;
• a small number of gas stations;
• plants destined for biofuel processing rapidly deplete fertile land.

This is not the entire list of alternative fuels.

Also consider the problem of utilization and recycling tires

The problem of recycling worn automobile tires is common to all industrialized countries of the world, has great ecological and economic importance. In addition, modern economic realities dictate the need to use secondary resources with maximum efficiency.

Annually in the world according to the UN, more than 24 million tons of waste are generated in the form of worn tires, of which about 15 million tons, i.e. more than 60%, is thrown out to landfills.

Basic approaches to tire recycling

Currently, there are two fundamentally different ways of recycling tires:

1) electromechanical grinding with the use of cutting tools (with cooling or in an elastic state) with the subsequent processing of rubber crumb into rubber products and regenerate;

2) processing with the change of the chemical structure of rubber by thermodestruction or pyrolysis of rubber to obtain liquid decomposition products similar to petroleum products, suitable for the production of fuels and lubricants, anti-corrosion mastics, etc.

The main disadvantages of electromechanical grinding:

Low coefficient of "clean" working hours of those. Lines (not more than 50-60%) and downtime associated with the time spent on replacing cutting tools and repairing equipment.

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WHAT IS THE SOLAR ENERGY AND WHY UKRAINE NEEDS IT TODAY. SOLAR ENERGY DEVELOPMENT IN UKRAINE

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Solar energy is still a wonder in Ukraine, not often are solar panels found in the streets, at businesses or public institutions. Nevertheless, Ukrainians are beginning to use the energy of the Sun, and solar batteries gradually penetrate our market. Modern development of the global economy is closely linked with the

growth rate of energy production. This is due to many factors: the overall increase in world production, transport and telecommunications, the development of remote mineral deposits, disposal of waste, increasing energy consumption at home (heating, lighting, power household appliances), modernization of armies and so on.

Thus, the energy production grows faster than the population. Modern power engineering faces a lot of problems, and the most urgent problem is the new energy sources. At present, 6 billion people on the Earth consume more than 12 billion kWh of energy per year, i.e., an average of 2 kWh per person. This energy is obtained from coal (26%), oil (42%), gas (20%), hydro power (4%), nuclear power (5%), and 3% comes from other sources. That is, about 90% of the energy we get by fossil fuels - oil, coal and gas. These energy sources are called non-renewable because their rate of accumulation in the bowels of the Earth is much smaller than the speed of their consumption (approximately 106 times).

Humanity needs more and more energy, and to get it from non-renewable sources will be difficult or impossible in the nearest future. Indeed, according to various estimates, explored fossil fuel reserves will last for 30-50 years. If we consider the so-called geological reserves, assuming they will be promptly investigated, and their operation won't be delayed, then, given the increasing level of energy consumption, fossil fuels may suffice even for 100-150 years. And only coal may keep its place in the energy balance for any prolonged period of time. However, its use is accompanied by high levels of pollution. Nuclear energy, which today has much more natural reserves than fossil fuels, is dynamically developing over the past 20-30 years. However, according to many experts, it can no longer be considered a promising kind of energy because of the high risk of radioactive pollution, which manifested in a series of industrial accidents and disasters, especially during the infamous Chernobyl disaster.

Foreign investments in renewable energy projects benefit Ukraine in the shift to clean energy, but they also are have wider geo-economic and national security importance for this struggling European democracy. Ukraine is currently pursuing a number of renewable energy ventures funded by foreign investments. The latest is a 10 million euro ($12 million) solar plant project by Canadian firm TIU, to be located in Nikopol, Dnipropetrovsk oblast (Interfax, September 25). The 10.5 megawatt (MW) Nikopol solar power facility also represents the first investment to have come in under the Canada-Ukraine Free Trade Agreement, in force since August 1, 2017.

Ukraine is following the global trend of accelerated investment in renewable energy. Indeed, 2016 was the fifth year in a row that global investment in renewable energy capacity outstripped financing for new fossil fuel generation (Unep.org, April 6).

In addition to business considerations, solar power and other renewables have a special meaning for Ukraine’s energy security. Currently comprising less than 1 percent of current energy generation, renewable energy’s role is set to dramatically increase: the government has established a 10 percent benchmark for

renewable sources of power by 2020. And according to the recently adopted Energy Strategy 2035, it will reach 25 percent by that year (Mpe.kmu.gov.ua, September 25). Currently, according to the Ministry of Energy and Coal Industry, the top four energy sources for Ukraine are coal (30 percent), natural gas (28.9 percent), nuclear power (25.5 percent), and oil and oil-based products (11.6 percent).

Solar power development, in particular, will make Ukraine's energy more cost-competitive. According to a 2016 International Renewable Energy Agency (IRENA) study, "[B]y the year 2030, the increased use of renewable energy will reduce Ukraine's overall energy system costs." It will also have positive ecological and health effects from reduced smog and carbon dioxide emissions (Irena.org, 2016).

Clearly, if solar power development can be viewed as a proxy for innovation in the broader energy sector, Ukraine is offering attractive opportunities to international energy market players. In the future, Ukraine's renewable energy policies should lead to a more decentralized and distributed — and thus more secure and resilient — energy generation network.

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THE ROLE OF GREEN PLANTS IN THE FORMATION OF THE SURROUNDING SPACE

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The problem of transport pollution has recently reached critical levels. Transport influences in many areas, such as noise, thermal pollution, gas pollution of exhausted gases, pollution of soil and water, electromagnetic radiation. And the most important task in improving the ecological environment of roadside space is its landscaping. There is a difference of gardening with a protective and decorative purpose.

The protective gardening includes:

- anti-erosion gardening; Anti-erosion gardening is carried out in order to protect the roads from the destructive effect of growing ravines, erosion directly by water flows, erosion and destruction by mudflows, and also in order to combat landslides.

- sand-protective gardening; Sand-protective landscaping is carried out in order to protect motor roads from sandy drifts by creating plantations, fixing the sands adjacent to the road with sowing grass and establishing a special regime for using this area.

- noise-gas-dust-protective gardening.

Functions of green spaces are:

1. Reduction of dust and gas pollution.

Green plantings clean the city air of dust and gases. The polluted air stream, which meets the green mass in its path, slows down the speed, as a result of which, under the influence of gravity, 60-70% of the dust in the air settles on trees and bushes. Some of the dust falls out of the air stream, bumping into trunks, branches, leaves. A significant part of the dust settles on the surface of leaves, needles, branches, trunks. During the rain, this dust is washed off to the ground.

2. Gas protecting role of green plantations.

The green plantations located on the path of the polluted air flow divide the original concentrated stream into different directions. Thus, harmful emissions are diluted with clean air, and their concentration in the air decreases.

3. Phytoncidal effect of green plantations.

Most plants release volatile and non-volatile substances - phytoncides, which have the ability to kill harmful pathogens detrimental to humans or inhibit their development.

4. Effect of plantations on thermal conditions.

The air temperature among green plantations, especially in hot weather, is much less than in open places.

5. Influence of green plantations on humidity of air.

When heated, the surface of the leaves of trees and shrubs evaporates a large amount of moisture into the air.

6. The influence of green plantations on the formation of winds.

Green plantations are very conducive to the formation of air currents.

7. The importance of green spaces in the fight against noise.

Green plantations, located between noise sources and residential buildings, recreation areas and sports grounds, reduce the noise level by 5-10 % [1, 35-38].

And greening of the roadside space should still have decorative features, since a well-maintained road directly affects the visibility and evaluation of the road by drivers. The landscape harmoniously combined with the tortuosity of the road does not make driving difficult, but on the contrary facilitates it.

Comprehensively qualitatively equipped road taking into account all requirements and conditions is an indicator of the state development level and compliance with international standards and norms of the latest world achievements.

Decorative tree and shrub plantings, being one of the best means of architectural and artistic decoration of the roadside strip, are placed in any case, taking into account whether this section of the road is affected or not by snow drifts. In this case, it is necessary to provide for the following cases:

1. road segment entered, protected by artificial devices (shields, fences);

2. road section is unbearable and protected by plantations;

3. unincorporated road section located on the embankment exceeding the estimated height of the snow cover by at least 1.2 m for roads of the I category, 0.7 m - for the II category, 0.6 m for the III category, 0.5 m for the IV and 0.4 m for roads of the V category or in a deep depression;

4. road section is unbearable due to the nature of the surrounding conditions (forest, buildings, other barriers are close);

5. roads located in the climatic zone where there are very rare or no snowfalls.

In accordance with the existing garden and park styles and local conditions, in decorative landscaping, three main methods are used: regular (alleys or common planting), landscape-group (or free) and mixed [2, 8-10].

Regular reception provides a strictly defined arrangement of trees, shrubs or groups of monotonous construction along straight or right curved lines. The distance in the rows between individual plants or their groups remains constant throughout this design area. This technique is used on sections of roads passing in the flat terrain, or when registering particularly important road sections, entrances to cities and settlements, in the settlements themselves.

Landscape-group (or free) reception provides free (picturesque) placement of trees and shrubs in the form of separate elements and groups of various sizes. Distances between groups, individual plants and from the road to them are the most diverse (they are limited only by the strip of the tap). This technique is used mainly on sections of roads passing through a territory with a hilly or undulating relief [3].

Elements of landscape-group reception should be used for visual orientation of drivers. The plantings created in this way can be divided into three groups: guides, barrier and decorating or accenting.

Thus, gardening plays an important role in the organization of the roadside space. It is worth noting the multifunctionality of green spaces, which is very diverse. Plants also serve as a protective role, and decorative, the importance of which is equally important. Green plantations are not only a kind of “shield” against polluting emissions of road transport, against mechanical destruction such as sand drifts and erosion, but also directly affect safety and ease of driving a car.

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INFORMATION TECHNOLOGY

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REVIEW OF ELEMENTS OF COMPUTER VISION SYSTEMS

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Every person who has a personal vehicle has large responsibility, because inattentive or careless management is dangerous not only for the driver but also for the people around him. One of the dangers is the driver's inadvertent crossing of the markup strip, which marks the edge of the lane on which it is moving. Such a situation may lead to the exit of the car to the oncoming lane or roadside. Most often this is due to fatigue, drowsiness or during a long car drive along a section of the road with the same natural landscape (speedway or highway). According to the National Highway Traffic Safety Administration (NHTSA), 40…60% of all accidents on the roads in the US are directly or indirectly related to the fact that the car leaves its lane. In order to reduce the likelihood of an accident, leading car makers are developing computer vision technologies that can locate, track and inform the driver of the approach or crossing of the marking strip. Among those the development of "Opel Eye" or "Papago! P3" should be mentioned.

The methods of computer vision have found wide application in driver assistance systems. Works on detection of marking, obstacles on the road, recognition of signs, etc. were actively conducted in the 90's. However, they have reached a sufficient level (both in accuracy and reliability of the methods themselves and in the performance of processors capable of real-time performing appropriate methods), they reached mainly in the last decade. One example of the use of stereo vision is the methods used to detect obstacles on the road. These methods can be very critical to reliability, accuracy and performance. In particular, in order to detect pedestrians, it may be necessary to build a dense range map at a scale close to real time. These methods can require hundreds of operations per pixel and accuracy, which is achieved with graphics sizes not less than a megapixel, that is, with hundreds of millions of operations per frame (several billion or more operations per second) [1].

It is worth noting that the overall progress in the field of computer vision is not at all solely related to the development of hardware. The latter only opens up possibilities for the application of computational expenditure methods of image processing, but these methods themselves also need to be developed. For the last 10–15 years, the methods of comparing images of three-dimensional scenes, the methods of restoring close-range maps based on stereosight, methods of identifying and recognizing faces, etc. have been brought to an effective practical use. The general principles of solving the corresponding problems by these methods have

not changed, but they have been enriched by a number of non-trivial technical details and mathematical techniques that have made these methods successful.

Driver assistance systems include modern methods of detecting pedestrians, in particular, based on histograms of oriented gradients. Modern methods of machine learning for the first time allowed computers to solve such a common visual task as recognition of road signs better, but not through the use of special means of image formation, but thanks to recognition algorithms that received exactly the same information as a person.

One of the significant technical achievements was the Google unmanned vehicle, which, however, uses a rich set of sensors besides the video camera, and also does not work on unfamiliar (previously un-removed) roads and in bad weather conditions [2].

Thus, for driver assistance systems, a variety of computer vision tasks are required, including:

- stereo player;
- identification of obstacles on the roads;
- recognition of road signs, marking, pedestrians and cars;
- tasks related to the control of the driver's condition.

The initial component of computer vision on the car is an element that receives the primary information about the road or road situation.

Such elements can be:

- sensors (infrared, optical);
- video camera (monochrome or color)
- infrared camera or thermal imager;
- automotive radar and lidar.

For an unmanned vehicle, the main task is to follow its own lane in a given direction. At present, this task is performed by the driver for 90% of the time. Rebuildings, maneuvers are all inevitable, but most of the trip is always just a traffic on the road. Therefore, the cruise control should firstly be able to recognize where the roadway begins and ends and how the lanes for traffic are located on it – so as not to leave the roadside or the oncoming part of the road. In “The systems of traffic assistance on the strip” the ways of its implementation are described.

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INFORMATION TECHNOLOGIES FOR DATA PROCESSING IN INTELLECTUAL CONTROL SYSTEMS FOR VEHICLES

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The concept of transport management, based on the application of mechanization, automation and automated management has exhausted itself. Innovative ways of development require the creation of new methods of operation, management and control.

One of the major problems in intelligent control systems is that the system receives a huge amount of data that needs to be processed and filtered, but processing and filtering data is also one of the most important processes in the intelligent system; the correct choice of data processing and filtering is a key element for the entire system and that is why data processing is an actual scientific problem ерфе requires proper study by scientists and engineers.

A method has been developed to improve the accuracy of data processing using the Kalman filter and an experiment was conducted using a real car.

The Kalman filter uses a dynamic system model, known as control actions, and a set of consistent measurements to form an optimal state estimate. The algorithm consists of two repeating phases: prediction and correction. At the first stage, the forecast of the state at the next time point (taking into account the inaccuracy of their measurement) is calculated. On the second, the new information from the sensor corrects the predicted value (also taking into account the inaccuracy and noise of this information).

Using the Kalman filter, we filter the data obtained from the accelerometer of the Skoda Octavia while driving on the road, the graph of which is shown in Figure 1.

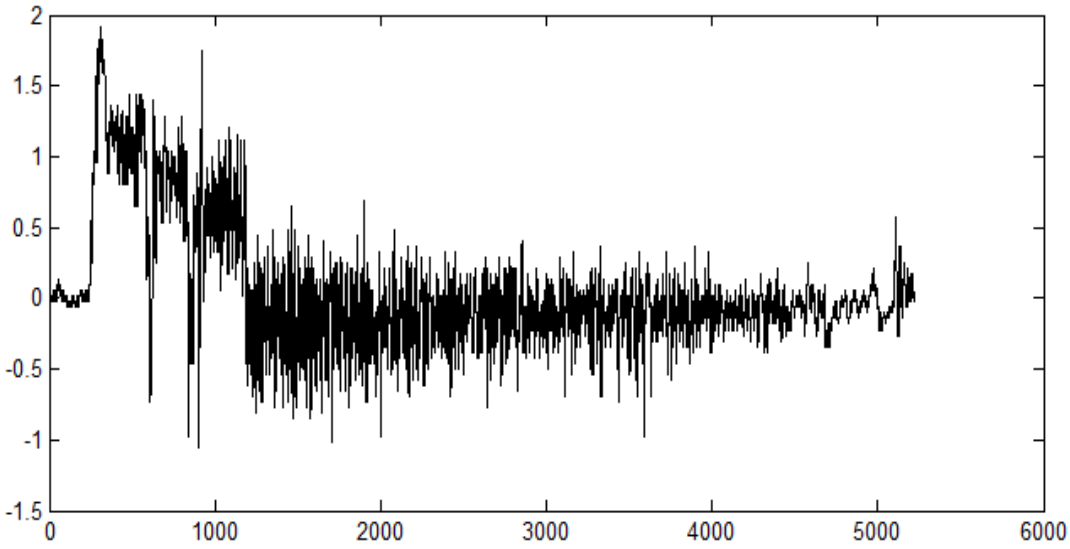

Figure 1 - Graph of the unfiltered accelerometer signal

It is convenient to use the MathLab application package to automate the processing of data from accelerometers.

Using the MathLab application package and the built-in function (1), we synthesize the Kalman filter for our data and get a filtered graph (Figure 2) with much more accurate data and values.

$$[y, e, s] = adaptkalman(x, d, s), \quad (1)$$

where x – is the vector of input signal counts;

d – is the reference sample vector vector;

s – is the structure with parameters of the algorithm and the initial state of the filter.

The three returns have the following meaning:

y – is the reference vector of the output signal;

e – is the error vector of error signal;

s - is the resulting parameter values and the final state of the filter.

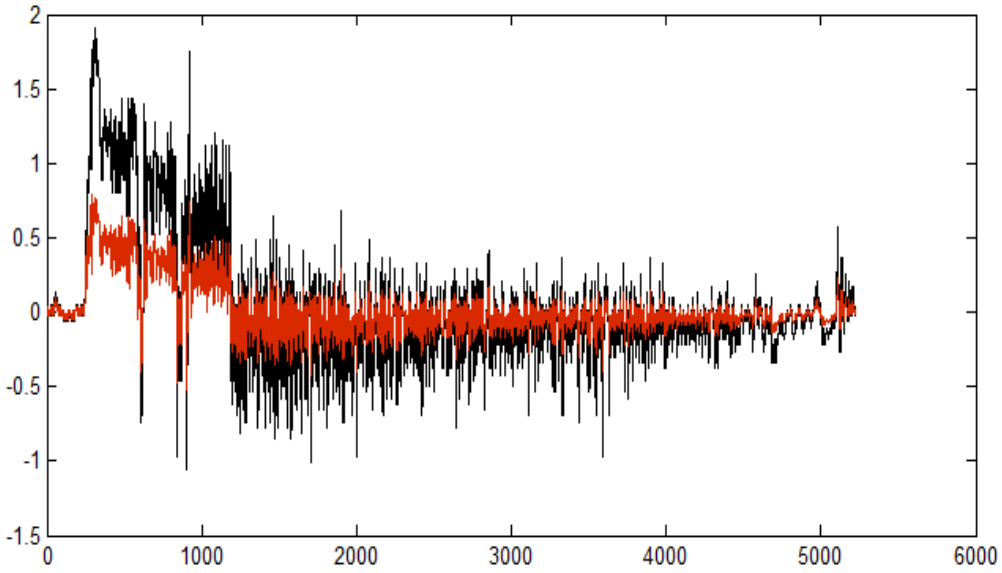

Figure 2 - The result of the Kalman filter application

The algorithm of data filtration was successfully implemented and operated on the diagnostic complex of Bosch company.

This development is presented in the form of third-party software, and it is able to receive data from diagnostic complexes and made it possible to filter the data obtained during the work of the complex.

The introduction of this feature, which was not available to it, greatly simplified the diagnostic process, accelerated the troubleshooting and improved the process of troubleshooting.

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REASONS FOR AUTOMATION OF MANUFACTURING PROCESSES

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Automated manufacturing systems operate in the factory on the physical product. They perform operations such as processing, assembly, inspection, or material handling, in some cases accomplishing more than one of these operations in the same system.

Companies undertake projects in manufacturing automation and computer-integrated manufacturing for a variety of good reasons. Some of the reasons used to justify automation are listed below.

To increase labor productivity. Automating a manufacturing operation usually increases production rate and labor productivity. This means greater output per hour of labor input.

To reduce labor cost. Ever-increasing labor cost has been and continues to be the trend in the world's industrialized societies. Consequently, higher investment in automation has become economically justifiable to replace manual operations.

To mitigate the effects of labor shortages. There is a general shortage of labor in some countries, and this has stimulated the development of automated operations as a substitute for labor.

To reduce or eliminate routine manual and clerical tasks. An argument can be put forth that there is social value in automating operations that are routine, boring, fatiguing, and possibly irksome. Automating such tasks serves a purpose of improving the general level of working conditions [1, 2].

Develop a Comprehensive Corrective and Preventative Action Strategy. rror detection and prevention is a hot-button issue today, and compiling accurate records of corrective actions is crucial for maintaining a good quality system and preventing the reoccurrence of defects. It is important to have a closed-loop mechanism for initiating, implementing, and verifying the effectiveness of changes resulting from the non-conformance process [2, 2].

To improve worker safety. By automating a given operation and transferring the worker from active participation in the process to a supervisory role, the work is made safer. The safety and physical well-being of the worker has

become a national objective with the enactment of the Occupational Safety and Health Act (OSHA) in 1970. This has provided an impetus for automation.

To reduce manufacturing lead time. Automation helps to reduce the elapsed time between customer order and product delivery, providing a competitive advantage to the manufacturer for future orders. By reducing manufacturing lead time, the manufacturer also reduces work-in-process inventory.

To improve product quality. Automation not only results in higher production rates than manual operations. It also performs the manufacturing process with greater uniformity and conformity to quality specifications. Reduction of fraction defect rate is one of the chief benefits of automation [1, 3].

Synchronize Inspections and Audit Data to Supplier Rating. When manufacturers rely only upon manual processes to complete inspections and audits, it is rare that these results are correlated back to supplier rating results.

Maintaining the information in a centralized database, minimizing the possibility of error and automating calculations could in fact signal exceptional gains in the performance of suppliers to quality standards. The opportunity for a manufacturer to further increase the performance of suppliers to quality, delivery, and performance standards is lost because the supplier rating information is not adequately calculated and communicated to the supplier.

Improve Product Conformance at the Process Level. Let's face it, when products aren't regularly conforming to quality assurance or customer standards, it costs the entire company lost time in firefighting toward a workaround solution and possibly reduced customer satisfaction.

Instead of resorting to the quick fix that can drain revenue, manufacturers that have turned compliance into a competitive weapon take these steps:

First, they evaluate and in many cases re-define the supply chains, production processes, and quality-assurance standards to alleviate bottlenecks in the production areas.

Second, entirely new approaches to measuring quality and compliance are often initiated to augment procedures already utilized. Parameters are rigorously scrutinized. These steps give the manufacturing teams' insight into which processes are under-performing and the circumstances responsible for these defective processes.

Third, enterprise compliance and quality management software is used to selectively automate those areas where manufacturers can get the best return from this IT investment [2, 3].

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FLOW, TYPES OF EXPENDITURE AND MEASUREMENT

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Flow is the value of mass or volume of the amount of matter passing through the cross section of the flow per unit time. The main units in the SI system are kg/s and m^3/s.

Volume flow is a volume of fluid flowing per a time unit through the live section of the flow. The mass flow of a liquid is the mass of fluid flowing per a time unit through the live section of the flow. The weight of the liquid is the weight of the liquid flowing in a unit of time through the live section of the flow. Most often, the volumetric flow rate of the liquid is used. Taking into account the fact that the stream consists of elementary jets, the flow rate also consists of the input of elementary liquid jets.

The need to regulate the flow occurs when most systems of heat and gas supply and ventilation are automated. Automatic flow control systems designed to stabilize disturbances in material flows are an integral part of automation systems. Often these automatic control systems are internal circuits in cascade control systems of other parameters. To ensure the desired composition of mixtures, maintain material and heat balances in apparatuses and structures of heat and gas supply and ventilation, the systems are used to regulate the ratio of the input of several substances.

Flow control after the centrifugal pump is carried out by a control valve installed on the discharge pipeline. It is not recommended to install a primary transducer, for example a diaphragm, on the suction line of a centrifugal pump: throttling the flow through the diaphragm can cause cavitation in the pump, resulting in its rapid wear, reduced productivity and heat. The valve on the discharge line of the pump can also operate from regulators of other values, if required by the technology.

In the case of the use of volumetric piston pumps, the pressure responsible for the movement of the liquid is created by periodically displacing the reciprocating piston from the closed volume by a reciprocating piston. Piston pumps are driven by steam engines or electric motors.

For an electrically driven piston pump, throttling is not allowed, since when the regulator is operating, the valve can close completely, which will lead to a rupture of the pipeline (or to surge if the valve is mounted on the pump suction). In this case, flow control is used to control the flow: the part of the liquid is redirected from the discharge line to the suction line. Similarly, the performance of gear and vane pumps is regulated.

The performance of a piston pump with a steam drive is regulated by changing the steam supply to the actuator cylinder. To do this, a valve is installed on the steam pipeline, with varying degrees of opening, different amount of steam

is supplied to the pump drive, which determines the number of strokes of the pump piston and provides capacity control. The control action on the valve is supplied from the flow controller, and the sensing element of the primary transmitter is installed on the pump discharge line. With frequently and dramatically changing steam pressures, a cascade control system is used, with a correction for the flow rate of the injected product.

Concerning the measurement of the flow and the mass of substances, it is widely used both in commodity-processing operations, and in the control, regulation and management of technological processes. In the food industry, the optimal management of many technological processes is based on mixing of various components and ingredients that make up the desired product in certain proportions, the change of which can lead to disruption of the processes and the production of a poor-quality finished product.

Flowmeters measure the amount of material flowing through the pipe per the unit of time. By the method of measurement, they are: Flowmeters of variable pressure drop on the narrowing device installed in the pipeline. Flowmeters of variable pressure drop consist of three parts:

1. flow transducer, creating a pressure differential;

2. connecting device transmitting this drop to the measuring device;

3.differential pressure gauge that measures this pressure drop and is calibrated in flow units.

The flow rate of the substance is measured using flowmeters, which are measuring instruments or flow meters. Many flowmeters are designed not only for flow measurement, but also for measuring the mass or volume of a substance passing through a measuring device during any arbitrary time taken. In this case, they are called flowmeters with counters or simply counters. The mass or volume of the substance passing through the counter is determined by the difference of two consecutive readings of the counting device or integrator. Flowmeters, most widely distributed in the food industry, are divided according to the principle of action into the following main groups: variable differential pressure; overflow – constant pressure drop; tachometric; electromagnetic; variable level; thermal; vortical; acoustic. In addition, flowmeters based on other principles of action of resonance, optical, ionization, and others are known. However, many of them are in the development stage and have not been widely used so far.

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INNOVATIONS IN ART

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Innovation is the result of investing in the development and obtaining new knowledge, not previously used ideas to update spheres of life and the subsequent process of implementing this, with a fixed additional values.

The art is actively moving from static forms and structures in the area of ideas and innovation, where it intersects with physics, mathematics, biology, philosophy and many other sciences [1].

Modern art and design as special kinds of creative activity take into account achievements of science, techniques of modern art, and represent a synthetic process of the environment transformation. Artists, designers use technologies which have become an integral part of all spheres of life, but their excessive use is sometimes harmful because it can create aggressive or uncomfortable existence of the environment, resulting in impaired perception of space, the semantic line break, lost logic, and the image conceived is deformed.

Contemporary art has an extensive range of possibilities of impact on the viewer: music, light, color, spatial-temporal movement. Visual and auditory receptors cause the strongest aesthetic and psychological experience. The main task of the artist is to immerse the viewer in the desired emotional state. This can be achieved by sound and visual impact, including media technologies, the effect of the presence and complicity of the viewer in the exhibition space. The techniques that artists use in contemporary art, especially the spatial arts, are universal and can be used outside the Museum to create an environment for life. In addition to aesthetic features, in some cases, contemporary art has a therapeutic effect and can be used in public spaces for special purposes [2].

An example can be the Electric objects EO1. Pulling up family photos on your flatscreen TV is one thing, but for actually displaying digital art you need something a little more purpose-built. The Electric Objects EO1 is a 23-inch 1080p display with a matte finish and wide viewing angles. There are no cumbersome dongles or software to deal with - you control the EO1 from your smartphone and it can show off any static or moving image you can find on the Web. I mean, sure, it doesn't play sound and it's basically a high-end version of the digital picture frame you presented grandma for her birthday, but if you're looking for something like this (and plenty of people are), the EO1 is top of the line.

Imagine if you could 3D-print a song. Reify can. The company uses a proprietary technology to record and then model sounds in three-dimensional space before using a collection of 3D printers to produce small desktop sculptures capturing them in plastic. A simple app uses your phone's camera to "read" the sculptures, playing them back on your phone. Think of it as the vinyl of the slightly quirky future. These aren't pieces of on-demand artwork (yet), and the sculptures shown here are of experimental sounds, not the latest Beyoncé single. It is early

days, but it is hard not to get excited about staring your favorite song right in the face [3].

Hiding behind each of these paintings is a fully functioning wireless speaker that can play behind-the-scenes interviews with the artist, tracks chosen by the artist, or whatever tunes you want to listen to while admiring your new gallery. It is about experiencing art and music together, and this time Drake is not making all the choices. If you are more of a DIYer, you can also get blank chalkboard or canvas Soundwalls and change your look with your mood (or your grocery list).

Once you get past the unfortunate name, the DAD (Digital Art Device) is a pretty fantastic option for bringing a proper video art installation into your living room. It is a combination of dedicated hardware (either a self-contained 42-inch screen or a special drive that plugs into an existing TV/display) and a subscription service that gives you access to rotating exhibitions of multimedia art. A subscription comes with bimonthly collections, each of which comes with a printed catalog to match. Unlike the EO1, there is sound, and because everything is downloaded and then played, you do not have to worry about rough resolution should the signal cut out.

So, contemporary art is linked more closely with life; and design becomes an integral part of life. New technologies are widely used in the surrounding space, but to properly manage them to achieve the desired effect is an important task of artists-designers. This classification can serve as a basis for design. It can be argued that the identification and proper use of tools in the design allows not only to solve the functional, emotional, cognitive and aesthetic challenges, but also to address important issues in the design of social objects.

Currently, we are witnessing a paradigm shift in the world. A new understanding of space becomes deeper and more layered, which allows to correctly design a harmonious environment, reflecting the emotional psychological state of the person and his needs. I would like to emphasize that the basis of almost any creative work is an experiment. Installation projects-experiments carried out by the artists-designers in the contemporary art on the basis of the exhibition spaces, help to find new ways in the design and organization of living environment [4].

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Dohadailo I. H.

AUSSICHTEN FÜR DIE ENTWICKLUNG DER INFORMATIONSTECHNOLOGIE IN DER UKRAINE

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Informationstechnik - eine Kombination von Methoden, Produktionsprozesse und Software und Hardware, mit der technologischen Kette kombiniert die Leistung von Informationsprozessen bietet die Zuverlässigkeit und Effizienz zu steigern und die Komplexität der Bewegung reduzieren Informationsquelle zu nutzen.

Informationstechnik - eine der großen Errungenschaften der Menschheit. Die Informationstechnologie ermöglicht es, günstige Bedingungen für die wirtschaftliche Entwicklung zu schaffen, das Produktivitätswachstum und Lohnerhöhungen zu stimulieren, die Organisation der Kommunikation auf allen Ebenen der Regierung zu erleichtern, schnell reduzieren Material- und Energieverbrauch der einzelnen Branchen und die Volkswirtschaft als Ganze [1, 289].

Entwicklung von Gebieten neuer Technologien hat großen Beitrag zur Entwicklung von Informationssystemen. Für die Ukraine ist es wichtig, dass die Nutzung der Informationstechnologie ermöglicht es, die Qualität der Ausbildung und wichtige Entscheidungen der Exekutive zu verbessern. Seit dem Jahr 2000 Ukraine in der Informationsgesellschaft aktiv beteiligt. Im Jahr 2007 das Gesetz der Ukraine „über die Grundlagen der Entwicklung der Informationsgesellschaft in der Ukraine für 2007-2015“ [3, 82].

Das Hauptziel der Informationsgesellschaft in der Ukraine ist es, jede Person, die Leistungen ihr volles Potenzial verwirklichen zu schaffen Waren auf dem umfassenden Einsatz moderner IKT-Möglichkeiten zu erleichtern Informationen und Wissen, Nutzung und zu teilen, produzieren und liefern, um ihre Lebensqualität zu erhöhen. Die Entwicklung der Informationsgesellschaft in der Ukraine und die Einführung neuer IKT in allen Aspekten des Lebens und die Aktivitäten der staatlichen und lokalen Regierungen bestimmte eine der Prioritäten der staatlichen Politik.

Die nationale Politik der Entwicklung der Informationsgesellschaft in der Ukraine auf der Grundlage der Prinzipien: Priorisierung von Forschung und technische Innovation und Entwicklung des Landes; die Bildung der notwendigen rechtlichen und günstigen wirtschaftlichen Bedingungen; umfassende Entwicklung der öffentlichen Informations-Infrastruktur, Informationsressourcen und den universellen Zugang zu Telekommunikationsdiensten und ICT bereitstellt; Förderung der Vielfalt und die Anzahl der elektronischen Dienste erhöhen, die Schaffung von öffentlichen elektronischen Informationsressourcen zu gewährleisten; Personalkapazität zu verbessern; erhöht die Motivation für den

Einsatz von IKT; breite IKT in Wissenschaft, Bildung, Kultur, Gesundheit, Umweltschutz; Informationssicherheit [2, 107].

Aber diese Ziele zu erreichen, gibt es Schwierigkeiten im Zusammenhang mit unzureichender technologischer Basis, komplizierter finanzieller Unterstützung dieses Prozesses, der Mangel an ausreichendem Forschungsprozess der Informationsgesellschaft und ihre Komponenten.

Modernes Informationssystem ermöglicht:

1) direkt und zeitnah Zugang zu Informationsprodukten;

2) wirksame interne Koordinierungsaktivitäten;

3) Technologie einsetzen, eine bessere Qualität der Systemanalyse und Design operativen Management auf verschiedenen Ebenen des Unternehmens, usw. [4, 111].

Die Ukraine hat ein erhebliches Potenzial in der Informationstechnologie angesammelt. Sein nationaler Wettbewerbsvorteil ist ihre Entwicklung. Aber die Ukraine als Ware kann zu Mangel an angemessener öffentlicher Ordnung wegen aus den vielversprechendsten globalen Märkten geschoben werden. Die Entwicklung der Informationsgesellschaft in der Ukraine soll über die Koordinierung aller Zweige der Regierung basieren. Addressing Verzögerung der Informationstechnologien in der Ukraine erfordert einen nationalen Ansatz, nämlich:

1) Bildung einer nationalen Strategie, internationale und nationale Politik, günstige rechtliche, soziale und wirtschaftliche Auswirkungen auf dem Gebiet der Informationstechnologie;

2) die potentiellen Möglichkeiten der technologischen öffentlichen Zugang zu Informationstechnologien durch gemeinsame Anstrengungen von öffentlichen und privaten Sektor für die Entwicklung der Informationsinfrastruktur;

3) fördern die Menge und Verteilung der öffentlichen Dienstleistungen und Unternehmen zur Verfügung, durch Informationstechnologien;

4) die Konzentration der Bemühungen des Staates und die Gesellschaft öffentliche elektronische Ressourcen durch vrahuvan nationale, politische, wirtschaftliche zu schaffen. Sprachliche, kulturelle und religiöse Aspekte der Ukraine;

5) zu ermöglichen, den Erwerb von Wissen und Fähigkeiten zu den Informationstechnologien in dem Prozess der Aufnahme Bildung zu verwenden. Unser Land braucht eine gewisse Politik im Bereich der Informatisierung, weil in der Ukraine noch einige Hindernisse beseitigt werden müssen.

Die Informationsgesellschaft ist ein komplexer Begriff, der aus einer Vielzahl unterschiedlicher Aspekte besteht. Um wettbewerbsfähig in den Köpfen der progressiven evolutionären Sites zu bleiben, nutzen alle, und Patente, alle Vorteile der neuesten Technologie.

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BITCOIN – A BIG BUBBLE OR BIG TROUBLE?

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Today bitcoin is in everybody's A-list. But what do we know about it? Most people have no information about this hi-tech futuristic value, which has already become reality. So let us sort out this object.

Bitcoin is a cryptocurrency and worldwide payment system. It is the first decentralized digital currency – the system works without a central repository or single administrator [1]. The network is peer-to-peer and transactions take place between users directly through the use of cryptography, without an intermediary. These transactions are verified by network nodes and recorded in a public distributed ledger called a blockchain. Bitcoin was invented by an unknown person under the name Satoshi Nakamoto and released as open-source software in 2009 [1].

Bitcoins are created as a reward for a process known as mining. They can be exchanged for other currencies, products, and services. As of February 2015, over 100,000 merchants and vendors accepted bitcoin as payment [2].

Nowadays when bitcoin costs a pretty penny everybody wants to take one. But we also have to take a look at risks we can face.

1. Bitcoin is a voluntary currency and its use as a transactional currency is limited to those willing to accept it, otherwise it becomes worthless

2. Extreme price risk – historical price volatility has been over 130 percent.

3. Possible quick erasure of a company's profit margins. Net profit margins are industry specific generally ranging from 10 to 20 percent. Given bitcoin daily price movements can be as high as 10 percent, business owners accepting bitcoin could see profit margins reduced or completely erased in a couple of days [3].

4. Bitcoin is a hyper asset deflating bubble. Over 90 percent of bitcoin are also hoarded setting a temporary price floor.

5. Growing concentration and bankruptcy risk to financial middleman. In an effort to avoid bitcoin's extreme price risk, merchants are increasingly using the risk-mitigation services of firms, which simply warehouse the risk on their books.

6. Bitcoin exchange bankruptcy risk. The industry remains unregulated with little oversight which enables unscrupulous operators to take advantage of bitcoin buyers and sellers, increasing fraud and bankruptcy risk.

7. Triggering significant tax risks. Bitcoin has been designated by the IRS as property for tax purposes, so consumers using bitcoin can be imposed additional taxes. This provides a further incentive to hoard bitcoin and not utilize it for transactional purposes thus reducing its market liquidity.

8. Transactional fraud risk. All bitcoin transactions are validated through the block chain, a public ledger verified independently every 10 minutes. This 10-minute window presents a risk if two businesses were paid with the same bitcoin.

9. Significant consumer protection risk. There are no acting laws protecting consumers against theft, fraud or human error. Bitcoin is an anonymous, digital currency that eliminates banks as financial middleman and in doing so also eliminate the legal protections offered by such structures. Once bitcoin transfers are made they are irrevocable leaving consumers with no opportunity for dispute resolution. Bitcoin features also make it an ideal target for cyber criminals. If an e-wallet is hacked and coins stolen or transferred by mistake, they are lost forever.

10. Sovereign attack risk. Bitcoin could possibly undermine the longstanding bond between the state and its currency. Governments exercise a monopoly power on currency issuing to provide their citizens with greater economic stability. Citizens can thus satisfy public and private debts including paying taxes.

Under the Bitcoin model, those who create the algorithm, protocol, manage the transactional ledger and mine virtual currencies would become the new central bankers controlling a monetary basis [3]. Bitcoin has a fixed growth rate and built-in scarcity capped at 21 million e-coins by 2140. If bitcoin were allowed to co-exist as “legal tender”, bad currency (bitcoin) would be used and good currency (US Dollar) would be hoarded thus providing for greater economic instability [2].

So let us make us some conclusions.

1. While bitcoin is an example of new technology that has clear promise, it also poses a multitude of risks to consumers, companies and sovereigns.

2. Bitcoin and its delivery system cannot be separated. The strength or weakness of the system is linked to bitcoin as both a currency and a delivery platform. If the engine (currency) is not sound due to extreme market volatility, or artificial scarcity, the system cannot function reliably and safely.

3. Bitcoin is not an experiment conducted in a controlled environment. Currency issuing and management is the lifeblood of the global economy.

4. Pumping a pseudo currency into the economy and adopting a new payment system without rigorous testing would be risky and highly imprudent.

5. To counteract the set of risks associated with virtual currencies such as bitcoin, there should be greater regulation, international oversight, sovereign control and stronger consumer protection rules put firmly in place.

To sum it all up, bitcoin is a "speculative mania" according to the governor of the Reserve Bank of Australia [2]. But we cannot say for sure that Bitcoin is a

bubble – we just do not know how to value it. But it is not a reason for stop monitoring and finding out more and more information about it.

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Dzhordzhevich O. I.

WHY PROGRAMMERS NEED ENGLISH

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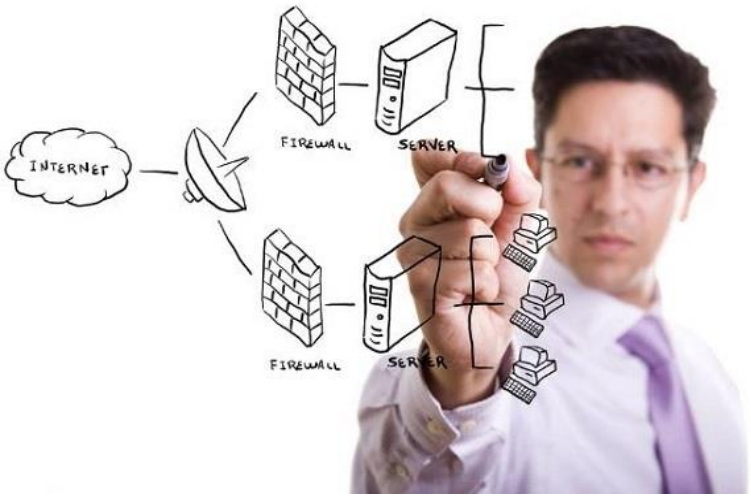
English is the language of international communication. In addition, it is universally recognized as the international language of business, technology, financial and economic development. English is very important for the IT industry as a whole, as a rapidly developing industry. Ignorance of the language restricts significantly the programmer in development as a specialist, as it narrows his information field and circle of communication.

About 80% of customers for software development are foreigners, many of them are native speakers of this language. That is why an equally important aspect in the work of a programmer is the ability to negotiate with a foreign customer. First, you need to be able to pass the interview competently, express themselves as clearly as possible, tell about yourself, your skills and work experience. Secondly, already in the process of software development it is very important to catch the smallest

comments and requests of the customer, respond to them flexibly and quickly, be able to negotiate different options for the task.

Knowledge as well as the use of English in the work of a programmer is an attribute of his high professionalism and competence, and in the future is the key to successful career development. For successful employment, obtaining large orders from the foreign companies and career development the programmer needs to know English because all large IT companies are in the United States of America (Google, Microsoft, ORACLE, Apple).

Most programs as well as all programming languages have been developed by English-speaking experts, which later became the part of the trend - to implement development through the English language. A great amount of information and documentation appears first in English. When it will be translated or adapted by someone, it can take a long time, and the information will become obsolete, and in the process of translation, the meaning is often distorted. In the work of an IT programmer, difficulties often arise. Sometimes you have to look for a solution to the problem on the World Wide Web, and it often happens that the necessary information in Ukrnet has simply not been published. But in the English-speaking environment, you can find almost any necessary information, especially on the topic of IT. With a good enough knowledge of the language, it is always better and easier to read the documentation in the original. Good knowledge of English also opens up access to a huge number of conferences and seminars taking place around the world.



It is better to learn English, like any other language, at the courses where the teacher is fluent in it. It is also not superfluous to search for a native speaker of the language that you are studying, preferably, that he does not know your native language. Reading of literature, dictionaries, watching movies and video clips, methodics for learning foreign languages will also help you. Programmers need to know technical English in order to work, in which it is enough to learn from 1000 to 3000 words to freely communicate with the same specialists and read texts, besides, it is learned easier and faster than literary spoken language. For this, there are special textbooks and dictionaries for IT professionals. If you seriously study the English language, then you can pass any interview without difficulty, even to a foreign company.

Life changes too fast today and modern information and communication technology is even faster. IT workers, like no other, understand that without the knowledge of English professional growth is impossible.

Fomenko P. O.

THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS USE

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Quite a lot of electronics play a big role in our everyday life. We cannot even predict our lives without it. Nevertheless, the progress does not stay still and is creating more and more gadgets to ease our life, which leads to the creation of artificial intelligence in the future.

Nowadays we can already see the prototypes of artificial intelligence even on a mobile device. Certainly, they are not a full-featured artificial intelligence but the device based on the ideas about it. They are well known Siri and A.L.I.C.E. that are used on phones and represent artificial intelligence one can communicate with. They also come in handy when looking for some information on the Internet.

Yet people sometimes confound artificial intelligence with simple programs or the work of equipment. We need to consider artificial intelligence as an independent unit to understand what it is.

Artificial intelligence is the branch of computer science that includes the development of computer programs to perform tasks that require human intelligence. Artificial intelligence algorithms can solve the issues of learning, perception, problem solving, language understanding or logical reasoning.

Artificial intelligence is used in a lot of ways these days. For example, artificial intelligence algorithms are used in Google search, in the recommendation program Amazon and in the SatNav search engines. Most artificial intelligence programs are not used to control robots. Even when used to control robots, artificial intelligence algorithms are only part of a larger robotic system that also includes sensors, actuators and programming without artificial intelligence itself.

A key aspect that distinguishes artificial intelligence from a more conventional programming is the word intelligence. Programs with no artificial intelligence just follow a command series whereas the ones that do bear artificial intelligence simulate a certain level of human intelligence [3].

Therefore, artificial intelligence to perfection is a learning, developing program that human feelings are not alien to and that is not likely to need our service.

A rather striking example in this field is gaming industry as you play against artificial intelligence or bots controlled by it. Game developers have been improving artificial intelligence in games for a long time, which leads to some complex tests for gamers or common users. Artificial intelligence sometimes even beats human in games like checkers or chess.

However, it is not only game industry that is growing rapidly in the era of artificial intelligence, but automotive industry is also not far behind it. One of the transportation companies has adopted a new program for cruise control that promises to save the fuel cost for transportation.

The program bids fair to automatically adjust the speed and transfer on up-hill grade to increase the coasting during the descent. The engine will not run in this case and the movement of the machine will be carried out under its own inertia. Thus, up to 15 % of the fuel will be saved.

There are also products involving artificial intelligence in medicine such as suicidality detection. According to the statistics, about 800,000 people commit suicide annually. There was a group of volunteers consisting of 34 people only. 17 patients had some suicidal tendencies (about half of the participants of the group had already tried to commit suicide before) and 17 people were quite normal, without any suicidal tendencies. The participants passed a CAT scanning then. The volunteers were shown 10 cards with words relating to suicide ("despair", "hopelessness", "lifelessness"), 10 cards with positive words (e.g., "carefree") and 10 cards with words just bearing some negative emotional connotation ("problem") during the scanning. After the scanning, the scientists chose six of the terms the volunteers had responded most emotionally to "death", "cruelty" and "problem". There were also five singled out brain regions, the ones of the "suicides" worked differently from "normal" people during the demonstration of cards. The experts began to train the neural network to respond to the similar picture of the brain work using this rather small data set. The system determined the tendency to suicide in 9 out of 10 cases at the end of the training process [2].

Therefore, the development of artificial intelligence does not stay in one place and helps us to discover ever more interesting facets of life. Of course, there are opponents of artificial intelligence who claim that it can destroy humanity. Elon Mask, the founder of the Tesla and SpaceX companies, has predicted the death of humanity because of the "car revolt". According to Mask, an uprising is going to happen not in a long shot but already in the next decade. The inventor estimates the chances of success of humankind at 5-10 percent in this opposition. "The risk of something seriously dangerous happening is in the five year timeframe. 10 years at most", says Mask [1].

Artificial intelligence has brought only good news so far and it has been largely helping humanity. The scientist may be probably right but let us not forget that we are the creators of artificial intelligence. It is we who decide what it will be for us. The key is not to make any mistake.

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CLOUD COMPUTING

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At present, the ability to effectively use computer technology to solve problems is a necessary attribute of the professional activity of any specialist and determines the level of demand in the society. The preparation of students of higher educational institutions is not possible without the use of modern teaching technologies, the use of computer information and communication technologies in the educational process. The everyday reality is the use of mobile computing devices (tablets, e-books, smartphones), constant access to the Internet.

Cloud computing is a rapidly growing area of IT. Different categories of consumers are already offered in the information technology market: the financial sector, industry, trade, services, the telecommunications sector and, of course, science and education. «Cloud computing» denotes a complex infrastructure with a lot of technical details hidden in the "clouds". The cloud is the provision by the provider of remote computing resources and services at the request of the consumer. To build a cloud, one of three basic models is used: software as a service, a platform as a service, an infrastructure as a service.

To build a cloud, one of three basic models is used: software as a service, a platform as a service, an infrastructure as a service. The basis of the cloud is the infrastructure as a service (IaaS - Infrastructureas a Service), then it is superimposed on the platform as a service (PaaS - Platform as a Service), and over PaaS - software as a service (SaaS - Software as a Service). Infrastructure as a service (IaaS, infrastructure as a service) - providing the computer infrastructure as a service based on cloud computing. At this level, users receive basic computing resources (organizations can use this infrastructure, installing on virtual machines and, if necessary, increase computing power). This model provides free storage resources, e-mail functions and collaboration systems, which can be of interest to educational institutions. The platform as a service (PaaS, platform as a service) is the provision of an integrated platform for the development, testing and support of web applications as services. Here, users can install their own applications on the platform provided by the service provider. The cloud stores not only data, but also related applications, and the user only needs a web browser to work. This level is of the greatest interest for the educational process. The best examples of this approach are Google Apps for Education and Microsoft Live @ edu, which provide both communication support and office applications such as e-mail, spreadsheets, word processing applications.

In the world practice, four models of cloud systems are implemented: - Private cloud - to provide services in one organization. It can include several consumers, for example, organizational units located in different buildings, its customers and contractors. A public cloud is a computing infrastructure that is designed for free use by a wide range of users. Public clouds can jointly own or operate and operate state, commercial, scientific organizations. A hybrid cloud is a combination of two or more different cloud infrastructures, each of which remains a unique object. Hybrid cloud combines the advantages of private and public clouds. Community cloud - a kind of computing infrastructure, designed for use by a specific community of consumers who have common tasks. For educational institutions, public and communal clouds are the most suitable. Such examples are in Lithuania Kaunas University of Technology uses cloud services provided by Microsoft Live @ edu. In the US, Hofstra University uses cloud-based services provided by Google Apps. One can distinguish the following advantages of using cloud technologies in the educational process:

Economic-it like e-mail is provided free of charge by external providers. Premises are exempted, which is relevant in the case of a shortage of classrooms; Technical - the minimum requirements for hardware - the only prerequisite is the availability of access to the Internet. Didactic - a wide range of online tools and services that provide a secure connection and collaboration opportunities for teachers and students. The disadvantages of cloud technologies, mainly technical and technological, do not affect their capabilities and advantages. These drawbacks include the limitation of the use of software capabilities, the lack of domestic providers of cloud services, and the lack of a legal framework for cloud technologies.

Cloud technologies offer an alternative to traditional forms of organizing the learning process, creating opportunities for personal instruction, interactive classes and collective teaching. The introduction of cloud technologies will reduce the cost of acquiring the necessary software, improve the quality and effectiveness of the educational process.

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Grechko E. K.

HOW ENGLISH LANGUAGE IS IMPORTANT FOR A STUDENT-PROGRAMMER

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English is spoken all over the world, and it is very popular. We are surrounded by English everywhere, it is firmly embedded in our lives. It so

happened in the world that it was English that became the de facto standard: practically in any online service, you can solve your problem knowing only one language. And the world of programming was no exception - the international community communicates in English.

The purpose of this work is to identify the main reasons for the importance of English in programming.

Does the programmer need English? Of course, he does. Whether we like it or not, most of the fundamental works on any branch of computer science are written in the west. The world's largest IT companies work in the US (Google, Microsoft, etc.). And they, by the way, have moved our entire industry forward. In the same heap, you can also collect programmer's literature, documentation, stackoverflow - everything is published in English much more often than in any other language. All popular programming languages, as it is not difficult to see, are based on English-language lexemes.

Example: many people probably know the company Jet Brains. It produces great IDEs, works on its language and does many other good things. So this company has been founded by Russians - S. Dmitriev, E. Belyaev and V. Kipyatkov, one of its main offices is in St. Petersburg, and Russian programmers work there. However, you can not find the official Russian-language documentation for their products.

If you know English even a little, you can find the answers to your questions much faster. If you know English even slightly more than "very little", you can use the English documentation to the libraries, sdk and others. If you know English more or less tolerably, you can read the relevant literature without expecting that wonderful moment when it will be translated into Russian. Especially considering the fact that sometimes the quality of translation leaves much to be desired. And even more especially considering the fact that sometimes there is no translation at all. If you know English well, you can work remotely.

As a result, we have **7 main reasons** why English is so important for the profession of a programmer:

1. All basic (and not only) programming languages are based on English words. In practice, it means that mastering a new programming language and learning how to handle with already familiar ones will be much easier if you speak English.

2. All fundamental specialized literature is written, first of all, in English. And not everything has been translated into Russian. Even less materials have been translated correctly.

3. To pass specialized certification in the field of information technologies and to receive certificates of such companies as CISCO, Microsoft, etc. you can only if you know English.

4. Often difficulties arise in the work. Sometimes you have to look for a solution to the problem on the World Wide Web, and it often happens that the necessary information in RuNet simply has not been published. But in the English-speaking environment, you can find almost any necessary information, especially on the topic of IT.

5. All the largest IT companies in the world are based in the USA (Google, Microsoft, ORACLE, Apple etc.) and even in their Russian divisions English predominates. So, if you do not speak the language, then you will not be able to build a career in one of the world's largest IT corporations.

6. Programmers often have to work with foreign customers. Most often, all communication is exclusively in English - initial negotiations, drafting of the technical assignment, its coordination, interaction during the implementation of the project, etc.

7. Most of the master classes, seminars and webinars from the most famous gurus in the field of IT are conducted in English. It's no secret that attending such events is extremely useful for professional and personal growth, as well as for inspiration.

Gusenkova k. v.

USE OF INTELLECTUAL INTERNET TECHNOLOGIES FOR IMPROVING EFFICIENCY OF USING VEHICLES

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One of the major problems in the transport complex is creation of conditions for highly efficient application of vehicles with the observation of requirements of reliability, no-failure operation, robustness, fuel efficiency, application safety, environment, ergonomics etc. Thus development of technologies aimed at solving this problem is by far urgent. The practice of creating modern automotive instruments and devices, units and systems was ahead of the theory of the information analysis and synthesis of complicated systems. Individual solutions by information support of transport, existing now, call for generalization, standardization and unification, determination of new special requirements on the creation of computer systems and networks in transport.

In connection with the constant information development of society and its industrial component, new transport systems and machines have reached a high information level of excellence. Accordingly, a new contradiction emerged between the rapid development of means and methods of informatization of complex objects and systems and the heterogeneous nature of existing subsystems and links in the transport complex. Elimination of this contradiction will allow creating conditions for highly efficient use of vehicles at all levels of the transport infrastructure.

Creation of a common information space of transport organizations provides opportunities for performing calculations that were previously available only for supercomputer solutions, by distributing computational processes between the computer resources of the participants of the movement. This will provide participants in the movement (transport organizations) with an economical

analogue of a powerful system and will provide the conditions for creating new service providing computational resources by order.

The developed Internet technologies provide registration, processing and provision of data to the participants of the traffic in real time, both for prompt decision making on the analysis of transport situations, and for the accumulation of data. The information functions of solving problems of continuous monitoring of the transport network contribute to reducing the costs of improving the existing transport systems. Accordingly, the quality of decision-making on the management of transport services in large cities and regions is improving.

The created Internet technologies are based on the principles [1-4]:

- active connection of information resources of transport vehicles, traffic participants and transport organizations of local, regional and state levels;
- creation of a distributed control system for the transport complex;
- synergetic self-organization of subsystems and links of the transport complex;
- application of X-by-Wire and Wireless-technologies;
- mechatronization of transport vehicles and systems.

These principles of organization of transport systems have a certain analogy with the informatization of society and can be realized on the basis of creation of a common information space for transport. A distributed system of computing resources of the transport Internet portal is a physical realization of such space. The source of information for this portal is a distributed network of information and communication systems installed on board the vehicles.

The indicators of a number of vehicle sensors, its current coordinates in space and speed are the input data for the information and communication complex. This data is processed and a packet is formed from them, which is transmitted using the wireless communication means to the transport portal.

All systems have standalone storage devices, which in case of communication failure between the communication module and the Internet portal will allow recovering data that have been registered.

Installation, operation and maintenance of information and communication complex facilities should be carried out taking into account the requirements stipulated in the operational documentation for them.

The software is sufficient for the implementation of all functions of the information and communication complex, and also provides the ability to replace and add its program modules with the purpose of modifying and enhancing functionality.

The workplaces of the end users of the system should be built primarily on the existing computer facilities of transport organizations.

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Harmash V. M.

AUTOMATED SYSTEM FOR ENSURING STABILITY OF A CAR AGAINST A SKID ON THE BASIS OF FUZZY LOGIC

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Over the past 10 years, the number of cars in Ukraine has increased significantly, resulting in an increase in traffic accidents. The issue of improving the stability of the car against the skid taking into account the changing road conditions, and their influence on the driver is actual. For this purpose an electronic system, which operates on the basis of fuzzy logic, has been developed.

To implement the project, the MATLAB environment was chosen, namely the special Fuzzy Logic Toolbox package, which includes FIS Editor fuzzy output system editor [1].

The fuzzy controller (NFC) has been developed as a control device with adaptation functions to changes in dynamic car and environmental characteristics, which is based on the qualitative correlation between the coefficient of engagement of the wheels with the road, the speed and angle of rotation of the steering wheel, that is, the rules and knowledge of the control. In the IPC, the following fuzzy control rules are developed, fuzzy conclusions are made, the maximum acceleration of the car is calculated, and the coefficient of adhesion of the wheels with the road, the speed and angle of rotation of the steering wheel are used as input information for the NK (Fig. 1).

The MATLAB FIS Editor software package allows you to simulate the behavior of the projected system. By changing the values of the input variables, we can observe the corresponding values of the output variables (Fig. 2). When connected by a physical link of a computer with a developed control system and a real control object, we obtain a single debugging complex. This type of debugging allows you to observe the behavior of the system in real conditions and, if necessary, make changes to the project.

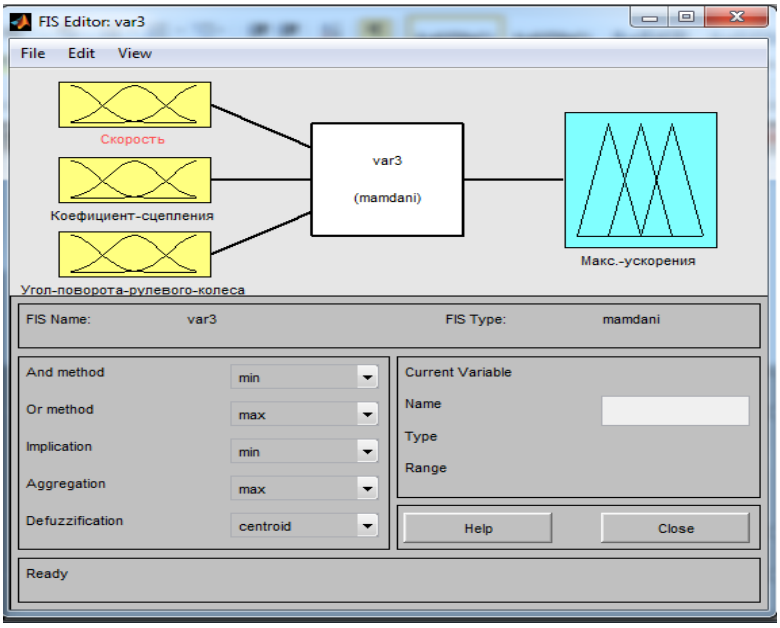

Fig. 1 – Structure of the system of the car stability in the window of the project FIS Editor

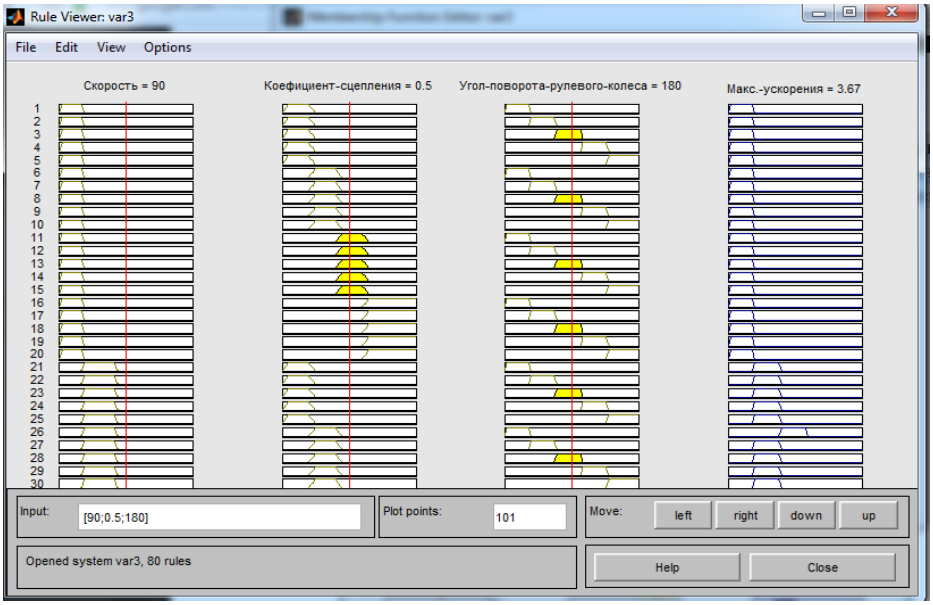

Fig. 2 – The window of the developed program in the debug mode

The developed project in the MATLAB package allows you to model the behavior of the system, depending on the traction-speed characteristics of the vehicle and the parameters of interaction between the wheels with the support surface (Figure 3), as well as to obtain control effects to ensure the stability of the car.

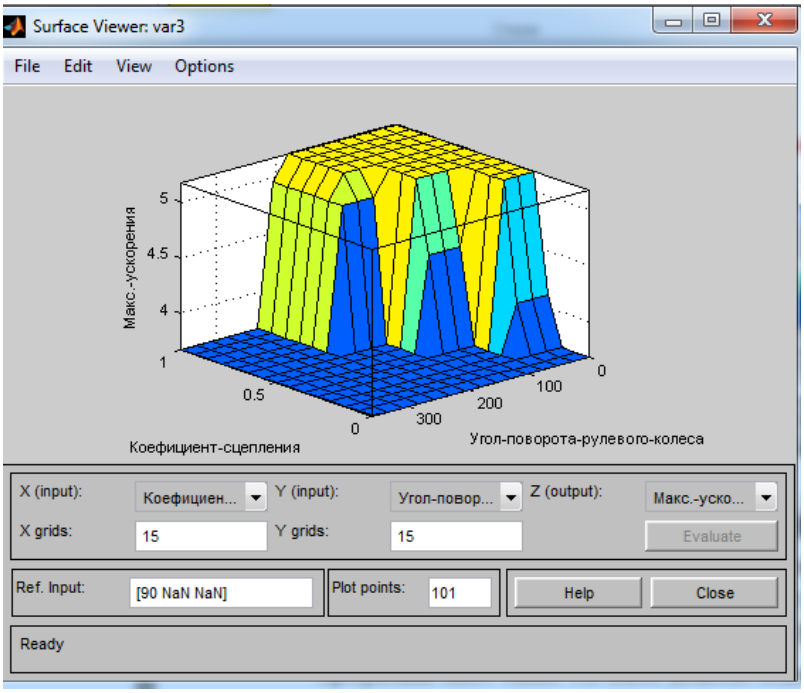

Fig. 3 – Dependence of the coefficient of clutch on the angle of rotation of the steering wheel

At the last stage the program code of the microcontroller or the on-board computer of the car was received.

The proposed system of stability of the car against the skidding on the basis of fuzzy logic can increase its active safety in the traction mode of motion.

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Ivashyn D. Y.

SMART HOUSE

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Smart house is a house of modern type, organized for the convenience of people using high-tech devices. Electronic appliances in a smart house can be integrated in the home.

The concept of “smart house” was formulated by the Institute of intelligent building in Washington in the 1970s: “the building provides a productive and efficient use of space...”

It is necessary to divide the concept of a “smart home” and a “life support system”. Separate systems have only the necessary interfaces and control. The concept “System for intelligent building control” suggests a new approach to the organization of life of the building, in which the complex software and hardware significantly increase the efficiency of operation and reliability management of all systems of operation and actuators of the building.

The main feature of a smart building is the integration of individual subsystems from various vendors into a single managed site.

The “smart house” should be understood as a system that should be able to recognize specific situations that occur in the building, and appropriately respond to them: one of the systems can control the behavior of others in accordance with predetermined algorithms.

“Smart house” in the original sense means “the building, ready to change” or “adaptable (flexible) building”, engineering systems which are able to adapt to the possible changes in the future.

The building is designed in the way that all of its control system could integrate with each other with minimal cost, and their service would be organized in an optimal way. The project necessarily involves the ability to build and modify the configuration of the installed systems.

Over time, the building will have “artificial intelligence”. It can rightly be called intellectual. The system can monitor the performance and condition of all “stuffing” of the building, and to make their own decisions in changing circumstances.

The term “smart home” usually refers to integration of the following systems into a single building management system:

Heating, ventilation and air conditioning, fire alarm, access control to premises, monitoring water leaks, gas leaks, CCTV, communication network, lighting system.

Today technologies allow to build a home automation component and you can select only those features of a smart home that you need.

The functions of the smart home include :

1. Light control. Light control allows the user to create lighting scenes from an unlimited number of light sources with different brightness, to turn them on simultaneously or with a delay, simulating, for example, the effect of “running lights”. Using special light dimmer can not only change the brightness to which a lamp lights up when turned on, but the time in which this will be achieved.

The function of permanent control of the light is intended mainly for office premises and provides an opportunity to support a user-defined illumination of the working area regardless of whether the sun shines or the sky is covered with clouds.

Automatic exterior lamps depending on the time of day and human presence will not only provide additional comfort but also deter uninvited guests.

2. Climate control. The system constantly measures the temperature individually in each room and maintains it at the specified level, directly driving

valves of radiators or valves of the air conditioner and, if necessary, automatically turns ventilation on or off.

Every day, the EIB helps You save funds due to the different operation modes: comfort mode, night mode, “no one in the house” mode.

Changeovers occur on schedule or at the use’s command. It’s enough to set the temperature on the touch panel display in the room for each of the modes only once. Heating / air conditioning will turn off automatically to save energy if the window of the room will be open for ventilation (the signal will be to send interframe contacts).

3. Blinds. In summer, the blinds are automatically rotated at a certain angle and prevent excessive sunlight from entering the room without reducing luminous flux. Thus, they prevent heating and help save electricity consumed by air conditioning.

4. Security. Smart house keeps a record of all the events that happened in it during your absence: when and who came, how long was in the house, any suspicious person hanging around the house. Their faces and actions are recorded in its memory.

Uninvited guests can encounter unpleasant surprises in the form of a blinding light and an audible siren. In addition, their entry into the House will call the user and the security guards.

In conclusion, I would like to note that the system of “Smart House” is a comprehensive home automation system with a vast number of functions. The system is relatively popular in all countries of the world. The system includes control functions such as lighting, ventilation, security system, fire protection system, protection system against water leaks, heating system etc. The System works with various platforms, making up such systems as LanDrive, LCN, iRidium Mobile, BPT, MyHome SCS, EIB.

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AUTOMATION OF PRODUCTION THROUGH THE USE OF AUTOMATION SYSTEMS

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This article deals with the automation of production through the use of automation systems. The aim of the research is to define the meaning of the

automation of production, distinguish the structures of automation systems and the main advantages of automation. The object of the research is automation and automatic systems.

The rapid development of technology in the XX century has accelerated the production of energy, technological, transport and other machines and units with automatic control. Automatic devices have become the invaluable helpers of a person. At present, in the conditions of scientific and technological revolution, automatic machines are widely used in industrial, transport and research laboratories. The purpose of the automation of production is to increase the efficiency of labor, improve the quality of products, create the favorable conditions for the most rational use of all production resources. The automation of production is the highest level of technology development when the regulation and the management of production processes are carried out without the participation of a person, but under their control [1].

The current state of the development of the automation of production has brought about the emergence of a qualitatively new system of technological machines with control facilities based on the use of electronic computers, programmable logic, intelligent means of measurement and control, information integrated industrial networks. The automation of a production process is achieved through the use of the machine systems which are the combination of heterogeneous equipment, combined vehicles for the implementation of the partial processes of the output of products and other technical devices located in the manufacturing sequence.

Modern automation systems are integrated into complex computer-integrated systems. Taking into account these systems, it should be emphasized that a set of interrelated and interacting elements in them is intended to achieve certain goals. Many elements of the system and the characteristics of the relations between them are determined by the structure of the latter. When creating and analyzing automation systems, the following structures are distinguished:

- functional - a set of parts for the realization of certain functions: obtaining information, processing and transferring it;
- algorithmic - a set of parts for performing certain algorithms of information processing;
- technical - a set of necessary technical means as the reflection of functional and algorithmic structures.

As computers and technology have penetrated the industry, automation has become a competitive advantage in today’s manufacturing world [2].

Through the introduction of automation and automatic systems people can benefit in many ways as the main advantages of automation are:

- productivity growth and improvement of working conditions;
- performance of works in accessible and inaccessible areas (radioactive zones, separate space types of metallurgical and other industries);
- increase in reliability, technical and economic indicators as well as the overall production culture and qualification of maintenance personnel.

Thus, the widespread introduction of automation into computers and technology is the most effective way to increase productivity through ensuring the stable quality of products, improving the working conditions for people and creating the favorable conditions for the rational use of all production resources. Reduced labor can be the serious benefit for any company.

Further research should be concentrated on the costs of automation in order for the company to have the financial sense to introduce new machines and technologies.

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FIVE GENERATIONS OF COMPUTERS

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The development of electronic computers can be divided into five generations depending upon the technologies used. The following are the five generations of computers.

The beginning of commercial computer age started from UNIVAC (Universal Automatic Computer). It was developed by two scientists Mauchly and Echert at the Census Department of United States in 1947.The first generation computers were used during 1942-1955. They were based on vacuum tubes. Examples of first generation computers are ENIVAC and UNIVAC-1.Vacuum tubes were the only electronic component available during those days. This technology made possible to make electronic digital computers which could calculate data in millisecond.

But they have many disadvantages. First of all, the computers were very large in size, consumed a large amount of energy and they heated very soon due to thousands of vacuum tubes. Besides, they were not very reliable, required constant maintenance, used machine language only. At last, the first generation of computers was very faulty, not versatile, has very slow speed and limited programming capabilities.

The second generation computers used transistors. The scientists at Bell laboratories developed transistor in 1947. These scientists include John Barden, William Brattain and William Shockley. The size of the computers was decreased by replacing vacuum tubes with transistors. The examples of second generation computers are IBM 7094 series, IBM 1400 series and CDC 164 etc.

These computers were smaller in size as compared to the first generation computers, were more reliable, used less energy and were not heated. They used Assembly language instead of Machine language and faster peripherals like tape drives, magnetic disks, printer etc. The second generation computers had better speed and could calculate data in microseconds. Their accuracy improved.

At the same time, they also required cooling system and constant maintenance. Their commercial production was still difficult and costly. These computers were not versatile and were only used for specific purposes.Third Generation Computers (1964-1975)

The third generation computers used the integrated circuits (IC). Jack Kilby developed the concept of integrated circuit in 1958. It was an important invention in the computer field. The first IC was invented and used in 1961. The size of an IC is about ¼ square inch. A single IC chip may contain thousands of transistors. The computer became smaller in size, faster, more reliable and less expensive. The examples of third generation computers are IBM 370, IBM System/360, UNIVAC 1108 and UNIVAC AC 9000 etc.

These computers were smaller in size, more reliable and had better speed. They produced less heat as compared to the previous two generations of computers, used less energy and fan for heat discharge to prevent damage. A mouse and keyboard for input appeared. The computers could be used for high-level languages and became totally general purpose. All these advantages and lower cost increased their commercial production. But air conditioning and highly sophisticated technology were still required for the manufacturing of IC chips.

The fourth generation computers started with the invention of Microprocessor. The Microprocessor contains thousands of ICs. Ted Hoff produced the first microprocessor in 1971 for Intel. It was known as Intel 4004. The technology of integrated circuits improved rapidly. The LSI (Large Scale Integration) circuit and VLSI (Very Large Scale Integration) circuit was designed. It greatly reduced the size of the computer. The size of modern Microprocessors is usually one square inch. It can contain millions of electronic circuits. The examples of fourth generation computers are Apple Macintosh & IBM PC.

This generation was more powerful and reliable than the previous ones. They were remarkable for small size, fast processing power with less power consumption. Computers of this generation were totally general purpose, required less repair and no air conditioning. All types of High level languages can be used in this type of computers. They were cheapest among all generations, so taking into account all these advantages, their commercial production greatly increased.

Scientists are working hard on the 5th generation computers with quite a few breakthroughs. It is based on the technique of Artificial Intelligence (AI). Computers can understand spoken words & imitate human reasoning. They can respond to its surroundings using different types of sensors. Scientists are constantly working to increase the processing power of computers. They are trying to create a computer with real IQ with the help of advanced programming and

technologies. IBM Watson computer is one example that outsmarts Harvard University students.

The development of actual quantum computers is still in its infancy, but experiments have been carried out in which quantum computational operations were executed on a very small number of quantum bits. Both practical and theoretical research continues, and many national governments and military agencies are funding quantum computing research in additional effort to develop quantum computers for civilian, business, trade, environmental and national security purposes, such as cryptanalysis. A small 16-qubit quantum computer exists and is available for hobbyists to experiment with via the IBM quantum experience project. Along with the IBM computer a company called D-Wave has also been developing their own version of a quantum computer that uses a process called annealing.

Some of the first useful problems quantum computers will probably tackle will be to simulate small molecules or chemical reactions. They could go on to speed the search for new drugs or kick-start the development of energy-saving catalysts to accelerate chemical reactions. To find the best material for a particular job, quantum computers could search through millions of possibilities to pinpoint the ideal choice, for example, ultrastrong polymers for use in airplane wings.

Quantum computing is rooted in quantum mechanics, the counterintuitive physics that governs tiny entities such as atoms, electrons and molecules. The basic element of a quantum computer is the qubit (pronounced “CUE-bit”). Unlike a standard computer bit, which can take on a value of 0 or 1, a qubit can be 0, 1 or a combination of the two — a sort of purgatory between 0 and 1 known as a quantum super-position. When a qubit is measured, there’s some chance of getting 0 and some chance of getting 1. But before it’s measured, it’s both 0 and 1. Because qubits can represent 0 and 1 simultaneously, they can encode a wealth of information. In computations, both possibilities — 0 and 1 — are operated on at the same time, allowing for a sort of parallel computation that speeds up solutions.

The capabilities of these fledgling systems could reshape the way society uses computers. Eventually, quantum computers may become part of the fabric of our technological society. Quantum computers could become integrated into a quantum internet, for example, which would be more secure than what exists today. There are probably plenty more uses for quantum computers that nobody has thought up yet.

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CASE TECHNOLOGIES

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Today, system developers are challenged to produce complex, high quality software to support explosive demand for new and revised computer applications. This challenge is complicated by severe resource constraints, forcing management to deploy new technologies, methods and procedures to manage this increasingly complex environment. Often the methods, procedures and technologies are not integrated. Therefore, they achieve less than desired improvements in productivity, or force management to make tradeoff decisions between software quality and developer efficiency. Computer-Aided Software Engineering (CASE) helps system developers meet their challenge by providing a new generation of integrated system development tools which provides an automated environment in which to design and implement system projects. CASE technology enables system developers to improve both quality and efficiency, resulting in a net improvement in maintenance and development productivity [1].

CASE originated in the 1970s when computer companies were beginning to borrow ideas from the hardware manufacturing process and applies them to software development. Some CASE tools supported the concepts of structured programming and similar organized development methods. More recently, CASE tools have had to encompass or accommodate visual programming tools and object-oriented programming. In corporations, a CASE tool may be part of a spectrum of processes designed to ensure quality in what is developed [2].

A CASE tool is working for the Systems Development Life Cycle (SDLC). CASE uses structured methodologies and powerful graphical interfaces. Because they are automate many tedious system design and implementation activities. CASE tools play an increasingly important role in information systems development.

CASE tools are usually classified according to the extent of support they provide for the SDLC. For example, front-end CASE tools provide support for the planning, analysis, and design phases: back-end CASE tools provide support for the coding and implementation phases. The benefits associated with CASE tools include:

- A reduction in development time and costs
- Automation of the SDLC
- Standardization of systems development methodologies
- Easier maintenance of application systems developed with CASE tools

One of the CASE tools' most important components is an extensive data dictionary, which keeps track of all objects created by the systems designer. For example, the CASE data dictionary stores data flow diagrams, structure charts, descriptions of all external and internal entities, data stores, data items, report

formats, and screen formats. A CASE data dictionary also describes the relationships among system components [5].

A typical CASE tool provides five components:

- Graphics designed to produce structured diagrams such as data flow diagrams. ER diagrams, class diagrams, and object diagrams
- Screen painters and report generators to produce the information system's input and output formats (for example, the end-user interface)
- An integrated repository for storing and cross-referencing the system design data; this repository includes a comprehensive data dictionary
- An analysis segment to provide a fully automated check on system consistency, syntax, and completeness
- A program documentation generator [3].

CASE software classified into3 categories:

- Tools support specific tasks in the software life-cycle.
- Workbenches combine two or more tools focused on a specific part of the software life-cycle.
- Environments combine two or more tools or workbenches and support the complete software life-cycle [4].

Some of the most significant risk factors for organizations adopting CASE technology include:

- Inadequate standardization. Organizations usually have to tailor and adopt methodologies and tools to their specific requirements.
- Unrealistic expectations. In reality no such technology can do everything that consumer want and if organizations approach CASE with unrealistic expectations they will inevitably be disappointed.
- Inadequate training. As with any new technology, CASE requires time to train people in how to use the tools and to get up to speed with them.
- Inadequate process control. Without the proper process guidance and controls new capabilities can cause significant new problems as well.

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THE ROLE OF COMPUTER IN HUMAN LIFE

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Computers have long and firmly entered our lives. They radically changed the world and the possibilities of people. But we all know that the computer has both a positive impact on a person, and a negative one.

The computer has made our life much easier. Sometimes we no longer imagine our life without a computer and the Internet. For example, a student in a short time can find a course or an essay on the topic. The Internet has unlimited possibilities. Doctors use computers to diagnose the body. For fashion designers, designers and architects, the computer has opened huge horizons. In production computers control other machines. Today, man is just a passive observer.

More recently, physical labor has been more appreciated, but today the need for intellectual labor is constantly increasing. But it is impossible to unequivocally assess this. Yes, many significantly increased their horizons, but the physical condition of many has suffered. Gradually, we forget about sports and physical activities. But it's very difficult to regain health. Some do not understand this, or just do not care. Often (especially schoolchildren) prefer to sit for long hours at a computer desk than to take a walk in the open air, and do not even suspect what harm they themselves cause.

Therefore, in order to somehow improve the situation, you need to properly organize the workplace. The first thing you need is a comfortable computer desk and an armchair. Of course, you can put the computer on both the dining table and the table-book, but the table-book is intended for other purposes and it's difficult to name such work.

Yes, today books are slowly moving away, and the second plan. And, probably, it is natural, in connection with the current situation. Why read something, if you can find on the Internet any essay or essay. And efforts for this special will not be required, and the time is spent much less. And if one day there is a desire to read, then there is no need to go to the library or make the apartment bookcases, because one computer replaces hundreds of cabinets with books.

If we talk about the everyday life of a person, then the computer has gradually penetrated there too. For example, numerous online stores. Today, even a purchase can be made while in your own apartment. Nowadays, wherever we are, we talk a lot about the Internet. This technology affects our life as much as television or telephone. And, probably, there is already no such area of life that this technique would not touch.

Consider the positive effect of the computer on a person. For example, the Internet gave people the opportunity to receive the latest news, gossip, information about idols. Play in very interesting and exciting on-lain games.

Video conferences are very popular. With their help, people can not only hear each other, but also see. Thus, they can solve important issues without changing their workplace and saving both their means and time.

On the Internet you can find a job that will be highly paid and bring pleasure. You can quickly transfer documents to a partner, receive newsletters, quickly learn the latest news, for example, from the stock exchange, and this in business is very much appreciated.

The Internet simplifies shopping. In electronic form, they are cheaper. When ordering goods and services, you can look in detail description, photo, check reviews for this product. Sell a car, buy a pet, find entertainment for the weekend, pick up a tour trip.

Communicate in on-lain mode on social networks . So former classmates, old acquaintances and childhood friends who have not seen each other for many years can communicate again, view photos and give each other presents. There are dating sites where lonely hearts can find each other and live a long and happy life if they are lucky.

Do not forget about disabled people, sick people, people who do not have the possibility of real contact with other people. The Internet also allows you to communicate with real compatriots and other people living in other countries. What makes it possible to study culture, customs, history of other states. The Internet provides great opportunities for education, because it can find sources of information that are not found in any library. The network allows you to quickly find the answer to

Provocation of epileptic seizures. There is an opinion about the possibility of provocation of seizures when working on a computer is greatly exaggerated. It is also not proven whether the computer can influence the course of epilepsy. However, there are individuals with increased sensitivity to light flashes and the possibility of having epileptic seizures (photosensitive seizures). If you have a concern about the appearance of photosensitive seizures in your child, you should contact a specialized medical center and make him an investigation of the brain bio currents during light flashes of an electroencephalogram (EEG) with photo stimulation. This study in the vast majority of cases reveals the disrupted work of brain cells (photosensitive epileptic activity) in people with epilepsy. At the same time, the presence of photosensitive epileptic activity on an electroencephalogram is not a definitive contraindication for working with a computer. With properly selected treatment and observance of a number of protective measures, it is possible not to deprive the child of the pleasure of working on the computer.

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MODERN TECHNOLOGIES IN INTERIOR DESIGN

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Every person wants to live in a comfortable place, but each person has his or her own choice of interior design style. Today, computer technology has made it possible for designers to create outstanding and artistic designs through software.

In fact, designers can come up with so many realistic designs for any given space to provide clients with as many options as possible.

Technology is contributing to building our homes and spaces in more ways than we could have imagined. Consumers, as well as designers, have continuously been leveraging on technology to take design into their own hands for creating new home spaces or designing home and furniture pieces. The influence of technology in interior design over the years has been notable from new product offerings to changing the way we design; a whole new range of possibilities has been created [1]. Various 3D design software makes interior designing a lot easier than ever before. With a few clicks of the mouse button, a computer user can turn any conceptualized design into a viewable and navigable model.

Through the use of software, designers can experiment with a variety of color combinations without having to waste a lot of ink and paper. Hence, if you are interested in having your home renovated, a designer can easily show you various designs with different color combinations and furniture setups [2].

There are various software for creating interior design, e.g.: Autodesk and Sweet Home 3D. Homestyler. Autodesk, Inc. – the world leader in the field of solutions for 3D-design, design and creation of virtual reality. Since the release of AutoCAD in 1982, the company has developed a wide range of innovative programs that allow engineers, architects and designers to test their ideas before they are implemented.

Autodesk, the world leader in solutions for 3D design, design and creation of virtual reality, has presented an online program that allows implementing various design ideas. Equally convenient for both amateurs and professionals, the Homestyler program helps to experiment with the design of living spaces, visualizing them in 2D and 3D formats.

Based on pictures and panoramic views with a 360 ° coverage angle, Homestyler creates high-quality photorealistic 3D images of home interiors.

Homestyler – an example of the implementation of the concept of "cloud computing", where the user in the process of using the Internet service to edit and store their data. This approach is good because you can use any computer connected to the Internet to work on the project. No need to install additional software, all the work is done in the window of any Internet browser.

This is a simplified to a minimum 3D editor, allowing you to perform basic commands for building, editing and saving an apartment interior design. Most of all, it is suitable for preliminary calculation of the options for rearranging furniture.

Nevertheless, Autodesk has high hopes for the future and believes that Homestyler will be useful for owners of apartments, who are planning a redevelopment and for professional interior designers, if necessary, to quickly deliver their ideas to the customer [3]. SWEET HOME 3D. SWEET HOME 3D is a free application for creating interior design. It is accessible to users of any level. Sweet Home 3D is available in English, French, and 23 other languages. It is worth noting that SWEET HOME 3D is an open source program [4].

At the top of the program window is the main menu. The main part is the field of work on the project (2D and 3D). In the left part of the SWEET HOME 3D window there are a list of objects that the user can use to design his project (windows, doors, furniture and other interior items) and the list of those objects that are on the working field (the name of the object, width, depth, height and visibility).

The main advantages of the software are:

• the program is free;
• it needs modest amount of computer memory (file size is 40.7 MB);
• it has two fields of work (2D and 3D fields);
• Russian interface is provided;
• it does not require an Internet connection (offline mode).

The user can independently choose textures/materials of walls, floor, furniture and other various interior items in order to get as close to the result that the user receives in reality (changing the size of these objects is provided).

One of the drawbacks of SWEET HOME 3D is a small set of elements for creating a project. However, as a rule, these objects are enough for most users to create a general plan for the house or room.

You also export the file to PDF.

There are many other programs for creating interior design.

For example, 3D Studio MAX, Google ScketchUp, online-service Apartama, FloorPlan 3D, VisiCon, Planner 5D, PRO100, IKEA Home Planner. However, in the framework of this paper we considered only the most popular programs of the presented field. In conclusion, we can say that the programs of this subject are relevant at the moment, and in the future they will gain their popularity.

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INFILTRATION VON IT-PROZESSEN IN BANKPROZESSE

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Banken waren schon immer klassische Informationsprozessoren, nicht zuletzt aufgrund der Natur von immateriellen und elektronisch gut entwickelten Finanzdienstleistungen. Zu Beginn konzentrierte sich die IT-Nutzung jedoch hauptsächlich auf Aspekte der "Verarbeitung" und des "Datenmanagements", wobei der Schwerpunkt auf der Verbesserung von Effizienz und Produktivität und der Reduzierung von Kosten lag. Er unterstützt damit zunehmend alle Prozesse des Banking-Prozesses und vor allem die Sales Units. Banken werden sich jetzt strategisch neu orientieren, und die IT wird noch wichtiger werden. So wird einerseits die Entkopplung von Umsatz und Produktion verstärkt, andererseits ist der Bankbetrieb einer zunehmenden Elektrifizierung unterworfen. Die wachsende Bedeutung von Multi-Channel-Vertriebsstrukturen ist die Antwort auf die Fähigkeit des Kunden, jederzeit und von jedem Ort aus auf die Bank zuzugreifen. Darüber hinaus sollten Konzepte wie das Kundenbeziehungsmanagement implementiert werden, um die Kundenbindung aufrechtzuerhalten - trotz der Entmenschlichung der Vertriebsprozesse.[1] Aufgrund dieser Fragmentierungsphänomene müssen alle Bereiche des Bankbetriebs zusammen mit dem Einsatz von Informations- und Kommunikationstechnologien wachsen.

Dementsprechend ist in Zukunft mit einer deutlich stärkeren Durchdringung von IT-Prozessen in Bankprozesse zu rechnen, wobei auch die Digitalisierung von Bankdienstleistungen, die auch traditionelle Produktbereiche betrifft, zunimmt. Online-Transaktionen, Online-Brokerage und Online-Kredite sind jetzt fast selbstverständlich für die meisten Menschen neben der traditionellen Nutzung von Bankfilialen.[2]

Diese Entwicklung wird auch das Anforderungsprofil für Bankangestellte verändern. Während in vielen Bereichen ein traditioneller Bankangestellter mit bankfachlichem Know-how und ein IT-Spezialist mit dem entsprechenden IT-Know-how aufeinanderprallen, müssen zukünftig immer mehr Mitarbeiter einbezogen werden, deren Profilprofil beide Seiten abdeckt, also eine geeignete Kombination Banker und Informatiker. Vor allem die Notwendigkeit, beide Kompetenzprofile zu kombinieren, hat eine Grundlage dafür, dass Banker und Informatiker aus Erfahrung in unterschiedlichen Denkwelten und damit die notwendige Interaktion nicht immer einfach oder effektiv sind.[3] Oft gibt es Probleme mit der Kommunikation, was zu einer Verlängerung der Entwicklungszeit und oft sogar zu unerwünschten Änderungen führt.

Schlussfolgerung. Es werden immer mehr Mitarbeiter benötigt, die mit beiden Welten vertraut sind. Es ist notwendig, dass sich die höhere Institution des Bankwesens zum Ziel gesetzt hat, Personen mit einem solchen Profil des Bank- und

Finanzwesens auszubilden, dass sie eine einfache und effektive Arbeit bei verschiedenen Firmen und Banken leisten wird.

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MORE FLEXIBLE PRODUCTION

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Automation is the system of manufacture performing certain tasks, previously done by people, by machines only. The sequences of operations are controlled automatically. The most familiar example of a highly automated system is an assembly plant for automobiles or other complex products.

The term automation is also used to describe nonmanufacturing systems in which automatic devices can operate independently of human control. Such devices as automatic pilots, automatic telephone equipment and automated control systems are used to perform various operations much faster and better than could be done by people.

New Ways for Compact and Modular Solutions in Production Machines: The drive control is also integrated into the controller in addition to the motion control, logic and technology functions [1].

With the increasing demands on production machines – increasingly fast, increasingly reliable, increasingly versatile – the demands on the motion control functionality and technological functions are also growing. In the case of drive-based control platforms the functionality for logic (i.e. the classic tasks of a PLC), motion control (for example positioning, synchronization, cam disc, interpolation) and technology (for example temperature regulators, pressure regulators, can control unit) are “melted” with each other in one device and one process system and integrated directly into the control module of the drive system. This dispenses with interfaces between the individual automation components and the three

functional disciplines can be programmed homogeneously in one program. The result is a high-performance, easily configurable drive-based controller which is ideal for modular machine concepts thanks to its compactness.

The concept of integration of all the functions necessary for the machine automation on one module was implemented in the drive-based Simotion D controllers which are integrated directly as control modules into the Sinamics S120 drive family. Since the required functionality of a single drive-based module is provided, very compact automation solutions are possible, a decisive advantage in production machines in which the switch cabinet often has to find room in the machine bed. Modular machine concepts can also be implemented easily and efficiently with “functionally autarchic units”.

The demands on the drive technology of production machines vary from classic single-axis applications such as coilers or cross-cutters to multi-axis applications with more than 100 drives in printing machines. Siemens covers this wide range economically with a scalable system with two structure types: the single-axis Simotion D410 which is snapped onto the power unit and the Simotion D425/D435/D445 multi-axis system in three power stages. Simatic HMI devices can be connected via Profibus, Profinet or Industrial Ethernet for visualization and operation. The distributed periphery is linked via Profibus or Profinet. The controllers already have fast onboard I/Os for connecting measuring probes or output of cams [1].

All the development phases of a machine can be carried out in a single user-friendly workbench with the Scout engineering system. The combination of the classic PLC and motion control programming in one system enables easier implementation of a modular software architecture which makes it easier to reuse the created user programs. Like the operating system, the user program is saved on a plug-in CompactFlash card. The controller can then be changed easily by local personnel. In addition, the comprehensive service and diagnostic facilities reduce commissioning times and downtimes.

Horizontal continuous bagging machines for packing printed material require a very high flexibility in the sorting of the different supplements. Owing to the high variety of the products to be packed, modular machine concepts, consisting of a basic machines and optional units for product feeding and discharge are ideal for this purpose.

The machine modules are self-contained units which are synchronized with each other via Profinet and distributed synchronization. They can then be programmed, tested and commissioned separately. The customer can also vary the level of expansion of the machine flexibly and add an extra product feeder where required, for example, without having to change the software. Cycles of up to 300 bags per minute can be achieved by the use of efficient automation and drive technology.

The Simotion D4x5 multi-axis system which covers the control and HMI functions is used as a main controller in the basic machine. Technological functions such as a temperature regulation for the heating elements of the welding tools and

an optional pre-pickoff for the foil pickoff by an asynchronous motor on the packing material roll are implemented in addition to the classic PLC functionality. Highly dynamic servo drives which are synchronized by gear and cam disc synchronizations ensure precision movements of the foil pickoff, bin chain, cross sealer and pick-a-back cross sealer [2].

The optional machine modules are automated with a single or multi-axis controller such as Simotion D410 for the product feeder unit. The servo drive for the product dispenser is synchronized to a master control value via Profinet. In addition the complete machine module from the I/O processing to a local control unit can be automated with this single-axis controller. Thanks to the scalable, drive-based automation solution and the simple synchronization of the drives, the machine can be adapted easily to the new production specifications in the case of a product change [2].

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A BRIEF HISTORY OF STRUCTURAL FABRICATION TECHNOLOGY: THE ROAD TO FULL AUTOMATION

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Structural fabrication has evolved from a largely manual operation to one in which virtually every manufacturing step can be fully automated. The structural steel fabricator has developed into a lean, mean machine, but automation in this industry has a long and interesting history. Most structural fabrication operations of the past were labor-intensive. Layout, drilling, cutting, and welding were performed manually. In structural fabrication today, nearly every process can be automated.

The 70s and 80s: Structural fabricators stepped into beam line automation with machines like the Beatty punch, followed by the three- and five-press beam punch lines. The beam punch lines of the 1970s were the first step. They reduced the manual labor required to process main structural members by punching the holes in all surfaces in one pass. A saw could be added on the same system to cut members to length.

The next progression was the “pop mark,” an early way for a beam punch line to make layout marks on a beam. Using the tip of the punch, a machine could mark the centerpoint of the piece and the intersection for weldments, plate, and angle connection points. Early automated coping machines of the mid-1980s were

simple systems with no linear measuring that could prepare basic end-connection detail using three oxyfuel torches.

By the late 1980s, downloading of data from 3-D CAD systems became a reality. The basic cut-to-length, hole position, pop marks for part location, piece number, and cope information was held in the DSTV file format, which was developed in Germany and became a global standard. Many versions later, this format is still used today, but the file holds far more information.

The 1990s: In the 1990s the cold saw was phased out at many plants and replaced with more cost-effective methods, such as band sawing. Typically, the band saws were placed in tandem with the drill; this saved space and required only one operator. The CNC positioned both the saw and the drill before transferring the beam to a coping machine.

The industry soon witnessed the evolution of plate processing. Structural fabricators moved from the traditional burn table with multiple oxyfuel torches to a pass-through-style system in which the material moved and the machine remained fixed. Such combination systems could either punch and plasma cut or punch, drill, and plasma cut. The oxyfuel torch was retained on certain models for thick materials.

During the 1990s the industry began to notice the obvious constraints of material handling. They included the labor cost associated with moving steel through processing to fabrication and ultimately getting the correct detail parts to the weld stations.Many different material handling methods were used. Workers sometimes pushed beams on simple trolleys from station to station. Sometimes they operated a motorized system capable of positioning multiple beams at one time for each station.

Enter the MSI: Today's automated systems—known as multisystem integration, or MSI— position workpieces using electric motors, inverters, and encoders. Monitoring the position of each piece, the MSI combines multiple machines into one production line. Once the production requirement is created and material is loaded, an MSI operates without manual input. For example, material moves from a shot blasting machine to a drill machine, a layout marking machine, a sawing machine, and finally a plasma and oxyfuel robotic structural cutting system. All machines are mechanically connected to each other by roller conveyors and cross transports.

Today the operator simply selects the loaded profiles on the control panel and starts the process. Data then is updated automatically at the production office and at every machine. The material handling system has built-in buffers so the production line knows the order in which the beams go through and which processes are required on each piece.

Enter Welding Automation: The next step, now a reality but still in the early stages of adoption, is adding robotics to the structural fabrication shop. Robotic welding and thermal cutting are not new to structural fabricators, but automated welding is—that is, welding with no manual intervention whatsoever. This includes program development and moving material in and out of rotating

fixtures.Two technology advancements make fully automated robotic welding possible. Intelligent welding systems can import data from CAD, if the welding information is in the model. If it is not, a database can recommend the welding information to add to the model; a programmer then can take this recommendation or add in the welding information separately.

What's Next? The industry has moved from manual fabrication to comprehensive automation. The leap has been a large one, with massive reductions in labor and huge increases in output, and technology will continue to drive the industry forward.This isn't to say that every modern structural fabricator has become fully automated. The rate of technology adoption varies widely within the industry, and it has always been this way. Indeed, many may be surprised to find that some of the technologies described here have been around for so many years.

Some structural fabricators continue to move closer to full automation, while others remain manual in many respects. Regardless, automation technology is available, while skilled labor increasingly is not.

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MAKING SENSE OF MOTION SENSORS

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Motion detection has become an essential ingredient in traditional electronic security and now it is being utilized in access control and video surveillance systems. With more applications and so many different uses, can there be too much of a good thing? It seems the motion sensor is always the device getting the bad rap. However, an understanding about how these devices fit best in your installations will help them to be less prone to scrutiny.

Motion sensing technology has made huge advances since the introduction of PIR (Passive InfraRed) and MW (MicroWave) technologies. Before the introduction of PIRs and MW sensors, interior protection was attempted with devices such as photoelectric beams and ultra-sonic detectors. Beams created a threshold by sending a light beam to a receiver. They were monitored for interruptions in the beam. Ultrasonics emitted high frequency tones and then would measure for distortion or delayed reflections of the signal. Changes in the reflectivity of the protected area signaled an intruder.

While early ultrasonic and photoelectric beam technologies were relatively primitive and inherently prone to false alarms, dealers had nothing else to use for many installation situations. For example, back in the day, photoelectric beams were popular for flat roofs of commercial buildings, and ultrasonics was just the

thing for large, harsh environments such as factories and garages. Unfortunately, roof tops are frequented by birds and other flying objects, and industrial spaces are home to equipment such as pneumatics and steam heating. All of these objects can generate false alarms. Though there is still merit to both of these technologies, there are others from which the installer can select for the most appropriate method of providing protection.

When they first appeared, PIRs and MWs represented a major breakthrough for the alarm industry. The technologies have been combined, and the sensing and signal processing have been refined. The variety of selection has increased, making motion detectors and sensors more affordable and deployable for more applications.

Avoiding Problems. In practice, false alarms are the result of a number of issues including user error, poor application engineering, power surges and lightning, and faulty equipment. Of course, it is no surprise if you choose a substandard motion detector, false alarms result. Some dealers also instruct the central to dispatch on undefined signals (or neglect to instruct the central to log only), in case they are legitimate alarm signals which have been garbled during transmission.

Although many manufacturers make high quality motion sensors, experienced dealers, looking for the latest and greatest features in order to remain competitive, are still somewhat cautious about jumping on the bandwagon when something "revolutionary" appears on the market.

Strategic Deployment. Motion detectors are tools. The skilled security professional will select the appropriate detector; install it properly, and provide the desired levels of protection without contributing to the epidemic of false alarms. The use of dual technology detectors provides excellent detection while reducing false alarms significantly. Thoughtful deployment of motion sensors is essential for proper operation.

PIRs: The most frequently deployed form of motion detector. They have evolved into a cost effective and reliable security tool, successfully deployed in both indoor and outdoor applications. PIRs are used for security, lighting control and door control applications. Many innovations in the PIR technology constantly improve the level of performance of PIR products.

Dual Technology: These devices usually incorporate PIR and microwave. PIRs detect movement of warm objects against a background level; microwave sensors transmit a signal, and then analyze the reflected signal. Since PIR and microwave operate in different portions of the spectrum, and one uses passive sensing and the other active; they are not subject to the same false alarm sources but are nepenthes subject to possible false alarm issues. If improperly deployed, a dual detector can be double trouble. For example, if the detector logic is set to a logical "OR," then the detector will alarm if either section senses motion. Microwave sensor range is not limited by walls; they see right through them, so activity outside the structure might be detected as an intrusion. Similarly PIRs will react to a variety of non alarm stimuli.

Video Motion Detection: Digital video signal processing has fostered a new approach to motion detection, video motion detection. The surveillance camera may become the basic motion detection component for security systems of the future. By combining video cameras with advanced signal processing, new levels of surveillance are achieved to help provide security in airports and public places which are now targets in the new homeland security efforts.

Access Control: Motion sensors have found applications in door and access control applications as the demand for access control has increased in response to the public's demand for security. Motion detector technology is filling this need with a variety of devices.

Outdoor Motion Sensors: Have long been considered unfeasible because detectors were not available with the ability to adequately discriminate between real targets and nuisance events. By combining detection technologies and advanced signal processing such as Doppler and other advanced signal processing, motion sensors are now capable of performing in outdoor environments.

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NEURAL NETWORK

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This report deals with Artificial Neural Networks. The various types of neural networks are explained and demonstrated, applications of neural networks like ANNs in medicine are described, and a detailed historical background is provided. The connection between the artificial and real thing is also investigated and explained. Finally, the mathematical models involved are presented and demonstrated.

An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well.

Neural network simulations appear to be a recent development. However, this field was established before the advent of computers, and has survived at least one major setback and several eras.

Many important advances have been boosted by the use of inexpensive computer emulations. Following an initial period of enthusiasm, the field survived a period of frustration and disrepute. During this period when funding and professional support was minimal, important advances were made by relatively few researchers. These pioneers were able to develop convincing technology which surpassed the limitations identified by Minsky and Papert. Minsky and Papert, published a book (in 1969) in which they summed up a general feeling of frustration (against neural networks) among researchers, and was thus accepted by most without further analysis. Currently, the neural network field enjoys a resurgence of interest and a corresponding increase in funding.

The first artificial neuron was produced in 1943 by the neurophysiologist Warren McCulloch and the logician Walter Pits. But the technology available at that time did not allow them to do too much.

Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. This expert can then be used to provide projections given new situations of interest and answer "what if" questions.

The other advantages that should be mentioned include:

Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.

Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.

Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.

Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

As noted by Andrei Kalinin, most of the neural networks present in the market differ little from each other. "Technology is about the same for all. But the use of neural networks is a pleasure that not everyone can afford. To independently train a neural network and put on it a lot of experiments, you need large training sets and a fleet of machines with expensive graphics cards. It is obvious that large companies have such opportunities, "he said.

Among the key market players, Kalinin refers to Google and its division Google DeepMind, which created the AlphaGo network, and Google Brain. There is their own development in this area in Microsoft - they are engaged in the laboratory Microsoft Research. Neural networks are created in IBM, Facebook (a division of Facebook AI Research), Baidu (Baidu Institute of Deep Learning) and others. A lot of developments are conducted in technical universities around the world.

Grigory Bakunov, director of technology distribution of Yandex, notes that interesting developments in the field of neural networks are also found among start-ups. "I would remember, for example, the company ClarifAI. This is a small startup, made once by immigrants from Google. Now they, perhaps, are the best in the world who can determine the contents of a picture. Such start-ups include MSQRD, and Prisma, and others.

"Yandex" is also involved in creating its own neural networks: "Basically, such networks are already used in working with images, with sound, but we will explore their capabilities in other areas. Now we put a lot of experiments into using neural networks to work with text. These developments are being conducted at universities: Skoltech, MIPT, Moscow State University, Higher School of Economics, and others.

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AUTOMATIC CONTROL SYSTEM ELEMENT BASE SELECTION MODEL

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The main purpose of my graduation project is to increase the operational efficiency of the ACS of excavator working parts.

The object of the project is the process of the automatic control of working parts of excavators, and the subject is the choice of the most suitable controller in order to implement a rational trajectory of the movement of excavators working parts.

We have the following tasks at the moment:

- to perform an analysis of the criteria in order to choose a controller;
- to investigate the existing decision-making methods under uncertainty;
- to make a structural model for choosing a controller.

Control theory in control systems engineering deals with the control of continuously operating dynamical systems in engineered processes and machines. The objective is to develop a control model for controlling such systems using a control action in an optimum manner without delay or overshoot and ensuring control stability.

To do this, a controller with the requisite corrective behavior is required. This controller monitors the controlled process variable (PV), and compares it with

the reference or set point (SP). The difference between actual and desired value of the process variable, called the error signal, or SP-PV error, is applied as feedback to generate a control action to bring the controlled process variable to the same value as the set point. Other aspects which are also studied are controllability and observability. On this is based the advanced type of automation that revolutionized manufacturing, aircraft, communications and other industries. This is a feedback control, which is usually continuous and involves taking measurements using a sensor and making calculated adjustments to keep the measured variable within a set range by means of a "final control element", such as a control valve [1, 48].

The most popular types of regulators are:

- PI-controller;
- PD-controller;
- PID-controller;
- time-delay controller;
- fuzzy PID-controller;
- neuro-fuzzy control;
- PIP-controller;
- nonlinear PIP-controller.

Criteria for selection of controllers:

- economic: cost of purchase and cost of operation;
- technical: work efficiency under uncertainty, accuracy of working out the trajectory, energy consumption for the work cycle, runtime of the work cycle;
- operational: reliability and general term of use.

There are a lot of methods for making decisions under uncertainty. The most common ones are: the analytic hierarchy process, the expert evaluation method and the multi-criterion evaluation method.

There are many advantages of the analytic hierarchy process. Here are some of them:

- The main advantage of this process is that it is dimensionless, so there are no issues with converting to equal units of measurement.
- The process gives the possibility of making decisions in the conditions of limited quantitative data.
- The process allows to take into account the "human factor" while making a decision.
- The scope of the process does not depend entirely on the sphere of activity in which the decision is made.

The analytic hierarchy process (AHP) is a structured technique for organizing and analyzing complex decisions, based on mathematics and psychology. It was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then.

It has particular application in group decision making, and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare, shipbuilding and education [2, 25].

Rather than prescribing a "correct" decision, the AHP helps decision makers find one that best suits their goal and their understanding of the problem. It provides a comprehensive and rational framework for structuring a decision problem, for representing and quantifying its elements, for relating those elements to overall goals, and for evaluating alternative solutions.

Users of the AHP first decompose their decision problem into a hierarchy of more easily comprehended sub-problems, each of which can be analyzed independently. The elements of the hierarchy can relate to any aspect of the decision problem, tangible or intangible, carefully measured or roughly estimated, well or poorly understood, anything at all that applies to the decision at hand.

Once the hierarchy is built, the decision makers systematically evaluate its various elements by comparing them to each other two at a time, with respect to their impact on an element above them in the hierarchy. In making the comparisons, the decision makers can use concrete data about the elements, but they typically use their judgments about the elements' relative meaning and importance. It is the essence of the AHP that human judgments, and not just the underlying information, can be used in performing the evaluations.

The AHP converts these evaluations to numerical values that can be processed and compared over the entire range of the problem. A numerical weight or priority is derived for each element of the hierarchy, allowing diverse and often incommensurable elements to be compared to one another in a rational and consistent way. This capability distinguishes the AHP from other decision making techniques.

In the final step of the process, numerical priorities are calculated for each of the decision alternatives. These numbers represent the alternatives relative ability to achieve the decision goal, so they allow a straightforward consideration of the various courses of action [3, 38-39].

All in all, we are going to create a computer program that will be able to find the most appropriate controller using the analytic hierarchy process.

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USE OF AN ACCELEROMETER IN THE CONTROL SYSTEMS OF VEHICLE'S BRAKING SYSTEM

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Nowadays, motor transport takes the main place in the transport system of all developed countries over the world. At the same time, it remains the most dangerous type of the transport. Recently, much more attention is payed to the problems of comfort and safety of vehicles. Moreover, higher demands are set to the efficiency of the motor braking system operation. The braking system shall provide high active safety of motor transport system in operating conditions, along with the smooth, stability and controllability of ride, which is largely affected by the value of the adhesion coefficient of the vehicle wheels to the road. In operation of the motor transport system, its braking system ensures a smooth ride as well as such operational properties as stability and controllability.

Timely detection of vehicle's faults and their elimination can significantly increase the technical speed of the vehicle and its productivity without additional fuel consumption. However, untimely detection of faults and inadequate maintenance not only entail material losses, but also increase the danger of a road traffic accident.

Preservation of the packs, units and mechanisms in working order is the technical condition of the vehicle that directly depends on performing the routine and preventive maintenance. If all the parts of the vehicle meet the technical standards of operation, it is usable. Otherwise, this is an unjustified risk for the driver and passengers of the vehicle, as well as for other road users.

This problem was described in the papers of D. Klets, M. Podrygal, A. Korobko, V. Fiesta, the work of which enabled the development of a system for determining the parameters of the vehicles movement in dynamic (qualimetric) tests [2].

There are known systems that use one acceleration sensor to measure the vehicle's traffic parameters (Efficiency measurement of braking systems of vehicles, Passport M 016.000.00 of PS, NPF Meta, Sprinter SG-2 Performance Meter Ver. 1.01 User Manual).

In such systems, information about the speed of the vehicle is obtained by integrating the measurement results of its acceleration in the direction of the longitudinal axis, and information about the path passed by the vehicle is obtained by the double integration of the results of the acceleration measurement in the direction of the longitudinal axis. Such systems for determining the speed and the path passed by the vehicle have significant disadvantages, namely, the low accuracy of indirect measurements due to the application of integration, the inaccuracy in determining the position of the reference point, which parameters of

motion are characterized by the movement of the vehicle in a plane-parallel motion, and the calculation of the motion parameters is possible only after a complete stop of the vehicle.

The set task was solved in the following way. In the system for determining the parameters of the vehicle movement in dynamic (qualimetric) tests, consisting of measurement elements and devices for processing and visualization of information, according to the utility model, the determination of the parameters of movement is carried out simultaneously by two accelerometers, where accelerometers measure acceleration of the vehicle in longitudinal, transverse and vertical planes, the information about parameters of the vehicle movement in these planes is obtained by mathematical processing of signals from accelerometers. Information about the speed of the vehicle is obtained by mathematical processing without the use of signals integration from accelerometers.

In order to solve this problem, two accelerometers MOD-MMA7260QT made by Motorola are used, which simultaneously record accelerations in longitudinal, transverse and vertical planes, and in braking tests, an additional impact force sensor is installed on the brake pedal. Accelerometers and impact force sensors are connected to the computer unit through communication channels that can be connected to external storage devices, peripherals (for example, a keyboard) and an external personal computer. The display is used to visualize the measurement results. The power supply to the computer unit is provided from the on-board power supply of the base vehicle or from stand-alone batteries using the power supply [3]. The proposed system allows to reduce the measurement error of the linear speed of the vehicle, due to the fact that the acceleration of the vehicle is not integrated and the influence on determining the rate of acceleration in the transverse plane is taken into account. During the study of this topic, an Android-based software product was developed.

Structure and features of the software. The software includes the following modules:

– acceleration;
– deceleration;
– braking distances.

The Acceleration module implements the following functions:

– obtaining of the accelerometer indications on three coordinates (X, Y, Z);
– graphic display of coordinates;
– recording and saving to a file.

Butterworth filter [1] is used to filter the sensor data obtained. To ensure the sequence and repetition of the test results, the same filtration and processing protocols shall be used. For this task, the recommended filtering protocol for all channels is the use of the Butterworth LPF [4].

The module “Deceleration” implements the function of constructing a brake diagram. To develop the method of constructing a brake diagram, the main tasks were identified:

– detailed consideration of the process of breaking in the vehicle, which mainly includes a mathematical description of the dependencies of this process;

– comparison of graphs of a real and idealized brake diagram;

– determination of the registered parameters necessary for the construction of the diagram;

– description of the method of constructing the diagram.

The process of breaking in the vehicle is quite complicated. It consists of several successive stages, the first of which is the moment of pressing the brake pedal (the beginning of braking). After the start of braking, a certain amount of time is spent on the operation of the braking system and is called the time delay of the brake system's operation. After reaching the maximum impact force on the brake pedal, the state of steady deceleration comes. The time from the beginning of releasing the brake pedal to the occurrence of gaps between the friction elements is called slowdown time. This process can be presented in the form of a braking diagram. The Braking Distances module implements the following functions:

– speed;

– braking distances;

– braking time.

For the solution of this problem, the physical method for obtaining the braking distance was experimentally selected. To find the braking distance, the formula for uniformly decelerated motion (1-3) was used.

$$S = \frac{V^2 - V_0^2}{2a} \quad (1)$$

$$a = \frac{V - V_0}{t} \quad (2)$$

$$S = \frac{V_0 \times t}{2} \quad (3)$$

To determine S, GPS was used to find the path, but as practice has shown, the sensor has a large error and delay in finding the distance, but with the speed determination, it shows rather accurate data. Therefore, it was decided to use GPS to find the initial speed (V_0). During the experiment, an error was detected after 10 km/h – 2...3 km/h. To obtain the time, it was decided to use the buttons (“Start testing” – at start of braking, and “Stop and show” – at complete stop). The reading error varies from 0.1 m to 0.3 m depending on the reaction of the experimenter who can fully determine the state of the braking system.

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USE OF SOME SCADA-SYSTEMS IN THE GAS INDUSTRY. ODORIZATION OF GAS

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The relevance of the research topic is determined by the fact that the gas industry, being one of the basic branches of the economy, has a significant impact on the structure and dynamics of the national economy, ensures development and improvement of the social sphere and creates prerequisites for economic growth. The results of the functioning of the gas industry depend on ensuring the country's energy resources, the implementation of contracts for the supply of gas to foreign customers, filling the revenue side of the budget, as well as achieving high rates of socio-economic development.

The gas industry has a huge number of technological objects, which differ in both technical and functional characteristics. Control systems for them are developed by very many firms that use different SCADA systems.

Modern SCADA-systems are well-coordinated by functions and interfaces software products. In networked systems SCADA implements stations of various functional purposes: servers, client stations, monitoring stations, mainly for executives, data archiving stations, etc.

The functional basic profile of SCADA-systems was formed even during the first control computers. Over time, with the development of computer technology, the functionality of the systems began to expand (there were color displays, animation tools, voice alarms, etc.). With the advent of the concept of open systems, the software of SCADA-systems for operator stations becomes an independent product that interacts freely with software and hardware of various manufacturers. This specialization of software vendors also contributed to the

expansion of the functions of SCADA-systems. There was a function of network support, the development of communication means SCADA-systems with controllers of various manufacturers.

The purpose of the introduction of the SCADA-systems in this work is to increase the efficiency of odorization of natural gas-the addition to natural gas of a substance with a sharp specific odor (odorant) for the detection of gas leaks during the operation of home gas equipment, which in itself is a blending process.

Odorization of GAS

In the gas supplied to household and municipal needs, odorants must be added - substances with a sharp characteristic smell - for the timely detection of even small leaks by smell.

Odorization of natural and associated gases, as a rule, is carried out at field facilities.

When receiving from unidentified gas suppliers, it is cheated on the gas distribution system, from which gas enters the network of consumers.

If the gas is diverted to the commercial GRS or HS, an additional odorization is carried out if necessary on the GRS.

To odorize the gas on the main gas pipelines, ethyl mercaptan is used - a combustible liquid with a boiling point of 37 ° C. The average annual rate of consumption of ethyl mercaptan for odorization of natural gas is 16 g (19.1 cm 3) per 1000 m 3 of gas (at 0 ° C and 133 Pa).

The odorant must be stored in factory-built barrels in a special fire-resistant room or in a subterranean metal container, connected by technological lines with an odorizing unit.

The odorant from the storage tanks to the intermediate storage tank must be supplied by means of a pump through the filter.

In the odorizer supply tank, the odorant must flow through a special pipeline through a filter by gas-pumping from a gas pipeline.

The operation of the odorizer tanks operating at pressures above 0.07 MPa (0.7 kgf / cm 2), as well as the materials from which they are made, must comply with the requirements of the current Device Regulations and Safe Operation of Pressure Vessels of the Gosgortechnadzor.

The technological lines of odorization units, their stop valves and stuffing box should be made of inert materials to odorants.

By the time the odorization installation is commissioned, instructions for their operation and repair should be developed and approved by the leadership of the LPGUG; training of operating personnel was conducted.

To increase the efficiency and safety of the process of odorizing natural gas, you can use the Trace MODE SCADA system

SCADA-system Trace Mode (Adastra, Russia) runs under the operating system Windows 98 / NT 4.0 / 2000. First of all, the system is oriented to work with controllers, i.e. on the creation of process control systems for small technological objects such as fracturing, which is confirmed by the known applications of Trace Mode.

The license grading by the number of process parameters for Trace Mode is the following: 75, 150, 300, 800, unlimited. The system supports all modern information technologies. To connect controllers and third-party systems, OPC technology can be used. ODBC is used to access databases. Drivers of its own design include the connection of controllers such as Lemicon, Emikon and others (mainly Russian-made, which unfortunately reduces reliability). It is possible to use Web-technology to build automated workplaces on the basis of its own Web-server.

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ARDUINO

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Arduino is an open source electronics platform accompanied with a hardware and software to design, develop and test complex electronics prototypes and products. The hardware consists of a microcontroller with other electronic components which can be programmed using the software to do almost any task. The simplicity of the Arduino language makes it very easy for almost everyone who has an interest in electronics to write programs without the understanding of complex algorithms or codes. Wiring is the predecessor of Arduino. Arduino was developed in lvrea, Italy by Massimo Banzi and David Cuartielles in year 2005. The Project was named after Arduin of lvrea (King of Italy). The project Arduino uses the Wiring language. The concept of Wiring Language was created by Hernando Barragan, and under his supervision Massimo Banzi and David Cuartielles developed the Project Arduino.

Arduino is intended for an artist, tinker, designer or anyone, interested in playing with electronics without the knowhow of complex electronics and programming skills. Arduino is an excellent designed open source platform. It has specially designed boards which can be programmed using the Arduino Programming Language (APL).

The presence of Arduino is not only spreading between hobbyists, but it has also expanded its roots in industries and used by experts for making prototypes of commercial products. Arduino takes off the efforts required in complex coding and designing hardware.

The open source nature of Arduino has been the main reason for its rapid horizontal growth. Since it is an Open Source project, all the files related to hardware and software is available for personal or commercial use. The development cost of the hardware is very small as against the costly similar proprietary products by the industrial giants. The open source nature doesn't require any licenses to develop, use, redistribute or even sell the product. But the Arduino name is trade mark protected (Arduino™) i.e., you are free to sell the Arduino board under any other name however in order to sell it under the name "Arduino" you need to take permission from the founders and follow their quality terms.

The Software files which includes all the source code library are also open sourced. A user can modify them to make the project more versatile and improve its capabilities. This provides a strong online community support.

Concept of Arduino

The root of Arduino goes deep down to the development of Processing Language by MIT researchers. Processing language is an open source language designed to introduce the software development environment for the artistic people without the need of deep knowledge of programming of algorithms. Processing is based on java.

In early year of 21st century, designing an electronics gadget was nearly impossible for a common man. The requirement of specific skill set and hefty prices of software and hardware created a full stop in the path of their creativity.

In year 2003 Hernando Barragan, a programmer developed an open source electronics development platform with software IDE, where anyone with a small knowledge in electronics and programming could use his project to give wings to their creativity. His focus was to reduce the burden of complexity in designing electronics hardware and software. The project was named as Wiring. The software IDE of the Wiring used processing language to write the codes.

As the program written in C\C++ is named as Project, in the same way the code written in Wiring (even in Processing and Arduino) is termed as Sketch. The name sketch gives a familiar look for an artist.

The principle idea behind Wiring is that one can make the sketch of their idea on Wiring software and implement it using specially designed Wiring board. You need to write a few lines of codes on the software IDE and then download the program to the onboard microcontroller to see the output.

Wiring has predefined libraries to make the programming language easy. Arduino uses these libraries. The predefined libraries are written in C and C++. One can even write his software in C/C++ and use them on Wiring boards. The difference between writing a program in C/C++ and Wiring is that the Wiring Application Programmable Interface (API) has simplified programming style and the user doesn't require detailed knowledge of the concepts like classes, objects, pointers, etc. While sketching hardware you need to call the predefined functions and rest will be handled by the Wiring software.

The basic difference between the Processing and the Wiring is that the Processing is use to write the program which can be used on other computers while Wiring program is used on microcontrollers.

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VERGLEICH RELATIONALER UND NICHTRELATIONALER DATENBANKEN

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Relationale Datenbanken ist das am weitesten verbreitete Datenbankmodell. Es setzt auf das relationale Datenbankmodell, das auf der Speicherung von Informationen in verschiedenen Tabellen basiert, die untereinander über Beziehungen (Relationen) verknüpft sind. Ein Grundprinzip relationaler Datenbanken ist, dass diese stets konsistent und redundanzfrei sein müssen. Hierfür ist es notwendig, jeden Datensatz eindeutig zu identifizieren sowie alle Daten jeweils nur einmal in der Datenbank zu erfassen und zu speichern. Realisiert wird dies, indem die Datensätze auf verschiedene Tabellen verteilt und untereinander verknüpft werden [2].

Eine relationale Datenbank ist nicht in jedem Fall die beste Lösung. In einigen Bereichen haben relationale Datenbanken ziemliche Probleme. Ein klassisches Beispiel an dieser Stelle sind graphenbasierte Probleme, wie Netzwerke und Topologien jeglicher Art. Die Menge an digital gespeicherten Information wird immer größer, schon jetzt kämpfen relationale Datenbanken mit erheblichen Leistungsproblemen. Da es mittlerweile darum geht, Hunderttausende oder Millionen von Nutzer zu bedienen, kann die gewünschte Performance nicht mehr über einzelne Server erreicht werden, sondern nur mit Rechnernetzen und genau damit haben relationale Datenbanken große Probleme. Aus diesem Grund wurden NoSQL-Datenbanken entwickelt.

Eine NoSQL-Datenbank verfolgt einen nicht relationalen Ansatz und versucht die Probleme, die eine relationale Datenbank in manchen Bereichen hat, zu lösen. Um nun zu veranschaulichen, wie gut NoSQL-Datenbanken das realisieren, werden viele Arten von NoSQL-Datenbanken jeweils mit einer relationalen Datenbank verglichen [2].

Eine relationale Datenbank ist eine auf Tabellen basierende Datenbank, die auf dem relationalen Datenbankmodell beruht. Das bedeutet, dass die Daten mit einem eindeutigen Schlüssel ausgestattet sind und in einer Beziehung miteinander stehen. Die Abfragesprache der Datenbank ist SQL, eine weit verbreitete und größtenteils standardisierte Abfragesprache, so dass Anwendungsprogramme beinahe vom verwendeten Datenbanksystem unabhängig sind. Eine relationale Datenbank ist die am weiteste verbreitete Datenbank und bis heute ein etablierter Standard.

Bei der Datenverarbeitung von Big Data spielen vor allem NoSQL-Datenbanken eine wichtige Rolle. Diese können im Vergleich zu relationalen Datenbanken große Datenmengen oft schneller verarbeiten. Aber auch relationale Datenbanken bieten Möglichkeiten [2].

NoSQL-Datenbanken arbeiten bei der Datenverarbeitung nicht mit einem relationalen Ansatz und verwenden daher auch keine Tabellenschemas. Das beschleunigt Zugriffe großer Datenmengen, wenn Abfragen diesen Ansatz unterstützen. Relationale Datenbanken haben bei sehr großen Datenmengen oft Leistungsprobleme. Im Fokus von NoSQL-Datenbanken stehen daher vor allem Szenarien, in denen relationale Datenbanken von Oracle, IBM und Microsoft an ihre Grenzen stoßen. Das ist im Big-Data-Einsatz besonders häufig der Fall. Verantwortliche müssen sich daher bei der Planung von Big-Data-Infrastrukturen auch in diesem Bereich informieren und unter Umständen den Einsatz von NoSQL-Datenbanken planen.

Auch sehr große Datenmengen auf Basis von Bildern, Audiodateien, Videos und mehr passen in diese Kategorie. Dazu kommt, dass NoSQL-Datenbanken keine Transaktionen nutzen, was bei relationalen Datenbanken eine Grundtechnik darstellt. NoSQL-Datenbanken synchronisieren stattdessen Datenmengen in sehr kurzen Zeitabständen zwischen den Knoten, um eine Konsistenz zu erreichen. Dadurch können NoSQL-Datenbanken in sehr kurzer Zeit riesige Datenmengen verarbeiten. Häufig sind erst dadurch Big-Data-Abfragen erst sinnvoll möglich.

Einfach ausgedrückt sind NoSQL-Datenbanken vor allem dann sinnvoll, wenn die Daten in keine relationale Struktur oder in Tabellen passen. NoSQL-Datenbanken ergänzen diese Möglichkeiten nur und verbessern die Datenverarbeitung von großen Datenmengen für Big Data.

Zwischen SQL-Systemen und NoSQL-Systemen gibt es sehr viele Unterschiede in verschiedenen Aspekten. Wir werden in diesem Abschnitt die SQL- und NoSQL-Systeme nach den Aspekten: Allgemein, Skalierung, Performance, Konsistenz und die Realisierung von Beziehungen vergleichen. Allgemein Im Allgemeinen sind SQL-Datenbanken, im Gegensatz zu NoSQL-Datenbanken, keine Minderheit, sondern immer noch die Lösung für die meisten Datenbankprobleme.

SQL-Datenbanken gibt es schon sehr lange und fast jeder kennt SQL. Zusätzlich gibt es im Laufe der Entwicklung immer viele Erweiterungen der SQL-Systeme, so dass die Arbeit mit einer SQL-Datenbank immer einfacher wird. Man

hat eine große Auswahl an Anbieter mit einer großen Anzahl an Tutorien, Support usw. Doch der wichtigste Unterschied ist, dass SQL-Datenbanken eine einheitliche und sehr mächtige Abfragesprache besitzen, nämlich SQL. Deswegen bleibt SQL-Datenbank immer noch die erste Lösung für alle Datenbankprobleme, die mit einer SQL-Datenbank realisiert werden können [2].

Ein sehr wichtiger Aspekt, ein Grund warum NoSQL-Datenbanksystemen überhaupt entwickelt wurden, ist die Skalierung, insbesondere die horizontale Skalierung. Es ist hier kein Vergleich von vertikaler und horizontaler Skalierung, denn es existieren auch horizontale Skalierungsstrategien für SQL-Systeme. Aber durch den bei horizontaler Skalierung in SQL-Systemen erforderlichen Verwaltungsmehraufwand führen diese Lösungen ab einen bestimmten Punkt dazu, dass sich die Vorteile von SQL ins Negative kehren und die Performance deutlich sinkt. Bei NoSQL ist das genau das Gegenteil.

Alle NoSQL-Systeme besitzen eine hohe Skalierbarkeit aufgrund des einfachen Schemas oder es existiert gar kein Schema. NoSQL-Systeme sind so geschaffen, dass ihre gute Skalierbarkeit trotz hohen Datenvolumens konstant bleibt. Damit sind NoSQL-Datenbanken hinsichtlich Skalierung dem SQL-Datenbanken überlegen. Performance mit ähnlichen Gründen wie bei der Skalierung sind die NoSQL-Datenbanken performanter als die SQL-Datenbanken. Eine der Gründe warum NoSQL existiert, ist, dass SQL-Systeme von der Leistung her an ihren Grenzen stoßen.

Eine Reihe von Bedingungen müssen erfüllt sein, bis alle denselben Wert bekommen. Aber trotzdem ist NoSQL hinsichtlich der Konsistenz nicht so stark wie SQL, da sie eine absolute Konsistenz besitzen. Benutzer müssen hier entscheiden, was für ihn wichtiger ist: eine gute Konsistenz oder eine gute Performance [2].

Mit dem immer zunehmenden Datenvolumen der Firmen und dem zunehmenden Schwerpunkt auf Leistung sowie der zunehmenden Wichtigkeit, Beziehungen in Datenbank zu definieren, werden die NoSQL-Datenbanken immer beliebter und weitverbreitet. Trotzdem können sie SQL nicht ersetzen und anders herum können sie auch nicht durch SQL ersetzt werden. Je nach Zweck der Verwendung soll zwischen den Systemen gewählt werden, welche die bessere Lösung ist. SQL und NoSQL werden parallel existieren und einander ergänzen.

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COMPUTERS IN OUR LIVES

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In recent years, computer technology has been closely integrated into our lives. In our time it is quite difficult to imagine how people used to do without computers, so they are used to them. To date, each family can afford to buy a computer or laptop, and often not even one.

With the availability of computers, people also began to use the Internet actively. Now every morning the average person starts with a standard news feed, checking the contents of personal mail and visiting various popular social networks. The Internet slowly but surely has become a permanent assistant in everyday affairs.

With the help of it, people can make exciting trips to any country, make a variety of purchases without leaving their apartment and desktop. This is a kind of another world, another reality, where there is an extensive library for book lovers, a lot of music collections, various games, a lot of Internet shops.

The Internet makes communication easier and breaks language barriers, now even if your friend lives thousands of kilometers away from you in another city or even in another country, you can communicate with him, if desired, even for whole days.

But, nevertheless, people, more and more often ask themselves: "Are Internet and computers really useful or do they have an irreparable threat to humanity?" If you look at the problem from one hand, the Internet, undoubtedly, is of great benefit. It allows you to access almost any information, it facilitates greatly the learning and workflow.

On the other hand, everything is fine, but moderately, because spending long hours at the computer, people lose their health, impair vision and deprive themselves of live communication and active pastime. This is especially true for children, because of their age they do not understand how many pleasant moments and emotions they lose by sitting out their

childhood for computer games. It is much more useful for a child to go to a sports ground, play soccer or volleyball with peers.

Naturally, adults themselves should not neglect the process of education, not allowing their offsprings to linger behind the monitor. It is necessary to distinguish the line between reality and the virtual world, to know the measure and not to forget about simple human joys then the computer will be benefit for you and will not become an enemy.

If physical labor was formerly valued, then in our time there is an ever increasing need for intellectual labor. And again, one can not appreciate this uniquely. Of course, many people have significantly expanded their horizons, but the physical state leaves much to be desired. We gradually forget about physical activity, about sport, that has not harmed anyone yet. But you can not buy health for any money. Many people do not understand it. Or maybe they just do not care. Often people, in particular schoolchildren, prefer to spend long hours at the computer than to go for a walk in the fresh air, and do not even think about what irreparable harm they do to themselves.

And what about books? They recede gradually. And this is quite natural in the current situation. Judge for yourself: why read something, if any essay, any research work can be downloaded from the Internet? And you do not need to make any special efforts, and it will take less time. Well, if you still want to read sometimes, then there is absolutely no need to go to the library or clutter up the apartment with bookcases, because one computer can replace hundreds of such bookcases. In any case, if it can not yet, it can soon.

Progress does not stand still. Nowadays, wherever we are, people are talking about the Internet. This technology has as much impact on our lives as telephone and television. And there is probably no such sphere of life that the computer would not touch. But think, is it good that soon machines will make everything for a man? Honestly, I can not imagine living in a world that is one big computer. Of course, I'm not talking about the need to raise an armed uprising against machines. In the end, we can not do without them. But I believe that the intervention of computers should be limited. Nothing gets for free in life, and the price we pay for the help that the machines provide us is the harm done to our health. It is logical to conclude that the more computers help us, the more this price will grow. And can we pay it in the nearest future? I think that it is in our power to make it so that we can.

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ROBOT SOFTWARE

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Today, commercial and industrial robots are in widespread use performing jobs more cheaply or with greater accuracy and reliability than humans. They are also employed for jobs which are too dirty, dangerous or dull to be suitable for

humans. Robots are widely used in manufacturing, assembly and packing, transport, earth and space exploration, surgery, weaponry, laboratory research, and mass production of consumer and industrial goods.

Robot software is the coded commands that tell a mechanical device (know as a robot) what tasks to perform and control its actions. Robot software is used to perform tasks and automate tasks to be performed. Programming robots is a nontrivial task. Many software systems and frameworks have been proposed to make programming robots easier [1].

Some robot software aims at developing intelligent mechanical devices. Though common in science fiction stories, such programs are yet to become commonplace in reality and much development is yet required in the field of artificial intelligence before they ever begin to approach the science fiction possibilities. Pre-programmed hardware may include feedback loops such that it can interact with its environment, but does not display actual intelligence.

Robot Software consists of the instructions that control a robot's actions and provide information regarding required tasks. When a program is written using this software, the robot is able to execute commands and perform tasks. Programming robots can be a complex and challenging process, and while it has become easier over the years, the lack of cross-platform industry standards has affected the development of software tools for robots compared to other automated control systems such as programmable logic controllers (PLCs) [2].

Dataflow programming techniques are used by most robot manufactures, and is based on the concept that when the value of a variable changes, the values of other variables affected should also change. A programming language that incorporates dataflow principles is called a dataflow language. In addition to numeric processing, dataflow languages also incorporate functional concepts. Unlike other programming languages which use imperative programming, dataflow programming is modeled as a sequence of functions.

With any programming software, the state of program at any given time is an important consideration. The state provides an indication at a particular instant. In order to function properly, most programming languages requite a significant amount of state information. This information is invisible to the programmer [3].

Another key concept which is associated with any type of robot programming is the concept of runtime. When a program is running, or executing, it is said to be in runtime. The term runtime is also used as a short form when referring to a runtime library, which is a library of code instruction used by a computer language to manage a program written in the language. The term is also used by software developers to specify while the program can occur. A runtime error is an error that happens while the program is executing. For example, if a robot arm was programmed to turn left, and it turned right, then that would be a runtime error [4].

The software architecture of a system consists of the various software components used to design and operate the software. All programming methods rely on software architecture is a method of organizing a software system since it

not only provides communication support but is also a critical component in hardware and software interfaces.

A scripting language is a high-level programming language that is used to control the software application, and is interpreted in real-time, or “translated on the fly”, instead of being compiled in advance. A scripting language may be a general-purpose programming language or it may be limited to specific functions used to augment the running of an application or system program. Some scripting languages, such as RoboLogix, have data objects residing in registers, and the program flow represents the list of instructions, or instruction set, that is used to program the robot [1].

Programming languages are generally designed for building data structures and algorithms from scratch, while scripting languages are intended more for connecting, or “gluing”, components and instructions together. Consequently, the scripting languages instruction set is usually a streamlined list of program commands that are used to simplify the programming process and provide rapid application development.

Regardless which language is used, the end result of robot software is to create robotic applications that help or entertain people. Applications include command and control and tasking software. Command and control software includes robot control GUIs for tele-operated robots, point-n-click command software for autonomous robots, and scheduling software for mobile robots in factories. Tasking software includes simple drag-n-drop interfaces for setting up delivery routes, security patrols and visitor tours; it also includes custom programs written to deploy specific application. General purpose robot application software is deployed on widely distributed robotic platforms [1].

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HOW DID WE EVER LIVE WITHOUT GPUS?

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Programmable graphics controllers have been with us since the Hitachi HD63484 in 1984, but it was limited and addressable only in basic binary code.

Earlier in 1981, Jim Clark (founder of Silicon Graphics) and Marc Hannah (Stanford) developed the geometry engine that could transform model space to screen space viewing and it had very limited programmability. The first truly programmable graphics device was the TI TMS34010, introduced in 1986. The first company to use the term GPU was 3Dlabs when they introduced their programmable geometry processing unit in 1999. Moore's law was kicking in and it was possible, and economically viable to use a million transistors to incorporate all the registers and cache needed for a programmable device. It was also necessary to have a high-level complier, so a larger population of programmers could exploit the power of these machines [1].

In late 2000, Nvidia introduced their GPU, this time the "G" stood for graphics. Nvidia is one of the greatest marketing companies in the world, and was immensely successful in establishing the term GPU into our vocabulary. AMD also had a programmable device, and not nearly the marketing power of Nvidia, but nonetheless, their GPUs (which they called VPUs at the time) were used in experiments at Stanford as parallel processors. In case there's anyone left in the universe that doesn't know it, a GPU is a collection of 32-bit processors capable of doing integer and/or floating-point calculations simultaneously and summarizing the results, it's what's known as a single-instruction, multiple-data (SIMD). The SIMD construct, or architecture, was needed because graphics is such a parallel function. The easiest was to embrace the concept is to consider an HD display—it has >2 million pixels, and we want to refresh most, and sometimes all of them at least 30 times a second—you can't do that with a single processor.

The researchers at Stanford developed parallel processing algorithms using the arcane and cranky API OpenGL (developed at SGI decades ago). The group at Stanford left the university and formed a start-up software company to exploit the parallel processing power of GPUs, which at the time was being designed and targeted for PC games. The company, PeakStream, lasted almost a year and was acquired by Google in 2007 and buried deep inside the company, but the acquisition represented an affirmation by Google of the need for parallel processing. AMD supported the fledging PeakStream before and after the acquisition, but was distracted with other demands, and moved on. Nvidia, however, saw the opportunity and leapt on it, and by 2006 everyone thought Nvidia had invented the GPU, parallel processing and SIMD.

Nvidia, fully committed to SIMD computing, in addition to gaming and professional graphics, soon realized SIMD, or GPU-compute (also called GPGPU, a term I personally and pedantically don't like) would never realize its potential if the only way you could program the beast was through OpenGL, and so in 2005 the company made a big bet and invested in the development of a specialized parallel processing programming language they called CUDA. The company introduced CUDA to the world in 2006—20 years after the TMS34010 was introduced. CUDA, which stands for Compute Unified Device Architecture, is a C-like construct, and that opened up the possibility of making it accessible to millions of

programmers. But Nvidia took it a step further, and enabled hundreds of universities around the world to offer CUDA classes [2].

The platform was now in place, a SIMD language, and a SIMD processor that was being sold by AMD and Nvidia in the tens of millions every month and therefore very affordable. But any revolution takes time to be understood and adopted, and so it was with parallel processing. Hundreds of software accelerators were being developed in industry, in CAD, finite element analysis, and other scientific, medical, industrial, and military applications.

Seeking a non-proprietary solution, Apple developed OpenCL and then bequeathed it to the Khronos group, who also manage, develop, and support OpenGL. OpenCL is a framework for writing parallel-processing programs that execute across heterogeneous platforms consisting of central processing units (CPUs), graphics processing units (GPUs).

And then in mid-2000, Geoffrey Hinton developed an incredibly efficient deep-learning algorithm. His work was amplified by Andrew Ng and team at Google research with the cat-finder project. Who knew there was “big-data” for free on the web that consisted of hundreds of thousands of images of cats. Deep-learning enabled a quick sorting and learning process that when guided by a teacher could enable a computer to sort and select cat pictures [3].

The example, although cute and silly, became a sort of benchmark as universities vying for the fastest cat search, and ignited the imagination of thousands who quickly saw the artificial-intelligence applications.

In the meantime, GPUs kept getting bigger, faster, and in general more powerful, while still remaining affordable. When researchers began applying DL techniques to AI using GPUs, magic happened, honest to goodness magic. It suddenly became possible to sort through the ever-increasing reams of data being generated by ATMs, IoT devices, medical and social security records, credit card transactions, and scariest of all, social media activities.

AI is going to make autonomous cars, drones, submarines, and trucks possible, and not 20 or 50 years from now, but now, today. It is also going to make autonomous military weapons possible, which scares the hell out of famous people like Stephen Hawking, Elon Musk, and dozens of artificial intelligence experts. They have called for some type of regulatory system. Good luck with that.

Apart from the scary AI stuff, yet more earth-shaking applications have arisen for GPUs — crypto-currency transaction versifications, known as block-chain mining. Twenty-four hours a day, every day, tens of thousands of high-powered GPUs are evaluating Internet scans looking for transactions between buyers and sellers who use cryptocurrencies like Ethereum, bitcoins, Litecoin, and a dozen others. Cryptocurrency mining is a computationally intense process that contributes to the operations of the cryptocurrency network while generating new currency. However, it takes a massive amount of computer resources and subsequently electrical power to generate meaningful income. Nonetheless, thousands of people and organizations are involved in the work and it has

accounted for what I estimate is $1.05 billion in sales of graphics add-in boards (AIBs) to date.

In addition, there is great promise for block chain computing as a disruptive technology in the Internet economy. The idea of a shared, distributed ledger to record (and preserve) the history of transactions streamlines legal disputes, financial exchanges, even barter networks, or credit exchanges. The work going on around this capability is going to further drive demand for distributed processing even if cryptocurrency eventually blows up, or at least settles down from these go-go years [3].

Although today the largest demand and use for GPUs is still gaming, all these other activities and interests are taking a bigger share of GPU use every day. From what was a seemingly esoteric application of professional graphics (for applications like special effects in the movies) to PC and console gaming, the GPU has become the heart of supercomputers, AI machines, autonomous vehicles, cryptocurrency processors, and big-data, deep-learning applications in almost every industry and activity imaginable. The GPU has become ubiquitous—how did we ever live without it?

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Shveikin I. O.

CYBERNETIC INSECTS

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Cybernetics is the science of the general laws governing the processes of control and transmission of information in various systems. This is true when speaking in general. But a simple philistine understands the work with information systems under cybernetics, associated with coding some or other data in certain structures. For example, the creation of a robot can not do without cybernetics – in fact, robotics came out of cybernetics like Venus from the sea foam. Cybernetics is, for the most part, an industrial computer science, which, in turn, is also a science about the creation and organization of information systems. At present, cybernetics is widely used in all spheres of life: from politics and economy to programming at the genetic level.

An army of controlled insects capable of moving a miniature cargo, looking for explosives in hard-to-reach places and informing the operator of

information – is it fiction or reality? Radio-controlled insects today are not heroes of the Hollywood blockbusters, but rather specific developments of the professor at the University of California Berkeley Michel Maharbiz.

For the first time, they started talking about cyborg beetles in 2006. DARPA Manager Amit Lal at one of the organization's seminars said: it's time to seriously develop biorobots. Maharbiz and his team began to experiment. Three years later, the first flying insects-cyborgs with radio control were created.

Today, as a rule, rhino beetles are used for experiments. Their main advantage is their large size and heavy lifting capacity, up to three grams. The control device consists of a board with a microcircuit, a transceiver, dipole antennas and a battery. It weighs 1.33 grams, and there is a stock to fix on the beetle, for example, a miniature camera or sensors.

The technology of implanting electrodes in a living organism is not easy. The operation can be performed only at the pupal stage. At this time, cardinal reconstruction of the body is happening, and foreign bodies perfectly integrate into living tissue.

To conduct experiments, scientists created a special test chamber. Here, Makharbiz and his colleagues analyze the flight trajectory of the cyborg beetle. The goal of scientists is to completely subdue the insect's movements. They do not doubt that sooner or later it will happen. However, the public has already enjoyed the taste: they are interested in the cyborgization of not only insects, but also of a human.

Scientists around the world have long been engaged in the creation of hybrids of robots and living creatures, or, to put it simply, cybernetic organisms. Of course, research in the field of creating cybermen is a very specific issue in terms of morality, but experiments on animals and insects have so far been permitted, and recently Charles Stark Draper Laboratory Inc., located in Massachusetts, created the world's first remote-controlled cybernetic dragonfly.

In their work, scientists used their own newly developed optical conductors of a new type called “optrodes”, which are much smaller and more flexible than the “classic” fiber. Optocouplers were embedded in the brain of a dragonfly, namely in areas responsible for movement and orientation in space. The brainchild of scientists was named DragonflEye. The biomechanical engineer Jesse Wheeler, who is also the author of the whole experiment, said:

“The transmission of commands to the dragonfly requires that the light be directed to certain areas of the main “nervous cord” of this insect, whose thickness does not exceed the thickness of the thinnest fishing line. To this end, we have developed a new technology based on specialized opto-couplers, which are very flexible and can carry light through very curved trajectories”.

Naturally, it is not the first experiment in this field. Scientists have been creating various cybernetic organisms on the “base” of flies, cockroaches and even rats for years. But all the prototypes that existed before had a couple of significant drawbacks: they were extremely expensive in production, and also had a short battery life without recharging. DragonflEye does not have these

drawbacks: it can work for several months, while it's warm season and it has water, food and sunlight, in other words, while the “living” part of the body lives. In addition, all the necessary energy to feed the “iron” part of the cyber-shotkosis also gets through the food, and the electronics it carries are supplied with energy from a small light solar battery.

The technologies developed within the framework of the DragonflEye program will allow us to study the behaviour of insects, the features of their flight. We can even force dragonfly-cyborgs to act in an unconventional role for them – in the role of insect pollinators, which will take the place of a rapidly declining population of honey bees. In addition, the opto-optics developed by us can be used by physicians and neuro engineers as a means of access to individual nerves and small nerve nodes, which will allow us to make new research and apply some innovative methods of treating diseases.

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LANGUAGES IN PROGRAMMING

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There are not very many languages used in programming. The main language is English. This is due to the fact that programming has been originated in England and America and it is invested a huge amounts of money and resources in these countries.

But it does not mean that it is the only language in programming. In some countries there are rather successful examples of creating a programming language based on their native languages. For example: 1C, RAPIRA, Algol and many others. In general, there are a lot of programming languages, but why does English supersede everything?

To write its own programming language is not so difficult within the state, what's the problem? The problem is that the new language will not be known and in demand. To prevent it, you need to spend a huge amount of money. But the problem is not only in money: people simply do not want to reorganize and learn even a promising programming language.

At the moment English is an international language and people who speak and understand it can be found all over the world. It is just for this reason there is no sense to create programming languages in any other language besides English. It is easier for people to learn something they know even a little and what is used everywhere.

There is also the problem of translating and replacing English words with the corresponding analogues. It is not easy to oust English as an international language, and not every state can do it. But even if it happens, another problem arises: "How to develop the sphere of information technology to the same level as England or the USA?"

The use of other languages in programming is quite a popular question, but why does it even arise, why not accept that English in programming is like Latin in medicine?

So, the use of other languages (except English) in programming is not advisable, because it requires a huge amount of resources to be spent on it, it will have technical complexity, unguaranteed acceptance of it by people, low popularity, low demand around the world.

The complexity of dislodging of English from the sphere of programming is quite high so no person and no state in the world will do it in my opinion.

The modern world is becoming smaller all the time. Every day distances between different countries seem less. For this reason it's becoming more and more important to know different languages, especially English.

One billion people speak English today. That's about 20% of the world's population. 400 million people speak English as their first language. For the other 600 million people it's either a second language or a foreign language.

English is the first language in the United Kingdom, the United States of America, Australia and New Zealand. It is one of the official languages in Canada, the Irish Republic and the Republic of South Africa.

As a second language English is spoken in more than 60 countries. It is used by the government, businessmen and universities.

English is the language of politics and diplomacy, science and technology, business and trade, sport and pop music. 80% of all information in the world's computers is in English. 75% of the world's letters and faxes are in English. 60% of all international telephone calls are made in English. More than 60% of all scientific journals are written in English.

To know English today is absolutely necessary for every educated person, for every good specialist. Learning a language is not an easy thing. It's a long and slow process that takes a lot of time and patience. But it's a must.

English is taught throughout the world and a lot of people speak it quite well. In our country English is very popular: it is studied at schools (sometimes even at nursery schools), colleges and universities.

Everyone will speak English soon — I'm sure of it. We all need to understand each other. To do that we need an international language, and that's English.

Slavinska N. V.

PROBLEMS OF DISTANCE LEARNING MODEL CLASSIFICATION (GENERAL OVERVIEW)

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Information technologies are becoming widespread in all kinds of human activity including the sphere of education. Information technologies can improve quality and efficiency of the learning process and achieve equal effectiveness of e-learning and full-time tuition.

Nowadays most of educational institutions of any accreditation level and ownership form implement information technologies to their functioning. Distance learning experiences a rise of its popularity. Distance learning integration requires an appropriate theoretical and practical background. It makes practice summarizing and theoretical activity quite prospective, especially in the classification sphere.

Approaches to the classification of distance learning models are different. Unfortunately, most of them don’t have a clear approach to models division. Moreover, in some classifications the same group may contain several models different by their properties.

One of the most common classifications is represented in the monograph of T.P. Voronina, V.P. Kashitsina, O.P. Molchanova [2]:

1. traditional correspondence courses;
2. open learning (the next stage of correspondence training development that uses informational technologies);
3. multimedia-education (the use of audio, video and computer teleconferencing among participants of learning process);
4. virtual classes and virtual universities (technologies of teleconference and computer training programs).

A.A. Andreev distinguishes five main models of distance learning organization depending on the means of delivery and educational materials indication [1]:

1. *case-technology model.* The basis of this model is self-learning of educational and methodical materials called “cases”. Every case is united program-methodical complex. In turn, consultations may take place at the educational institution or its regional offices;

2. *correspondence learning model*. Learning process doesn't include personal communication between students and a teacher. They exchange training materials and tasks by the traditional mail;

3. *radio and television learning model*. Television and radio broadcasts are used as means of educational material delivery;

4. *network learning model*. Internet is used for educational material delivery and learning process arrangement;

5. *mobile technology model*. This model implies usage of mobile portable devices by students;

The most common classification of educational models is the classification developed by a team of authors led by E.S. Polat [5]:

1. *external education* that is based on traditional education regulations. It is applicable to students who can't attend classes;

2. *university education* (based on one educational institution functioning). It is a developed form of traditional university education related with wide-spread informational technologies usage;

3. *cooperation of several educational institutions* (consortium). Participants of the consortium jointly develop course programs and use educational materials;

4. studying in specialized educational institutions that is created specifically for distance learning;

5. *autonomous training systems*. They are completely based on television and radio programs usage, multimedia discs and additional printed guides;

6. *informal integrated distance learning* based on multimedia applications. The main means of delivering educational material are multimedia programs designed for self-education.

In certain aspects these models are not relevant enough. For example, the correspondence training model isn't currently used. Models based on television and radio programs usage have failed to achieve significant popularity. Moreover, they can be used only in combination with other remote learning types [4].

Also, it should be noted that in most of classification models there is no clear separating criterion, except for the classification by E.S. Polat.

We consider the classification to be relevant and multifactorial having several classification criteria. In our opinion, appropriate classification criteria are types of communication and interaction among learning process participants.

Several distance learning models depending on the type of interaction can be distinguished:

1. *self-education*, carried out by a student and educational resources interaction, contacts between other learning process participants are minimal;

2. *individualized training* that is based on the direct communication between a student and a teacher;

3. *group training*, which provides all participants' active involvement into the learning process.

We can divide these models by the following types of communication:

1. *case-technology model* that combines not only student individual work and periodic constituent but also coordinating and controlling;

2. *network learning model* uses modern electronic technologies for the training materials delivery and tuition process arranging.

Nowadays, most of the distance learning models that have been successfully introduced are mixed. They combine different features of particular models and use various forms of interaction between learning process participants. Moreover, these models include different ways of arranging learning resources and educational materials delivering.

In our opinion, the most appropriate distance education model to integrate into traditional universities is the individualized training model based on network technologies. Universities should have broadband internet connection and distance-learning server for its implementation. Most of the educational institutions in our country have fast Internet access and computers to set up a distance learning server. Educational institutions staff should be able to develop educational materials or to use existing educational resources in their practice, to conduct individual consultations for students through using different kinds of electronic communications [3].

Distance learning system based on these principles can be improved in future by educational materials optimization, introduction of combined methods based on interaction between learning process participants (combination of independent, individual and group work) and communication tools (combination of case-technology models and network learning).

It can be also developed by increasing the number of employees involved in this sphere and expanding the material facilities.

It should be noticed that nowadays distance learning is becoming more widespread. Most of the universities implement distance learning systems. Practice of distance learning technologies integration will be explored and generalized for several years. This process will have its influence on theoretical views, including classification issues. It is natural that views on this issue will be changed and improved. Therefore, we consider that we should treat distance learning classification models as a dynamic system rather than a static phenomenon.

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THE DESIGN AND DEVELOPMENT OF SOFTWARE FOR VIRTUAL REALITY GLASSES

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Computer technologies have become an integral part of our lives nowadays. Hence, the technologies have begun to develop at enormous speed and with possibilities that seemed impossible ten years ago. At present, they are accessible to everyone on the earth.

To my mind, virtual reality is one of the most interesting branches and virtual reality glasses are the most popular invention that is very widely used in gaming industry these days.

Virtual reality glasses start to be popular now but they have been invented quite a long time ago. A scientist from Sutherland, the United States, created the first model of virtual reality glasses in 1968. The device allowed watching low quality graphics while the design of the device was so massive that it had to be fixed to the ceiling.

The virtual reality glasses were created for SegaMegaDrive and Atari JaguarVR game consoles in the 1990's when the area of VR was considered promising a lot. However, they had outlined their usefulness by the beginning of the new millennium and they were forgotten forever in 2000.

The world began to remember of virtual reality glasses when Luckey and Carmack, the engineers, created the Oculus Rift headset in 2012. Luckey, who was a fan of the virtual world, wanted to have a better quality image that the earlier model had offered and so he had created the first developmental model in 2011 before the Oculus Rift. VR has become very popular since then [2].

But it was not only game industry that used augmented reality glasses. At present, a lot companies are developing industries such as medicine, engineering, etc. based on VR.

For example, Carl Zeiss, a German company, have designed very interesting glasses. Architects and real estate sale companies may find the invention suitable and as well as it may find its application for education. One can wear the glasses and walk around the house that has not been built yet, select the style and furniture and the size of rooms, etc. This will allow understanding how the customer wants his/her house to look like and to see the house without leaving the office also. Such

possibilities enable young architects to understand their work more accurately while the flight of their thoughts is not restricted.

There are striking examples not only in the architectural sphere. There are also interesting projects in space industry.

Goddard Space Flight Center in Greenbelt, Maryland, is creating virtual models of different environments and locations now. Thomas Grubb, an engineer and the developers of the area, says that he intends to depict solar emissions, the magnetic field around the Earth and the lava tube in Idaho with the help of the device. It is done to make sure that employees of various NASA laboratories could be able to observe a particular phenomenon while remaining in complete safety [3].

So, we will be able to see the Mars or to go to another galaxy without leaving home ground in the course of time. The developments in the area are very active and there are new ideas and suggestions literally every day.

Certainly, the price of the device is a big disadvantage. For example, Carl Zeiss glasses will cost you $850 a pair. It is a rather impressive price for such a small though functional gadget today.

Nevertheless, do not be upset because the developers of the smartphones can offer an interesting development in the industry to us that may be inferior to its big brothers in some ways, yet it is obviously not far behind them.

Today VR glasses for mobile phones are the cheapest. These devices are ideal and available to many people. The phone headset features the smartphone that plays the role of the display and the gyroscope. One should only add the frame and lenses to it. The price of the device is low due to such ideas unlike the cost of a helmet for the PC. Therefore, you can buy VR glasses, place them in the frame of the phone, adjust the lens to get quality images and start up any necessary program [1]. However, not all phones are compatible with virtual reality glasses.

Some well known brands of smartphones have begun to release glasses themselves and the price is lower than the one of the PC glasses. Thus, you can dive into the wonderful world of virtual reality and visit various places of our planet at a relatively low price even now.

In conclusion, I would like to say that we are not staying still and all the ideas of VR are good in their own rights. Anyway, let us not forget that the reality is none the worse.

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VIRTUAL REALITY FOR EDUCATION

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Virtual reality is a world created by technical means (objects and subjects) transmitted to a person through his senses: sight, hearing, smell, touch, and others. Virtual reality simulates both impact and response to the impact. To create a convincing complex of sensations of reality, a computer synthesis of the properties and reactions of virtual reality is performed in real time. Soon, virtual reality devices will become as popular and functional as mobile phones. With such devices, users can watch movies and TV shows, attend mass events and make purchases, educate.

The main thing that hinders the development of VR-technologies is the lack of necessary tools and client base for developers. Users, in turn, do not fully trust software developers for virtual reality due to the fact that there are no high-profile projects. It is proved by experience: full involvement in the education process increases motivation and success in gaining knowledge. Observation of the most realistic picture stimulates brain activity. And this means that with VR-technologies we pass to a qualitatively new level of information processing. With the use of virtual and augmented reality technologies, students of secondary and higher educational institutions will be able to interact with objects in virtual space or participate in important historical events. Google is promoting the Cardboard project in schools for free, by the beginning of 2016 more than 100 education programs have been prepared. In addition to schools, many medical educational institutions are interested in virtual and augmented reality projects.

Technologies of virtual reality should be applied in the field of education primarily because the educational system must adapt to more complex processes, models and theories, students need to operate with a large amount of information and new ways of presenting it. Adopting VR and AR technologies in early childhood will contribute to an exponential growth in the importance and adoption of technology. Therefore, today we can say that specialists in AR and VR will be in demand both in the future and today. Already virtual reality under the supervision of teachers is used to produce innovative teaching materials and organize VR-laboratories. During the lessons of computer science there is an acquaintance with the software that will be needed to operate the complex, and the necessary teaching materials and drawing concepts are developed in literature, mathematics and biology classes.

In drawing classes, you can create 3D images by applying 3D graphics software. After that, all the received materials are gathered together in a specific environment in order to eventually obtain unique three-dimensional educational resources. Further, the hardware and software complex is installed in one of the offices of the educational institution where the education will be conducted. Thus authors can be physically in other cities and countries. Work on a common project

is made possible through networking. Similar experimental laboratories are already actively used in many educational institutions.

The use of virtual reality opens up many new opportunities in education and training, which are too complex, time-consuming or expensive with traditional approaches, if not all at the same time. There are five main advantages of using AR / VR technologies in education.

-Visibility. Using 3D-graphics, you can detail the chemical processes up to the atomic level. And nothing forbids to go deeper still further and to show how inside the atom the nuclear division is divided before the nuclear explosion. Virtual reality is capable not only of giving information about the phenomenon itself, but also demonstrating it with any degree of detail.

-Safety. Operation on the heart, the management of a high-speed train, space shuttle, safety in case of fire - you can immerse the viewer in any of these circumstances without the slightest threat to life.

-Involvement. Virtual reality allows you to change scenarios, influence the course of an experiment or solve a mathematical problem in a playable and understandable form. During a virtual lesson, you can see the world of the past through the eyes of a historical character, go on a journey through the human body in a microcapsule or choose the right course on the Magellan ship.

-Focusing. The virtual world, which will surround the viewer from all sides to all 360 degrees, will allow you to concentrate entirely on the material and not be distracted by external stimuli.

-Virtual lessons. A first-person view and a sense of being present in the painted world is one of the main features of virtual reality. This allows you to conduct lessons entirely in virtual reality.

Disadvantages of using VR in education:

However, while the use of technologies and the devices themselves will not be as sharp as possible, there will be minuses and potential problems of using virtual reality in education.

-The volume. Any discipline is quite large, which requires a lot of resources to create content for each topic of the lesson - in the form of a full course or dozens and hundreds of small applications. Companies that will create such materials should be ready to develop for quite a long time without the opportunity to recoup it before the release of a full set of lessons.

-Cost. In the case of distance learning, the burden on the purchase of a virtual reality device rests with the user, or this device can be his phone. But educational institutions will need to purchase sets of equipment for classes in which classes will take place, which also requires substantial investment.

-Functionality. Virtual reality, like any technology, requires the use of its own specific language. It is important to find the right tools for making content visual and engaging. Unfortunately, many attempts to create training VR-applications do not use all the possibilities of virtual reality and, as a result, do not fulfill their function.

In light of the above we can assume the success of VR in education. Modern technologies, despite the long path of development, are still young, but still the virtual reality is the next big leap in the development of the sphere of education. And in the near future we will see many interesting discoveries in this area.

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IT TECHNOLOGIES IN EDUCATION TODAY

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Many still recall the time it used to take to do research for a school project. A trip to the library was almost always required. Collaboration meant actually meeting classmates and teachers at schools and offices. Today, students can access information with just a few clicks and collaborate online. The Internet has changed virtually every aspect of education as students attend classes on the Web and find more opportunities to learn than ever before. Not too long ago a "study group" would mean a few students getting together at someone's house to get ready for a test. Students and their teachers collaborate in online discussions groups and share ideas with blogs. Even textbooks include interactive online social elements that allow students to view the latest trends and join conversations. Networks form around common interests and relationships develop across states and countries. Through social media, the Internet fosters a global perspective of the world and a place for students to share and learn.

A student today does not even technically have to go to a school to receive an education. Online schools have quickly become an acceptable alternative for a brick-and-mortar education. Online courses give students with busy schedules like working adults and parents the opportunity to get an education. Similarly, home-schooled children now have access to structured online lessons. While some educators still question the effectiveness of online schools compared to face-to-face instruction, it is hard to deny they have become a mainstay of modern education.

The way students search for information has been impacted by computer technology. Instead of a trip to the library, students go online to access vast amounts of information. Large digital collections provide students with searchable text, engaging multimedia and interactive content.

Teachers making use of computer technology have more ways than ever to engage their students. PowerPoint presentations with rich multimedia such as graphics, videos and animations appeal to the visual learners in the classrooms. Multi-touch smart-boards go further by getting the students involved. Whether it is an elementary school student matching animals to their natural habitats or a chemistry student assembling molecules with the fingers, smart-boards add a kinesthetic dimension to the learning experience. All of this equates to an increase in motivation and interest that drive students to want to learn more.

Computer technology has brought many components of class management online. Through Learning Management Systems such as Blackboard and the open-

source Moodle, students enroll for classes, access important documents and take online quizzes. Discussion takes place in forums and wikis and teachers send feedback and grades all in a virtual space. Online schools make it possible for non-traditional students such as a working adult or a parent taking care of a child to earn a degree from an accredited online school despite their busy schedules.

Computer technology also affects geographically isolated and underprivileged students. Schools in rural areas, such as those in the state of Alaska, attend "blended classes," a hybrid of online and face-to-face instruction to connect to other learning communities. Children in India are closing the digital divide which helps students develop computer skills that promote social mobility in a caste system.

Hot debate surrounds the social implications of online learning. For those with crippling social anxiety, a screen separating them from others may be a relief – and provide a less stressful way to ask questions and make comments. Some may have the opposite reaction, however, if they lack proficiency with computers and the Internet. An online course facilitates discussion while respecting all of its students. Because instructors cannot see student reactions, and do not always receive immediate feedback, they must tread carefully with touchy subjects and keep the discussion focused and respectful. Online learning instructors may have to try harder to make everyone feel connected to the group and to the course content.

Distance communication technologies are being used to communicate information to large groups of people over the Internet. For example, a college class may use distance learning technology to conduct a weekly meeting to go over assigned reading, while a group of business associates may choose to conduct meetings with their West Coast office via video conference. The ability to share a single screen is helpful for both online classrooms and business associates.

If developed properly, online classes may increase efficiency and course productivity. To supplement lectures, teachers can provide access to tools that facilitate discussion and active participation. In an online environment, teachers can reach students with different learning styles more easily. For example, they could post a video lecture for those who learn best by listening, a diagram, photos or video for those who learn best by seeing and an interactive game for those who learn by doing. Online assessments may help teachers identify those students that need some extra attention, making it less likely that these students slip through the cracks than in a traditional setting. An advantage of distance communication technology is that it allows participants to meet in a single online location from literally anywhere in the world. A participant often only needs to create a username and password to be able to join an online meeting.

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ANALYSIS OF MAJOR THREATS OF MOTOR VEHICLES INFORMATION SAFETY

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The characteristics of on-board electronics and communication channels of most modern cars do not meet the minimum requirements for their information security [1, 137 – 142]. Vulnerabilities of automated systems of vehicles reduce their information security, and therefore, the efficiency of operation and road safety. These problems result in the relevance of information security risk management, as well as the need to develop methods for mechanical and electronic protection of vehicle systems.

Road accidents take up to 1.3 million people each year, and losses reach billions of dollars [2, 116]. The existing methods to improve the efficiency of vehicle operation are based on the study of certain characteristics of the driver-car-road environment system, without taking into account their synergies [3, 40]. However, highly efficient use of cars requires systematic study of their properties, which have a significant impact on road safety. There are active, post-accident, information, environmental and passive safety of cars. The European Program for the European New Car Assessment Program (Euro NCAP) [4] offers an overall assessment of the safety of new cars based on the assessment of the four most important components. These components are determined using the set of criteria given below.

To test the effectiveness of work, such safety devices as [4] are evaluated:

- an electronic stability control system;
- signaling devices of seat belts not fastened;
- a system for ensuring the recommended speed limit;
- a system of autonomous emergency braking during trips;
- a car restraint system on the lane.

Modern cars are sophisticated technical systems equipped with electronic devices to improve operational and technical properties. In 1990, electronic devices and software accounted for about 16% of the cost of the car, in 2001 – 25%, and in 2005 – up to 40%. According to estimates of the Center for Automotive Research of the State of Michigan, as of 2014, electronics and software account for up to 40 –50% of the cost of a modern car. Also, according to the IEEE Engineering Association, it is known that software represents 90% of innovations in cars.

The steady trend of increasing the number of electronic devices in modern cars with wired and wireless connection inevitably leads to an increase in vulnerabilities, which means a decrease in safety and operational efficiency.

The study of the state of information security shows that among the 173 automobile companies surveyed around the world, the number of incidents detected in 2015 increased by 32% compared to 2014. 98% of all tested software applications in cars have serious defects, some – from 10 up to 15 [3, 45].

The matrix of threats to information security of the car allows systematizing data on the probability of interception by the cars control as a result of the intervention of intruders, in particular:

– power unit (transmission, engine, hybrid drive systems, as well as their sensors);

– chassis and elements of safety systems (braking system, steering control, environmental sensors, airbag sensors, air pressure sensors in tires, chassis sensors);

– electronic body systems (door modules, remote locks, light control, seat control);

– comfort systems (air ventilation, climate control, remote start); infotainment systems, etc.).

Experts identify four classes of vulnerabilities in the vehicle protection system:

1. Direct physical access;

2. Indirect physical access (USB, PassThru, CD).

3.Wireless access at close range (Bluetooth, Android-applications, interception of the MAC address of the car network device, bruteforce PIN);

4. Wireless access at a long distance.

Using the complex of vehicle safety criteria, the probability and possible consequences of risks in the interception of vehicle control are determined. The obtained results can be used at the stages of production and operation of vehicles with the aim of improving both information security and road safety in general.

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Veis A. A.

CAN PROGRAMMING IMPROVE YOUR BRAIN?

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Programming is the process of taking an algorithm and encoding it into a notation, a programming language, so that it can be executed by a computer. Although many programming languages and many different types of computers exist, the important first step is the need to have the solution. Without an algorithm there can be no program.

Computer science is not the study of programming. Programming, however, is an important part of what a computer scientist does. Programming is often the way that we create a representation for our solutions. Therefore, this language representation and the process of creating it becomes a fundamental part of the discipline [1].

Careers in code and programming are no doubt booming. But are there less-visible benefits? Can a career in software and web development keep you healthy and fit, particularly your brain? Besides agile software development methods, meet-up groups and collaborative projects — which help foster social interactions — programming involves creativity, critical thinking and algorithmic skills necessary to complete tasks [5].

Although claims regarding the cognitive benefits of computer programming have been made, results from existing empirical studies are conflicting. To make a more reliable conclusion on this issue, a meta-analysis was performed to synthesize existing research concerning the effects of computer programming on cognitive outcomes. Sixty-five studies were located from three sources, and their quantitative data were transformed into a common scale — Effect Size. The analysis showed that 58 or 89 percent of the study-weighted effect sizes were positive and favored the computer programming group over the control groups. The overall grand mean of the study-weighted effect size for all 432 comparisons was 0.41; this suggests that students having computer programming experiences scored about sixteen percentile points higher on various cognitive-ability tests than students who did not have programming experiences. In addition, four of the seven coded variables selected for this study (i.e., type of publication, grade level, language studied, and duration of treatment) had a statistically significant impact on the mean study-weighted effect sizes. The findings suggest that the outcomes of learning a computer language go beyond the content of that specific computer language [4].

“Coding is like cardio for the brain,” noted SELF editor-in-chief Joyce Chang in a tweet. It keeps your brain in shape. Research has found that learning challenging tasks can keep cognitive functions sharp as we age. The key is that tasks must be new and mentally stimulating — they’re not repetitive or things that you already know you’re good at. One could certainly argue that computer

programming would count as a new challenging new mental task, as it forces you to ponder and conceptualize problems, spot errors, evaluate and re-evaluate decisions, and communicate through a different language (one recent study that used fMRI imaging tools to study coders' brains found that reading code activated parts of the brain that are related to learning, speaking and understanding language. Others have argued that computer programming is like communicating in a land where math and logic are the native tongues) [2].

So, are programmer brains different? Evidence from related studies support the idea that programmers may have enhanced working memory capacity, heightened language processing skills, stronger analytical skills, and possibly enhanced hippocampus capacity. We need more specific research in this area to be sure that the results hold for broader programming activities [3].

Students are able to obtain some cognitive skills such as reasoning skills, logical thinking and planning skills, and general problem solving skills through computer programming activities. Since fostering students' problem solving ability is usually part of our educational goal, the results provide to teachers a mildly effective approach for teaching students problem solving skills in the classroom setting. Left unanswered is the question of whether computer programming is as efficient, or any more efficient, at developing these problems solving abilities than other possible instructional approaches that teachers might use. Studies of this question, however, will probably require further clarification of the exact nature of the problem solving abilities most likely to be developed through programming. This meta-analysis points out only that improvements in cognitive outcomes are possible [4].

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Zimbytskyi S. V.

APPLICATION OF STRUCTURAL CONSTRUCTIONS FOR BUILDING PEDESTRIAN BRIDGES

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The erection of pedestrian bridges in conditions of difficult accessibility over the existing motor roads and railways without stopping traffic is a necessary component of the reconstruction program of the transport system of Ukraine. Obviously, to implement this task, it is necessary to develop new economically justified and technically efficient constructive systems of pedestrian bridges. It can be obtained using the new energy principles and direct design methods [1, 2]. In this case, the problem's goal is to build an energy-stable system with a constant strain energy density within each element and the system as a whole. This predetermines the rationale of rationalizing the construction of pedestrian bridges under the action of static and dynamic loads.

Based on the obtained theoretical results [3, 4], new constructive solutions for span structures of pedestrian bridges have been formed, in which the compressed part is presented in the form of a lightweight reinforced concrete slab with the possibility of using buried inside cavity inserts of lightweight, inexpensive material, and the stretched part in the form of metallic structural lattice [5, 6]. In this connection, tests of a separate module of the steel-fiber-span structure of a pedestrian bridge, 7 m long, 2 m wide, 0.5 m high (Figure 1), loaded with static short-term low-cycle and long-term loads [7] were carried out.

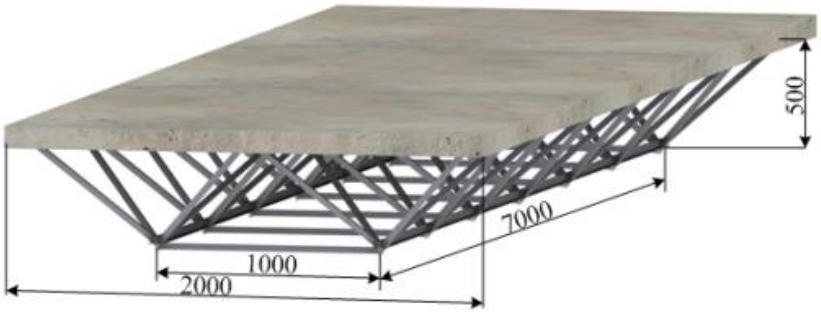

Fig.1. Scheme of the studied design of the pedestrian bridge span structure

However, according to the results of static tests, it is only possible to partially assess the bearing capacity of the bridge structure.

The considered dynamic tests of the span structure were carried out (conducted) in two stages: the first stage is the determination of frequencies of natural vibrations of the spatial metal framework, up to the device of the reinforced concrete plate (Fig. 2); 2-nd stage: - determination of natural oscillation frequencies of the fully equipped steel-fiber span structure (Fig. 3).

Fig. 2. Dynamic tests on the 1-st stage

To measure the value of static deflections arising due to the action of the load, which subsequently creates a dynamic impact (falling load), 4 induction displacement sensors (DPI) were installed at the central nodes of the structure to fix the vertical displacements.

Fig. 3. Dynamic tests on the 2nd stage

To record the vibrations of dynamic vibrations of the bridge, a self-recording mechanical device of the Geiger system was used (Fig. 4).

Calculations of natural frequencies were performed in the environment of VK “Lira” (version 9.6) . The results of calculations are demonstrated by numerical values of frequencies (Table 1.) for the two design schemes considered: for a metal spatial grid lattice combined with a reinforced concrete slab and without a plate. Dynamic characteristics for the studied span structure of the pedestrian bridge, obtained experimentally, are given in Table 2.

Fig.4. Mechanical device of the Geiger system

Table 1. Results of calculating the natural frequencies of bridge oscillations

Scheme	Form No.	Frequencies		Period T, s
		ω, 1/c	*f*, Hz	
Structure without a plate part	1	126,74	20,172	0,049
	2	126,74	20,172	0,049
	3	126,79	20,180	0,049
	4	126,83	20,185	0,049
	5	126,86	20,190	0,049
	6	126,88	20,194	0,049
Structure with a plate part	1	68,24	10,861	0,092
	2	68,26	10,864	0,092
	3	68,27	10,866	0,092
	4	68,28	10,868	0,092
	5	68,29	10,869	0,092
	6	68,30	10,871	0,092

Table 2. Dynamic characteristics of the span structure of the bridge L = 6m, obtained experimentally (during tests)

Structure without a plate part	The natural oscillation frequency f = 23 Hz; The number of free oscillations is ω = 144 s-1; period T = 0.043c
Structure with a plate part	The natural oscillation frequency f = 13 Hz; The number of free oscillations is ω = 81.6 s-1; period T = 0.077 s
Evaluation of the influence of dynamic effects on the structure	The period of natural oscillations for a structure without a plate T = 0.048s and for a structure with a plate T = 0.077c does not fall within the forbidden range for pedestrian bridges (0.45 ... 0.6) [9] The negative impact on the bearing capacity is not imposed

The given results of theoretical and experimental dynamic studies of a separate module of the span structure of a pedestrian bridge show that:

- the operation of direct design methods provides a successful solution of two basic problems of the modern construction theory (for example, the span structure of a bridge): obtaining structures with a minimum consumption of materials for a given bearing capacity and maximizing the load-bearing capacity of the structure at a given consumption of materials; - the values of the frequencies of natural oscillations, fixed in the natural experiment, demonstrate a stable excess over the theoretical ones;

- the period of natural oscillations of the structure does not fall within the range forbidden for pedestrian bridges (0.45 ... 0.6) and, as a consequence, the carrying capacity of the system under consideration, the design of which has undergone experimental verification, is sufficient to absorb design loads;
- the hardening of the structure, by including a reinforced concrete slab in joint work with the upper belt, leads to an increase in the rigidity of the system, on the one hand, and a significant increase in mass, on the other hand. In turn, the growth of the total mass of the structure entails a drop in the frequency of natural oscillations. At the same time, it should be noted that the increase in frequency can be achieved by means of the device of the proposed efficient reinforced concrete plate of a lightweight type with buried inside liners - embrasers made of some light, inexpensive material (for example, expanded polystyrene, polyurethane foam, etc.);
- comparison of the dynamic characteristics of the span structure of the pedestrian bridge, obtained experimentally, with the corresponding theoretical values determined on the basis of the constructed model made of finite elements of common rods and shells of zero Gaussian curvature, as well as in the case of static loading, characterizes the design model as sufficiently correct (the scattering of theoretical and experimental values of the studied parameters did not exceed 13-16%).

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MATERIAL SCIENCE

Asaian V. G.

WEB APPLICATION FOR AUTOMATIC CALCULATION OF TRACTION AND SPEED PROPERTIES OF A CAR

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The infrastructure of a large settlement has unpaved and improved roads, highways and colonial roads, thus, road transport plays an important role in the life of a modern country. Motor vehicles could participate in all spheres of human activity: national economy, transportation of passengers, transportation of cargo, etc.

Motor vehicles bring significant benefits in the most important aspects of urban and rural life. They are used to solve many tasks, but in addition to the advantages it also gives obvious disadvantages: every day there are a large number of accidents with serious consequences.

Motor vehicles can be divided into cargo, passenger and special (according to destination), or can be classified according to their manoeuvrability into the cars of ordinary manoeuvrability (non-wheeled), cross-country (four-wheel drive), moving through snow and bogs and amphibias.

They are also distinguished by the type of engine: petrol, diesel gas, gas-generator, electrical, etc.

Manufacturers allocate a significant part of the budget for research in the field of road safety – motor transport is the most dangerous means of transport. Designers do everything to increase control over internal and external factors that affect the controllability of the car.

The most popular security systems are the following: pedestrian detection system; brake force distribution system; emergency braking system; anti-slip system; stability control system; anti-lock brakes; electronic differential lock.

The existent security systems have become normal and are considered compulsory, but not all of them are available for a common consumer – many high-tech functions are only present in expensive models.

Do not forget about the features that any responsible driver can take into account. When using a car from a driver, you need responsibility and constant concentration, since tragedy often happens due to mistakes not on the side of the equipment. According to official data, among all types of road accidents, a significant percentage is due to speeding. The motor transport movement is determined by a number of external and internal factors.

In the study of any operational properties, a car is replaced by a computational model, since taking into account all the relationships between the individual elements of the car for predicting the parameters of motion is a task of a large degree of complexity [1]. When working on a calculation model, you need to determine the goals of the assignment, in some cases, for example, you need to know the qualitative characteristics of the transport as a whole – so you can not take into account the links of individual elements with the body or frame and build a fairly simple calculation model [2].

Traction-speed properties are a set of properties that determine the permissible ranges of speed changes according to the characteristics of the engine or the coupling of the driving wheels to the road. Also, they determine the limiting intensity of acceleration and deceleration in road conditions.

Knowing the traction-speed properties of a particular wheeled vehicle, it will not be difficult to establish the degree of its suitability for use, the possibility of each transmission. This will reduce the chance not to manage the control due to untimely braking, poor adhesion, etc. during the trip, however, to calculate them you need to own additional information, which, more often than not, is available to the average user.

During the calculation, a number of specific indicators and some characteristics of the car are used. Take into account the height, width and length of the body, the area of the windshield, tire size, weight, power and type of engine and other data [3].

External factors influence the behavior when moving. The adhesion of wheels to the road depends on its inclination, such as the surface (ice, snow, pebbles, sand, asphalt) and weather conditions, the strength of resistance to recovery, the strength of resistance to acceleration and the force of resistance to wind.

All the parameters required for the calculation of traction-speed properties are present in the developed database for a web application that is designed to facilitate the process of designing or modifying a vehicle and its further operation. The user has enough knowledge of the site address. The data obtained after calculation helps to choose the most effective speed and acceleration of traffic in the selected road conditions, determine the limits of the permissible conditions of movement.

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INCREASING WEAR RESISTANCE OF FUEL EQUIPMENT PARTS

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Improving the quality and efficiency of road construction machines, their durability and maintainability accelerates the rate of work at all stages of construction. The commonest cause of in-service failure of road construction machines is the parts wear, which changes the most important characteristics of the machines. Parts wear results in engine power loss as well as higher consumption of fuel and lubricants. Because of it the performance and traction characteristics of machines change for the worse, and energy losses increase. Materials, processing technology, construction design are to guarantee the trouble-free operation of machines.

The reliability of road construction machines to a large extent depends on the reliability of diesel engines and their fuel equipment. The state of the fuel supply system and especially that of its precision parts has a decisive influence on the operation of diesel engines. The state of the surface of these parts affects the mixing and combustion processes in the engine cylinders, which define economic, dynamic and performance indicators of the whole machine. The service life of fuel equipment is limited not only by the technology of manufacturing parts, improving fuel filtration, changing construction designs, but to a great extent, by the wear resistance of precision pairs.

Road construction machines, as a rule, operate in a dusty or otherwise contaminated environment, which results in penetration of abrasive particles into the friction units. Wear debris also acts as an abrasive. Abrasive particles find their way onto the friction surface with oil and fuel. The main components of abrasive particles are SiO_2 (quartz), Al_2O_3 (alumina), Fe_2O_3 and other element connections.

What is more, quartz is contained in the largest quantity.

Abrasive particles easily penetrate into fuel tanks through atmospheric tubes as well as contaminated fuel. The quality of fuel and oil has a significant influence on the parts wear process. Fuel and oil can create a corrosive environment, which contributes to gas and acid corrosion of precision parts.

The nozzle needle is made of P18 steel. To obtain high hardness and wear resistance, the needle undergoes hardening and three-fold tempering. After heat treatment the steel has a structure consisting of alloy martensite, carbides and retained austenite (25-30%). Hardness of the steel after heat treatment is 60-65 HRC.

For surface hardening pulsed laser light has been used in the work. The process of treating the surface of steels and alloys with pulsed laser light has revealed a number of peculiarities in comparison with continuous laser action. First, due to a smaller wavelength, pulsed light is more absorbed by the surface of materials. Secondly, by reducing laser beam defocusing under the equal laser power it is possible to achieve a significant increase in pulse power density. The heating temperature of the material increases significantly, and high-melting compounds existing in the surface layer structure are to melt. And thirdly, the speed of cooling the surface of materials after pulsed processing is 100-1000 times higher than that of continuous laser action. Consequently, it is possible to obtain unique structures and properties of the treated surface.

To strengthen the surface layer of the nozzle needle, a solid-state pulsed laser “Quantum 16” has been used. The laser treatment has been performed with covering 40% of irradiation patches, which provides the formation of a reinforced zone of practically identical depth throughout the length of the strengthened layer.

It has been determined that the hardness of P18 steel, which is subjected to volumetric hardening and secondary laser hardening at temperatures close to the solidus temperature, depends on the pulse duration (Fig.1.)

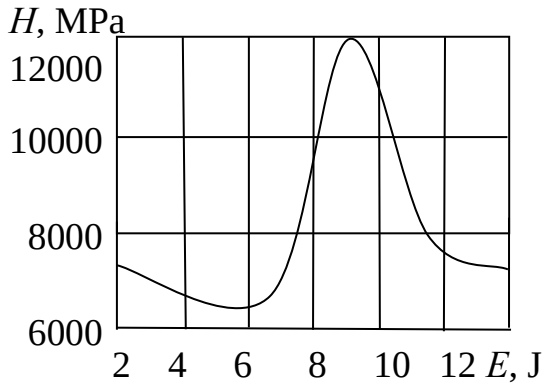

Figure 1. The dependence of hardness on pulse energy

Thus, based on the results of the study the optimal modes of laser hardening have been determined, namely: the pulse duration is 3 ms, the pulse energy is 8.5 J, the pulse energy density is 120 J*cm^{-2}, the power density is 40 kW*cm^{-2}. The

micro-hardness of the surface layer is 12900 MPa, the depth of the reinforced zone is 0.15 – 0.2 mm.

The technology for treating the nozzle needle has been developed, the suggested optimal modes of hardening can increase its hardness, wear and heat resistance, reduce the probability of abrasive wear, which positively affects the operation of fuel-supply equipment and the whole engine.

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EFFICIENT METHOD OF PRODUCING BILLETS FROM LOW-DUCTILITY STEELS BY COLD DEFORMATION

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Cold plastic deformation of steel in a high-strength state can not be performed by traditional methods of pressure treatment (rolling, drawing, and pressing). Almost the only appropriate method for it is hydraulic forging (HF) that is an extrusion of a metal out of a closed container through a die by means of liquid under pressure. Due to the high hydrostatic pressure and all-round compression, the ductility of metals is significantly increased and the possibility to process brittle materials with high degrees of deformation without cracking and layer separation appears. At the same time deformation homogeneity of the billet, high surface quality, substantial improvement of its performance characteristics are provided.

Along with the undeniable advantages of the HF method it should be noted that its implementation requires complex and expensive equipment and there is a shortage of it in Ukraine. The purpose of the work is to substantiate the expediency of using a simpler process of hydrodynamic extrusion (HDE) of billets made of low-ductility steels.

Billets of supercharger shafts of the internal combustion engine made of 4XN2MFA spring steel, whose chemical composition is given in Table 1, were produced by the HDE method, which is specified in the diagram in Figure.

Table 1. Chemical composition of 4XN2MFA steel

Number of elements, %								
C	Mn	Si	Cr	Ni	Mo	V	P	S
0.43–0.50	0.5–0.8	0.17–0.36	0.9 – 1.1	1.3 – 1.8	0.2 – 0.3	0.12–0.18	0.02	<0.02

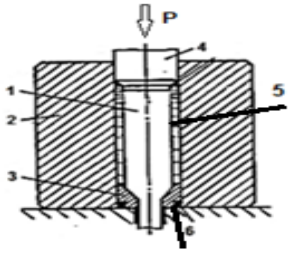

Fig. 1. The basic diagram of hydrodynamic extrusion: 1 – billet; 2 – container; 3 – die; 4 – ram; 5 – working fluid; 6 – sealing elements

Before being placed in the container, the billet is abundantly lubricated with spindle oil (quasi-liquid medium), which acts under strong pressure only on cylindrical surface of the billet, and its upper end is directly in contact with the metal ram (4). At the same time the conditions of hydrodynamic extrusion are fulfilled and all-around compression of the material occurs. According to such deformation pattern there are no tensile stresses and it gives a possibility of deforming the billet by 40-50% in just one pass. After the process of deformation is performed, the billet is tempered at 350°C for 3 hours to stabilize the structure of the deformed metal. The final stage of heat treatment involves hardening with rapid heating up to 870°C in salt bath (to avoid grain growth) as well as cooling in oil and tempering at 220 C° for 2.5 hours. The hardness has been determined using the Vickers hardness tester UIT HV-10/30/50. The dislocation structure has been scanned by the electron microscope REM 106. The mechanical characteristics (σv, σ0.2, δ, ψ, KCU) of the steel have been determined by standard techniques. Fatigue tests have been carried out on the MUI – 6000 machine.

The following results have been obtained in the course of the research: in the initial state after quenching and medium-temperature tempering, the steel has a bainite structure with troostite fringes along the grain boundaries. The size of the grain corresponds to ~ 0.03 mm. This structure provides high yield point (σ0.2) as well as low hardness and ductility and reduced ultimate strength (σv).

A heavy-loaded component part requires the high σv, which can be achieved by decreasing tempering temperature to 200-220 °C. However, in this case, the coarse-needled martensite structure with dispersed carbides is obtained. It has high hardness (540HV), but very low ductility and fracture resistance. In order to obtain high strength as well as high ductility indices and impact strength, the steel roller

billet with a diameter of 20 mm has been produced using the HDE method accompanied by further stabilizing tempering.

In the course of the deformation process under all-round compression the substructure undergoes changes, namely, clear dislocation cells of 0.5 to 2 μm are formed with a low density of dislocations inside and a disorientation angle of 12°. This substructure can increase the structural strength of the material.

After the final heat treatment (hardening with a low tempering) of the deformed metal, fine-needled martensite structure with a hardness of 540-550 HV is formed. The martensite inherits the dislocation structure of deformation, which explains an increase in mechanical characteristics.

The productive method of hydrodynamic extrusion with further strengthening heat treatment (hardening and a low tempering) is a promising technique for producing billets from high-strength alloy steels and low-ductility steels due to increasing their structural strength, as well as reducing the cost of items by means of simplifying manufacturing technology and using waste-free technological process.

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Krivtsov S. I.

DETERMINING HARDNESS OF MATERIALS BY SPHERICAL INDENTERS ACCORDING TO INTERNATIONAL STANDARDS

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According to the classical definition, hardness is the ability of a material to withstand indentation by a rigid body (indenter). The essence of the Brinell method lies in pressing a carbide ball with a diameter of 10, 5, 2.5 and 1 mm into the surface of the material under a load of 1 to 3000 kgf (ISO 6506–1: 2005). The Brinell hardness is determined using 30 scales, which complicates the selection of

measurement conditions. And the indenter size is measured using a loop with a low precision.

In KhNAHU it has been suggested determining surface, projection and volumetric hardness. The application of these hardness determination methods requires the development of formulae and computer programs to make possible their implementation in the international space.

The aim of the work is to simplify the selection of test conditions and increase the precision of measuring hardness by spherical indenters under implementing international hardness standards in Ukraine. This aim can be achieved by developing appropriate formulae and computer programs.

The Brinell hardness testing has been carried out on spherical graphite iron and flake one. The conditions for hardness measurement (i.e. the load intensity depending on the diameter of the ball and the material) have been chosen by the computer program in the following order: 1. Select the measurement method – the Brinell hardness method; 2. Select material group – cast iron; 3. Determine the Brinell hardness of cast iron; 4. Select the diameter of the ball – 5 mm; 5. Fill in the protocol on the results of measurements. The hardness is determined by the results of five indentation tests. The diameter of each indenter is measured in two planes with the aid of the measuring complex.

The formulae and computer programs for determining surface, projection and volumetric hardness by the spherical indenter using methods of recovered and unrecovered indents have been developed according to the standards ISO 6506–1:2005 and ISO 14577–1:2002.

By the parameters of the recovered indent the Brinell hardness can be calculated according to the the following formula:

$$HBW = \frac{2 \cdot F}{\pi \cdot D \cdot (D - \sqrt{D^2 - d^2})}$$

By the parameters of the unrecovered indent the Brinell hardness is determined as follows (N/мм^2): $HBW_{пов}^{інд} = \frac{F}{S_{пов}^{інд}} = \frac{F}{2\pi R h_{інд}}$

where h_{ind} is the depth to which the indenter is pressed into, mm;

R is the indenter radius, mm.

According to the parameters of the recovered indent, the projection hardness is calculated by the following formula (N / mm^2):

$$HBW_{np} = \frac{F}{\pi \cdot r^2}$$

where the projected area of the indent is defined as follows:

where r is the indent radius.

$$HBW_{np}^{інд} = \frac{F}{S_{np}^{інд}} = \frac{F}{\pi \cdot h(2R - h)}$$

According to the parameters of the unrecovered indent, the projection hardness is determined by the following formula:

where the projected area of the squeezed part of the indenter is determined as follows:

$$S_{\text{пр}} = \pi r^2 = \pi(R^2 - (R-h)^2) = \pi h(2R-h)$$

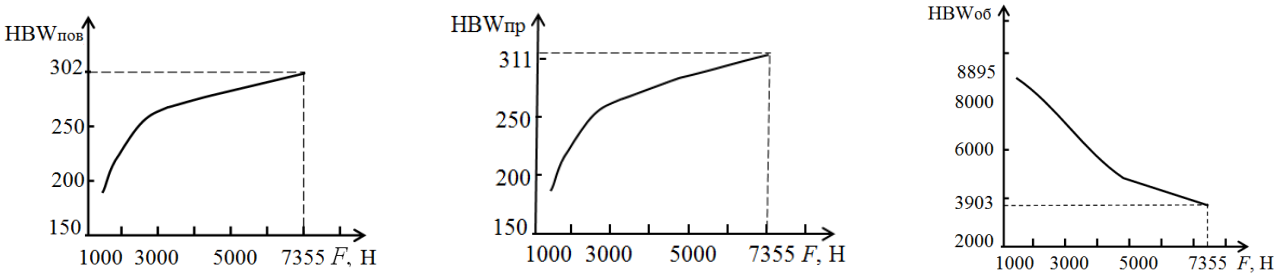
According to the parameters of the unrecovered indent, the volumetric hardness is calculated by the following formula (N / mm^3):

$$HBW_{об}^{інд} = \frac{F}{V_{інд}} = \frac{F}{1{,}047 \cdot h^{\,2}{}_{інд}(3R - h_{інд})}$$

where the projected area of the squeezed part of the indenter is determined as follows:

$$V_{інн} = \frac{1}{3}\pi h_{інн}^2 (3r - h_{інн})$$

The dependence of the surface, projection and volumetric hardness of high-strength cast iron on loading is shown in Fig. 1.



(a) (b) (c)

Fig. 1. The dependence of the surface (a), projection (b) and volumetric (c) hardness on the loading.

As a conclusion, it is clear from the graphs that the measured hardness is not constant over the full range of tests. It depends on the hardness measurement conditions (the depth of the indentation), the indenter geometry and size. When measuring the hardness, it is important to consider size effect, which can be reciprocal or direct.

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Kucherenko A. Yu.

ULTRASONIC FLAW DETECTION OF SEAM-WELDED JOINTS

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Ultrasonic flaw detection is a method proposed by S. Ya. Sokolov in 1928, which is based on studying the propagation process of ultrasonic vibrations with the frequency range from 0.5 to 25 MHz in the inspected articles using a special instrument called an ultrasonic flaw detector. It is one of the commonest methods of non-destructive testing.

Ultrasonic flaw detection is based on the ability of ultrasonic vibrations (UV) to propagate through the metal in the form of directed beams over long distances and to be reflected at the boundaries of two sections of different density (the base metal is a plate; the base metal is a surface layer of oxides, impurities, etc.).

One of the pulse methods of ultrasonic flaw detection of weld seams is the quality inspection by the frequency of the reflected signals of ultrasonic longitudinal waves (Fig. 1).

The piezo element of the search unit (l) emits a short pulse, which is injected through the intermediate medium (2) (water) into the controlled zone (3) (Fig. 1). While propagating through a metal, ultrasound is reflected when it encounters discontinuities along its path (6) or different surface planes (4 or 5) of workpieces. The reflected ultrasonic signal enters the detecting head (emission and reception can be performed by a single transceiver).

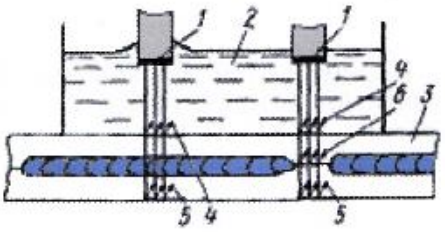

Fig.1. Schematic diagram of testing the weld seam quality by the reflection of ultrasonic longitudinal waves.

The aim of the work is to define the quality control technique for seam-welded joints and to offer the flaw detector type for performing the inspection.

The sensitivity of ultrasonic testing increases with an increase in frequency. If welding is performed without defects, ultrasonic signals are observed as a series of distinct pulses of constant frequency, in case of poor welding the frequency of the signals increases.

This method makes it possible to detect discontinuities with the thickness of 0.5–1 μm, when the total area of discontinuities is 50% and the thickness of the welding layer is 10–100 μm. In case of welding clad aluminum sheets they are not determined. The results of testing roller seam welds with a total length of more than 100 m as well as the macrosection test results have shown the data coincidence of 60% within the accuracy of 5–7%. Zones of poor fusion that are less than 2 mm cannot be detected with this method of ultrasonic testing.

Welding quality control allows detecting the points with lack of fusion according to the time of signal attenuation (Fig. 3) by the amplitude and coefficient of attenuation of the incoming ultrasound beam at a frequency of 10–15 MHz from the special head (Fig. 2).

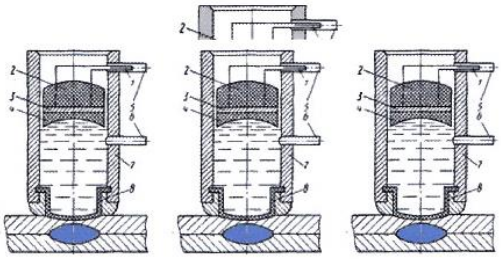

Fig.2. Schematic diagram of the head for testing the quality of points by the amplitude and frequency of the attenuation of the reflected ultrasonic signal.

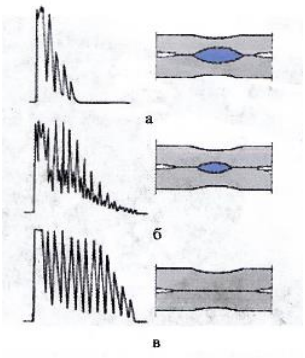

Fig.3. Diagrams of ultrasonic signal attenuation during proper welding (a), in case of partial defect of fusion (b) and total lack of fusion (c).

The head (Fig. 3) creates a parallel beam of ultrasonic vibrations, and the diameter of the piezo element depends on the thickness of the workpieces under test. With the help of the flexible adiprene membrane, a reliable acoustical coupling is created through the water supplied under pressure via the tube. Quality inspection of the points is carried out according to the indicated values of the electronic device connected to the leads. In this case, the total lack of fusion is determined by the coefficient that is equal to 1. The determination coefficient under partial defect of fusion is 0.6 and a point of normal quality corresponds to 0.08.

According to the results of the research UD-3-71 flaw detector (Fig. 4) can be recommended for ultrasonic flaw detection of seam-welded joints.

Fig. 4. UD-3-71 (Ultrasonic General-Purpose Flaw Detector)

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ULTRASONIC INSPECTION OF SPOT WELDS

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The quality of spot welds plays an important role in the reliability of vehicles. Three methods are currently used for inspecting spot welds:

– The “chisel and hammer” method. This method has a limited application, namely it does not provide the accuracy of testing three-layer welds as well as coated materials, and it cannot be used for painted parts;

– Destructive inspection. This method can detect defects in welds with 100% certainty, but it is very expensive;

– The ultrasonic testing method. Non-destructive method, which is characterized by high speed, accuracy and ease of implementation provided by the automated computerized analysis.

The ultrasonic method of spot weld inspection is based on the registration of multiple reflections of bottom signals from the opposite surface of the welded joint, as well as signals from the contact planes of welded sheets. The analysis of the total duration of the sequence of these signals, as well as their attenuation and the position of intermediate signals, makes it possible to differentiate between good and discrepant welds and to classify the defects in welded joints.

The aim of the work is to define the possibility of using ultrasonic waves for testing the quality of spot weld points.

The use of the digital amplitude of ultrasonic waves gives ability to computerize the inspection procedure on the basis of the on-line analysis of ultrasonic signals.

In addition to nondestructive quality inspection, the ultrasonic testing method offers high productivity as well as high reliability of detection and complete documentation capability (Fig. 1).

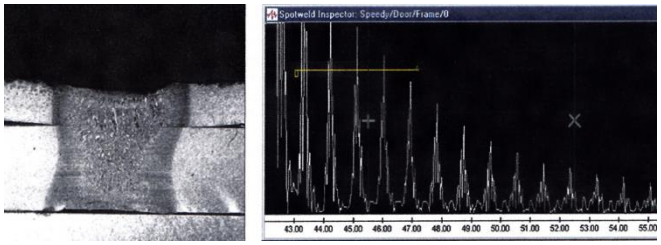

Fig. 1. – Lack of fusion between the second and third components of the three-sheet spot weld (a). A-scan image of the discrepant welded joint (b).

There are basically two methods of ultrasonic inspection, namely shadow method and pulse echo method (the method of reflected waves), Fig. 2.

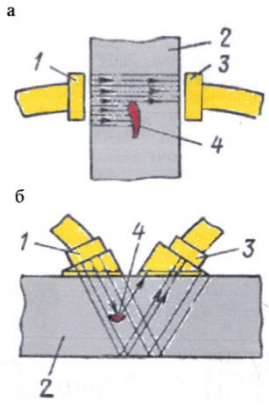

Fig.2. Schematic diagram of ultrasonic inspection performed by: a – shadow method; b – pulse echo method; 1– wave transmitter; 2 – workpiece under test; 3 – wave receiver; 4 – defect.

Under pulse echo method the boundary of ultrasonic reflections occurs in the weld zone during metal melting and disappears when the metal solidifies. The reflection of ultrasonic waves takes place due to the difference in the acoustic properties of solid and liquid metals.

The shadow method of ultrasonic testing can be considered a promising technique for spot welding. Piezoelectric transmitter *1* and receiver *6* of ultrasonic waves are mounted on the top *2* and bottom *5* electrode arms of the spot welding machine (Fig. 3).

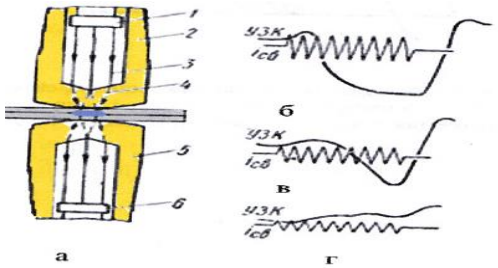

Fig. 3. Spot weld testing by ultrasonic shadow method.

The compression stress applied to the electrodes provides acoustical coupling and stable transmission of ultrasonic waves. In the process of melting zone formation, the conditions for the passage of ultrasonic vibrations throughout the workpieces undergo changes. Longitudinal ultrasonic vibrations weakly react to the formation and dimensions of the molten zone and therefore, they cannot be used for the inspection. Transverse ultrasonic vibrations cannot propagate in liquid fluids and they are completely reflected from the solid-liquid interface, which makes them suitable for the inspection by shadow method. From the transmitter longitudinal ultrasonic vibrations travel through the water used to cool the electrodes and by means of the cone bottom, they are converted into transverse ultrasonic waves, which, after passing through the welding zone, are again converted into longitudinal ones and get into the receiver.

This method has the following disadvantages: it is not suitable for spot welding using contoured electrodes; its results depend on stability of water supply into the electrodes and their heating under increasing welding heat; it involves labour-intensive adjustment of sensors and testing equipment.

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Nosenko A. M.

EXPERIMENTAL INVESTIGATION OF BUTT-WELDED JOINTS USING WDW-50E TENSILE TESTING MACHINE

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To carry out tensile testing of welded joints of circular bars a WDW-50E machine has been used. It is a computer controlled electronic universal testing

machine, which operates with high accuracy. A WDW-50E machine is employed in testing specimens for tensile strength, compressive strength, shear strength and performing bend tests along with other important laboratory tests. The primary use of the testing machine is to create the stress strain diagram. Once the diagram is generated, a pencil and straight edge or computer algorithm can be used to calculate yield strength, tensile strength or total elongation.

A WDW-50E machine consists of three parts:

– loading unit: load frame and equipment for it;

– operation unit: servo drive, servo system and movement delay system that is under the loading work platform;

– load measurement, data recording and processing: a sensor and software for measurement control, PC, systems for printing and data processing.

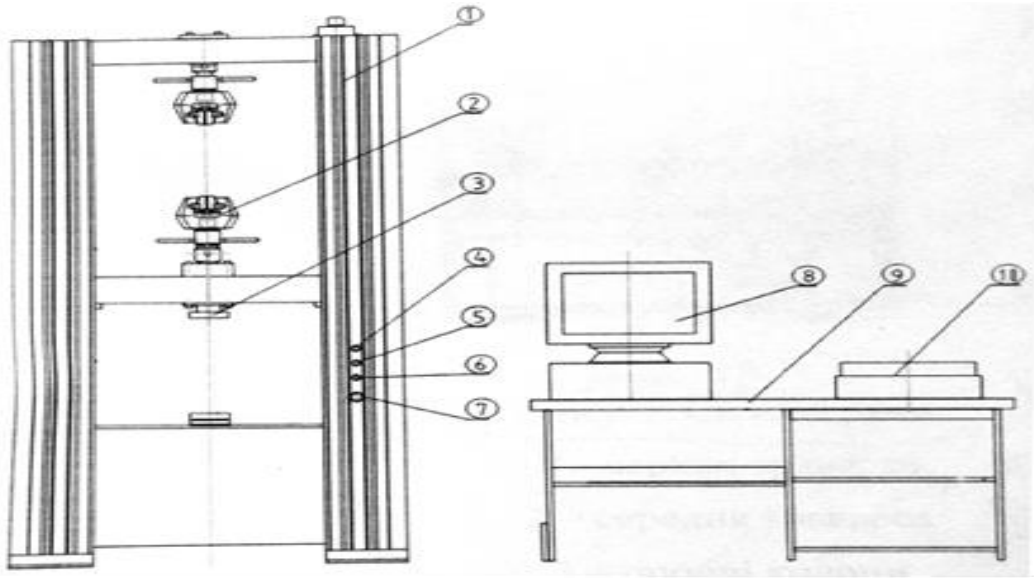

Figure 1. The general appearance of the WDW-50E machine
1. Load frame; 2. Wedge grip; 3. Additional compression device; 4. Up button; 5. Down button; 6. START button; 7. Emergency signal; 8. Monitor; 9. Computer desk; 10. Printer.

Static loading has been carried out by a slow and gradual increase in strength. The cylindrical specimens, on which the tests have been performed, are shown in Figure 2.

Under tension the dependence between the force P stretching the specimen along the ordinate axis and the deformation caused by it Δl (mm) that is an absolute elongation of the specimen along the abscissa axis $P = f(\Delta e)$ has been registered. The tension diagram is shown in *Figure 3.*

Figure 2.

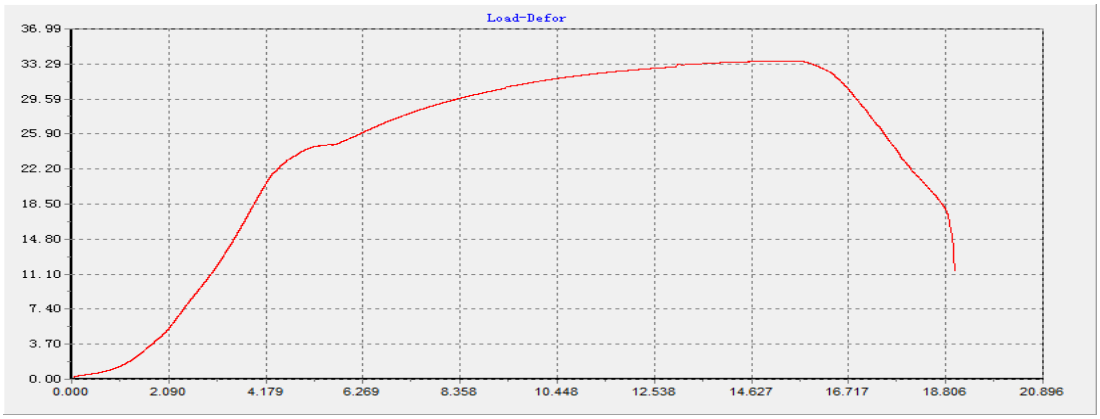

Figure 3.

According to the diagram, several sections can be singled out on the tension curve. At the initial stage the deformation/elongation Δl is almost proportional to the force P. At this stage, the so-called yield drop is observed. The second section corresponds to the deviation of the curve from the initial rectilinear direction. The initial plastic deformation conditionally corresponds to the force *Po2*, namely to the force that causes a permanent deformation of 0.2% and is called the offset yield point. After reaching the maximum value *P max*, the force is sharply decreased, and the specimen is destroyed. In the case under consideration, *P max* corresponds to 33.29 kN and the absolute elongation is 18.8 mm. In the diagram above, the yield segment can be singled out, which separates the section of plastic deformation from that of elastic deformation. The elastic deformation disappears after removal of the load, but plastic one remains.

Figure 4. General view of the program

As a conclusion, it can be pointed out that WDW-50E machines give an opportunity to control each stage of testing in accordance with the requirements, namely to stop loading at any point and obtain the required information. According to the testing results, the maximum force that causes the specimen destruction is 33.29 kN.

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Serdiuchenko S. V.

INVESTIGATING ADHESION STRENGTH OF COATINGS TO THE BASE MATERIAL

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One of the main quality indicators of flame coatings is the strength of adhesion to the base material. It is important to be able to determine this indicator when developing the spray coating technology.

There exist many methods for determining the strength of adhesion to the base, each of which has its advantages and disadvantages. To develop the technology of flame spray coating, it is necessary to use the most accurate method

of determining the strength adhesion, which can be implemented in the plant laboratory.

The aim of the work is to define the methodology for determining the adhesion strength of the coating to the base and to offer the equipment for its implementation.

The method lies in the uniform separation of the coating applied to the end face of the specimen, which is then stuck to the uncovered counter-specimen. The tests are carried out on cylindrical specimens with 25 mm in diameter and 16 mm in height. The thickness of the coating should be at least 0.2 mm.

To improve the strength of the adhesive joint the surface of the counter-specimen is to undergo abrasive jet treatment. Specimens and counter specimens are stuck together using an adhesive based on epoxy resin, such as grade ED-20 (GOST 10587-84).

The adhesive has the following composition in parts by weight:

– epoxy resin of ED-20 grade 100;
– plasticizer (dibutyl phthalate)13;
– hardener (polyethylenepolyamine)10;
– filler (calcined marshallit, Portland cement, aluminum oxide or asbestos) 100-200.

The allowable time between preparation and application of the adhesive should not be more than 30 minutes. The adhesive with the different composition can be used on condition that it does not penetrate into the base metal through the coating.

The bonding strength of the adhesive must be at least 30 MPa (300 kgf / cm^2).

The bonding strength of the adhesive is checked before testing each party of specimens. In order to do that, two counter specimens (uncoated) are stuck together, and the tests are conducted according to the procedure described below.

The adhesive bonding process requires providing axis coupling of the test specimen and counter specimen with an accuracy of 0.1 mm.

The pressure applied to specimens in the course of bonding equals 0.01-0.02 MPa (0.1-0.2 kg / cm^2).

The bonded specimens are kept at room temperature for 3 days until the adhesive is fully cured. To determine the strength of adhesion, pre-bonded specimens (Fig. 1) are fastened in a special centering device (Fig. 2) that provides alignment under loading and they are then placed in a testing machine.

The tests are carried out on the testing machine, which ensures gradual stretching of the specimen at a loading speed of 1-10 mm/min.

The test results are included in the calculation if the specimens are debonded either between the coating and the base metal or along the coating.

If a failure occurs along the adhesive coating, it is necessary to determine its strength as well as to improve bonding technology and to perform additional tests.

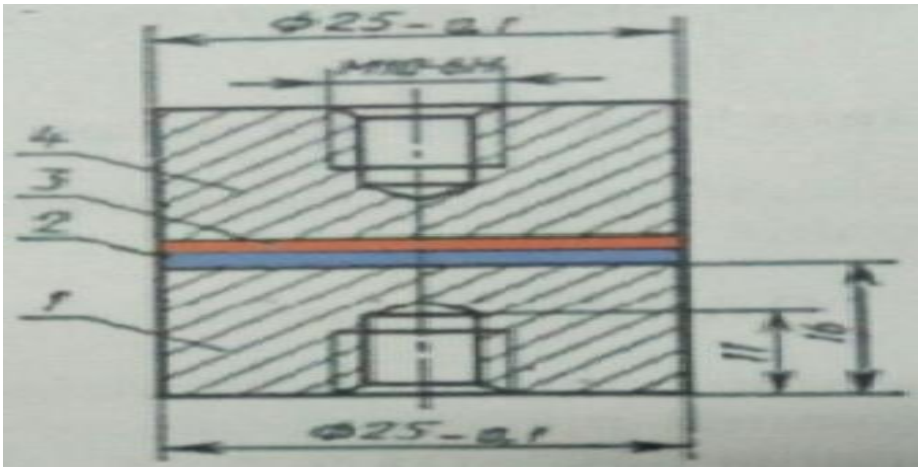

Fig. 1. Schematic diagram illustrating the adhesive bonding aimed at determining the strength of adhesion
1 – specimen; 2 – coating; 3 – adhesive layer; 4 – counter specimen

Fig. 2. The centering gripper

In the course of the investigation the methodology for determining the adhesion strength of flame coatings to the base has been chosen and specified. For its implementation, a testing machine “INTECHUNION” has been offered.

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Shepyk O. V.

EVALUATING OPERATIONAL PROPERTIES OF WORKPIECES USING KINETIC INDENTATION

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The most important operational properties of materials are strength and ductility, which can be obtained by tensile tests. This method is well-worked out, but requires the production of standard specimens by cutting. The researchers have always searched for the ways to conduct tests directly on workpieces, which is to use non-destructive testing. The basis of this idea lies in the statement that it is not necessary to evaluate the behavior of the material under its operational load. It gives a possibility of evaluating such important parameters as strength and ductility without expansion of the specimen but by indentation used on the materials, for which the empirical dependencies between these properties and hardness exist. The material under indentation (when measuring the hardness) behaves similarly as under tension. At first, elastic deformation occurs, then there is plastic one and, finally, destruction takes place.

Therefore, a special interest is paid to the improvement of rapid methods for controlling the operational properties of materials, based on the analysis of the continuous indentation diagram, which is the registration of continuous indenter pressing process. The use of such control methods allows us to evaluate the quality of materials by determining a number of properties, for example, hardness, elastic properties according to the indentation curve, and establish correlation bonds between them and strength factors as well as ductility indices.

The aim of the work is to determine the operational properties of machine parts using the load curve under continuous indentation by a spherical indenter. To achieve the aim kinetic diagrams are to be obtained to use them for determining the properties.

A UIT STM 50 tensile testing machine (maximum loading is 50 kN) has been used as a facility for continuous indentation. This model can operate in a hardness tester mode. For this purpose, a unit for mounting a ball indenter is installed on the machine and load force calibration is performed.

Using a UIT STM 50 testing machine it is possible to conduct simultaneously tensile and indentation tests under the same conditions, which gives an opportunity of determining the relation between indentation diagram characteristics and the indicators of mechanical properties with the greatest possible accuracy.

A carbide ball with a diameter of 10 mm has been used as an indenter. The maximum loading equals 29420 N. The indentation speed is 0.2 and 1.0 mm/min.
The kinetic hardness tests have been carried out on specimens with a thickness of 16 mm made of annealed steel.

The results of the indentation tests have been received on the computer in the form of load-graphs with the coordinates of the depth to which the indenter is pressed into and in numeric form. Each process of indentation has been performed twice and the average value has been taken into consideration.

Measuring indent dimensions has been performed with high accuracy using a measuring complex, which consists of a digital microscope connected to the computer and Scope Photo program. The depth of the recovered indent has been measured by an indicator with a scale division of 0.001 mm.

In the work, it has been offered to determine unrecovered surface hardness, which is Martens hardness at its core, but it is calculated for the entire interval of the indenter loading.

The recovered hardness has been calculated by the following formula:

$$HBW = \frac{2F}{\pi D\left(D - \sqrt{D^2 - d^2}\right)}$$

where D is the diameter of the carbide ball;

d is the indent diameter;

The unrecovered hardness has been calculated by the following formula:

$$HBW_{пов}^{інд} = \frac{F}{S_{пов}^{інд}} = \frac{F}{2\pi R h_{інд}}$$

where F is the load force applied to the indenter, N;

S is the lateral area of the indenter part pressed into the material, mm2;

h is the depth to which the indenter is pressed into the material, mm;

R is the radius of the spherical indenter, mm.

According to the research results the following conclusions have been made:

1. Modern machines and equipment under certain conditions require evaluating the operational properties of critical machine parts by rapid methods.

2. Rapid control of the properties can be performed according to the load curve, which is obtained by continuous indentation with the spherical indenter using special-purpose equipment.

3. Using indentation diagram the hardness, elastic component of deformation and other characteristics can be calculated.

4. The correlation relationship can be determined between indices of hardness and strength as well as indicators of ductility and wear resistance.

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NATURAL SCIENCES

Avditskaya A. E.

THE CONSEQUENCES OF THE CHERNOBYL ACCIDENT

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The Chernobyl accident occurred on April 26, 1986, at the Chernobyl nuclear power plant in Ukraine which used to be the part of the Soviet Union that time.

The Chernobyl accident was clearly a major disaster for the whole humanity. Public awareness of the risks of nuclear power increased significantly.

There was a nuclear reactor explosion which had far reaching consequences. The air, land, and water of Ukraine and vast areas beyond it have been contaminated by various radioactive isotopes, such as caesium-137, iodine- 131, strontium-90, plutonium-240, from the Chernobyl nuclear station. The radiation levels of Kyiv a few days after the accident exceeded the maximum allowable levels by a hundredfold.

The workers involved in the recovery and cleaning up after the accident received high doses of radiation. In most cases, these workers were not equipped with individual dosimeters to measure the amount of radiation received, so experts can only estimate their doses.

Besides liquidators there were many people who lived in that area. The accident produced a huge plume of radioactive debris that drifted over parts of the western Soviet Union, Eastern and Northern Europe, the UK, and even eastern USA. Large areas of Ukraine, Belarus, and Russia were badly contaminated. More than 300,000 people were evacuated and resettled.

Some children in the contaminated areas were exposed to high radiation doses because of an intake of radioactive iodine, a relatively short-lived isotope, from contaminated local milk. Several studies have found that the incidence of thyroid cancer among children in Belarus, Ukraine and Russia increased sharply.

As to the short and longer-term effects of radiation after the accident, the main health concern involved radioactive iodine, with a half-life of eight days. Today, there is not the less concern about contamination of the soil with strontium-90 and caesium-137, which have half-lives of about 30 years. The highest levels of caesium-137 are found in the surface layers of the soil where they are absorbed by

plants, insects and mushrooms, entering the local food supply. Recent tests have shown that caesium-137 levels in trees of the area are continuing to rise. There is some evidence that contamination is migrating into underground and closed bodies of water such as lakes and ponds.

The results of it were obvious: in the affected areas people suffered from stillbirth, birth defects and highly elevated rates of childhood leukemia.

Recent detailed field studies indicate that significant areas of agricultural and forest lands of Ukraine, Belarus, and Russia will remain unsafe for human occupancy and food production for upwards of eight thousand years. Nevertheless, thousands of people who were evacuated after the accident have returned to live and farm in these highly contaminated regions. Thus Chernobyl region has become something of a living laboratory for the study of nuclear contamination.

Different foreign countries offered specialized medical equipment and drugs for biological elimination of isotopes of numerous chemical elements from human body. Later on thousands of children were taken to other republics of the former USSR and abroad for corresponding medical treatment.

The IAEA notes that, the Chernobyl accident released as much as 400 times the radioactive contamination of the Hiroshima bomb. That is why the so-called «Red Forest» of pine trees within the 10 km zone, immediately behind the reactor complex, can be observed. The forest is so named because in the days following the accident the trees appeared a deep red hue as they died due to extremely heavy radioactive fallout. In the post-disaster cleanup operations, a majority of the 4 km forest was bulldozed and buried. The site of the Red Forest remains one of the most contaminated areas in the world. However, it has proved to be an astonishingly fertile habitat for many endangered species.

There is no doubt that the accidents like that in Chernobyl must never be repeated again, because the very existence of millions of people may be under a threat. The safe maintenance of nuclear power stations depends on proper work and sufficient technical knowledge of every worker and engineer.

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WATER CRISIS – A TOP GLOBAL RISK

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Even when surrounded by a mass of water, you can feel thirsty. Almost three quarters of the Earth's surface is covered with water, while fresh water on the planet

is less than 3%, and only 1% of it is easily accessible. We are all vitally dependent on this tiny percentage.

In the list of the largest global risks for humanity compiled by the World Economic Forum for the next 10 years on the criterion of potential impact, the problem of shortage of drinking water comes out on top. It has bypassed all the others, i.e., the failed attempts to mitigate climate change, as well as threats to food security. However, all these risks are interrelated.

Four billion people at least one month a year face a deficit of fresh water. According to a study published in the journal Science Advances, almost half of these people live in India and China. 663 million people have a lack of drinking water, and another 2.4 billion do not have normal sanitation conditions. The problem of lack of water resources is fed by different sources, we will consider the basic:

Natural water resources are unevenly distributed between the regions of the planet. The greatest negative effect of the lack of water resources is experienced by the countries of Tropical Africa, where the cost of water determines the development of the economy of entire regions. The situation with water scarcity is aggravated by the consequences of climate change: these two factors negatively affect agriculture, healthcare and income of the population. According to the forecasts of the World Bank, the GDP of several African countries may drop by 6% by 2050. The situation is aggravated by the low level of development of some states located to the south of the Sahara. To achieve a satisfactory level of water supply and sanitation, the economies of these countries will need investments of about 2.7% of GDP, or $ 7 billion a year.

The rapid growth of urbanization increases the consumption of water to support livelihoods. In addition to the factors associated with climate change, another 2 megatrends are involved in the rapid decline of water resources: population growth and urbanization. More than half the world's population currently lives in cities, and by 2050 the percentage of urban population will reach 66%. This means that another 2 billion inhabitants will need fresh water for drinking, washing and cooking. According to the UN forecasts, about 90% of urban population growth will be concentrated in Asia and Africa, where the problem of water deficit is the most pronounced. However, other regions, regardless of the climatic zone and geographic zone, are also not immune from the emergence of problems with drinking water. For example, Brazil, the birthplace of tropical forests and the storage of eighth of the world's freshwater supplies, as a result of rapid urbanization, has faced droughts that are more typical of deserted Iran.

70% of the world's fresh water is used in agriculture, and about 60% of this volume is lost because of irrigation, inefficient technologies, drainage of marshy areas, and growing crops that consume too much water (rice, for example). Such a wasteful approach leads to the drying up of rivers, lakes and even underground waters. Many countries producing a large number of food products, including

India, China, Australia, Spain and the United States, have already reached or are close to reaching their water reserves limits.

A lot of factors lead to water pollution: pesticides and fertilizers, washed away from farmland, untreated sewage, industrial waste. And in the case of toxic wastes that industrial enterprises dump, all the negative consequences on the environment and the food chain may not immediately appear.

Improper handling of water resources can have disastrous consequences. The most illustrative example is the Aral Sea, located in Central Asia. Once it was the fourth largest freshwater lake in the world. But in just three decades, as a result of ill-considered actions to irrigate the region, the area of the Aral Sea has decreased by 90%. And because of pollution and water leakage, intended for irrigation and power generation, the salinity of water has increased 7 times. Drying up, the sea left behind contaminated land. This man-made environmental disaster has led to a shortage of food, an increase in infant mortality and a decrease in the life expectancy of the local population. The climate has also changed: in summer it is hotter and drier, and in winter it is colder.

Ukraine does not yet feel a shortage of drinking water, although its quality in many regions is far from accepted norms. Intensive development of the agricultural sector, as well as pollution of lakes and rivers with uncontrolled industrial emissions, leads to the fact that more and more sources of fresh water become unsuitable for domestic use and food industry. Unfortunately, environmental issues are not included in the zone of close attention of our society, therefore politicians do not see in the protection of the environment a way to earn themselves points in the eyes of voters. However, the situation can drastically change in the coming decades.

There are many approaches to solve the deficit of fresh water:

1. Preservation of fresh water in reservoirs will allow not only to protect water resources, but also to have a supply of water in case of unforeseen cataclysms.

2. Household and waste water must be properly treated and cleaned. This would save a considerable amount of fresh water.

3. The transformation of salt water into fresh water (desalination) is an excellent solution to the problem of fresh water.

4. With the help of modern technologies of genetic selection, it became possible to bring out new varieties of crops that are resistant to saline soils. Such plants can be watered with salt water, and this saves a considerable amount of fresh water.

5. Another interesting way to save fresh water when watering plants is the technique of drop irrigation. To do this, agricultural land is supplied with a system

of pipes of small diameter through which water enters directly to the plant or its roots and this sharply reduces the consumption of fresh water.

6. Wastewater. Since agriculture consumes a very large amount of water resources, it is possible to use wastewater for watering plants. This practice is not applicable in all cases, but it gives an effective result when used.

7. An unusual solution to the problem of lack of fresh water in the arid regions of the world is the creation of an artificial forest in the deserts. In practice, such projects have not yet been implemented, but work is under way.

8. Huge reserves of fresh water are concentrated in glaciers. If you melt some of them technically, you can release a significant amount of water. Another option for extracting fresh water is drilling deep wells.

9. More exotic option is the technology of impact on rain clouds and the formation of water condensate from the fog.

Thus, using modern environmental technologies, the problems of using fresh water can be largely resolved in the near future.

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WATER PURIFICATION

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Water purification plays a key role in ensuring access to safe drinking water. Safe drinking water positively impacts the health of the entire community. Systems are in place to ensure ongoing water quality, including water quality testing. The testing helps ensure the water treatment process results in a product that meets federal water quality guidelines. Water analysis involves looking for several kinds of contaminants, including unsafe levels of organic, inorganic, microbial and/or radioactive contaminants.

According to the international charity Water Aid, one in eight human beings, mostly in the developing world, goes without clean, safe water. Every 20 seconds, one child dies from diarrhea caused by contaminated water and poor sanitation. In wealthier countries, illness and death from water contamination are far rarer because of wide-scale, mostly government-operated water purification systems. Although these water treatment systems vary, many safeguard public health through an eight-step purification process.

Pre-Treatment. Pumps bring “raw" or untreated water, often from lakes or rivers, into the purification plant where it passes through screens that exclude fish, weeds, branches and large pieces of debris. If ground water is used, screening may not be necessary since the water has passed through layers of the earth in what is essentially a natural screening function. The plant may aerate the water at this point to increase the oxygen content and thus help remove problematic odors and tastes.

Coagulation & Flocculation. The purpose of these two steps is to clear water of the small particles that cause it to be turbid or cloudy. Coagulation & flocculation is a chemical water treatment technique typically applied prio to sedimentation and filtration to enhance the ability of a treatment process to remove particles. Coagulation is a process used to neutralize charges and form a gelatinous mass to trap particles thus forming a mass large enough to settle or be trapped in the filter. Flocculation is gentle stirring or agitation to encourage the particles thus formed to agglomerate into masses large enough to settle or be filtered from solution. Treatment plant workers add alum and other chemicals to the water, which cause tiny sticky particles, or floc, to form. This floc attracts dirt particles, making them eventually heavy enough to sink to the bottom of the water storage tank.

Sedimentation. Sedimentation is a physical water treatment process using gravity to remove suspended solids from water. The water and flocs are pumped into sedimentation basins. Here, the flocs settle beneath the water so that they can be removed. About 85 to 90 percent of the suspended particles responsible for turbidity are removed at this point, including large amounts, but not all, of the bacteria.

Although sedimentation might occur in tanks of different shapes, removal of accumulated solids is easiest with conveyor belts in rectangular tanks or with scrapers rotating around the central axis of circular tanks. Settling basins and clarifiers should be designed based on the settling velocity of the smallest particle to be theoretically 100% removed.

Filtration. After separating most floc, the water is filtered as the final step to remove remaining suspended particles and unsettled floc. In filtration, the water flows through a multilayer medium such as quartz sand, activated carbon or anthracite coal in order to remove up to 99.5 percent of the solid materials remaining in it, whether flocs, microbes or minerals. This step usually is the last one in the process of removing solids from the water.

Disinfection. Disinfection is accomplished both by filtering out harmful micro-organisms and also by adding disinfectant chemicals. Water is disinfected to kill any pathogens which pass through the filters and to provide a residual dose of disinfectant to kill or inactivate potentially harmful micro-organisms in the storage and distribution systems.

Most water treatment plants use chemicals, generally chlorine compounds, as disinfectants. Although chlorine is still one of the most common disinfectants, ultraviolet radiation and ozone gas are becoming more widespread. Chlorine is increasing in cost and has some known toxic effects on humans and fish. In

addition, some disease-carrying microbes like Giardia and Cryptosporidium resist chlorine. Following the introduction of any chemical disinfecting agent, the water is usually held in temporary storage – often called a contact tank or clear well to allow the disinfecting action to complete.

Corrosion & Scale Control. The pH of the water is adjusted so that it neither corrodes nor deposits too much scale in pipes. Excessive amounts of scale can disrupt plumbing systems, but small quantities help pipes to function at their best. However, no amount of corrosion in the water distribution system is desirable. As well as causing leaks and other damage, corrosion releases pipe metals like lead and copper that jeopardize human health.

Taste & Odor Control. Unpleasant tastes and odors remaining in the water, such as those from algae, often do not pose any health hazards. Yet consumers prefer to do without them. So water purification plants often remove tastes and odors through additional chemical treatment, ozonation or filtration. At this stage, some municipalities also require the addition of fluoride to the water for dental health.

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THE VALUE AND EFFECT OF COLLOID-CHEMICAL PROPERTIES OF SURFACTANTS IN FLOTATION

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Deposits of the far Eastern Apatite-containing ores are widely distributed. Due to the tense environment caused by the extraction of minerals, there is a problem of comprehensive utilization of resources.

With the aim of comprehensive utilization of Apatite-nepheline ores of the Khibiny Deposit of waste (tailings) production of Apatite "Apatite" get nepheline concentrate with Al2O3 is 28.5 %. Nepheline is a valuable raw material for aluminum production, glass production, cement, chlorine-free fertilizers, soda ash. Almost all of these products are obtained in the production process the main component of the nepheline – aluminum. Russia is the only country in the world to get nepheline concentrates from the tailings of Apatite – nepheline ores [1].

The main method of enrichment of Apatite-nepheline ores is flotation — one of the most common colloid-chemical processes. Flotation method of enrichment is based on the different ability of minerals to resist at the interface of two phases due to differences in their specific surface energies. Vigorously stir the slurry containing the fine grains of crushed ore, saturated with air, seal in the amount of pulp in the form of a large number of air bubbles. Air bubbles in contact with the liquid phase of the pulp and create the interface water — air. The mineral grains are not wetted by water when confronted with air bubbles fixed on this boundary. Consolidation of hydrophobic grains is due to the excess surface free energy of the system (σ) on all involved in the process the interfaces. The rising mass of bubbles forms on the surface of the pulp layer of foam. In the foam are extracted grains of minerals that are not wetted by water. The surface energy of mineral particles, the distinction which is based on this method depends on the chemical composition and structure of the crystal lattice [2].

Most minerals in natural form are well wetted by water and have no ability to flotation. As a result, the main agents, which provide the flotation of minerals, are the reactants, water-repellent surface of the mineral. The main purpose of such reactants absorb on the surface of mineral particles and reducing their wettability. These reagents are called gatherers. Generally, the effect of collectors is not enough selective. Therefore, use reagents that regulate the action of collectors, enhancing or weakening it. Agents, enhancing the action of the collectors, are called activators, and debilitating suppressor (depressors).

In order to slow down the destruction of the formed complexes it is necessary to use foaming agents. The role of foaming agent is also to create conditions for the fine dispersion of the input air and the prevention of bubbles from the coalescence of the volume of the pulp. Foaming agents increase the strength of the contact of the complex particle-bubble. In addition, an important feature of foam is a substantial reduction in the rate of rise of bubbles in a liquid.

The effect of all flotation reagents due to their ability to adsorb at various interfaces, as a result, they change the properties of these surfaces.

Currently nepheline concentrate get reverse flotation of tailings Apatite. As factory collective mix on the "Apatit" used the crude tall oil of the coniferous and crude tall oil, deciduous.

Tall oil constitutes a colloidal solution of a complex mixture of fatty and resin acids, neutral substances and is obtained by the displacement of weak organic acids of the salts of sulfate soap (product of processing black liquor) with a strong mineral acid (sulfuric) [2].

Mainly tall oil are implemented by companies as a commodity product without additional processing: as the flotation agent for the mining industry, for obtaining the emulsifiers and lubricating fluids used in metal processing and mechanical engineering, in the production of superhard wallboards, emulsifiers, drilling fluids. Colloid-chemical properties talowah oils and its main components have been studied extensively and are widely used, and it is known that they can act

as dispersers, increasing the stability of emulsions and suspensions and as a surfactant, destabilizing heterogeneous system [3].

The most promising direction to optimize production of nepheline concentrate is the search for new reagents-collectors and agent modes. Due to poor knowledge of the colloid-chemical regularities of the behavior of surfactants at various interfaces, the technology of flotation enrichment of Apatite-nepheline ores are not provided with understanding of these processes at the heterogeneous level, which allows to stabilize their course. The result is reduced yield and quality of the useful component.

Therefore, the search and development of new flotation reagents, modifiers, and modification of traditional reagents is not possible without studying colloid-chemical properties.

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Klang P. S.

DIE AGRARMETEOROLOGISCHE CHARAKTERISTIC DER WARMEN PERIODE IM GEBIET TAMBOW

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Die Veränderung der Temperaturregime führt zu der Notwendigkeit die agrarmeteorologischen Charakteristiken des Wetters auf dem Landterritorium zu schätzen. Das Ziel der Forschung ist die Analyse von den Veränderungen den meteorologischen Charakteristiken der Warme und Feuchtigkeit auf der Wetterstation Tambow in den Jahren von 1985 bis 2015. Um gestelltes Problem vielseitig in den Blick zu nehmen, führte man die Analyse nicht nur in vollem Umfang, sondern auch in drei Jahreszenten: 1985 – 1994 (I), 1995 – 2004 (II), 2005 – 2015 (11 Jahre, III) [1–2].

Im Laufe der Forschung stellte fest:

Zu drittem Jahrzehnte nahm die Lange der Perioden mit den Temperatursummen höher 0, 5, 10 und 15°C auf 39, 11, 7 und 10 Tage zu. Das Übergangsdatum geht durch das 0, 5 und 10°C Temperaturmaß im Frühjahr auf 12, 3 und 3 Tage früher vor. Für das 15°C Temperaturmaß geht das Datum 10 Tage später vor. Das Übergangsdatum veränderte sich auch im Herbst: der Übergang passiert auf 22 Tage (>0°C), 6 Tage (>5°C), 13 Tage (>10°C), 6 Tage (>15°C) später. Dieses Ergebnis zeigt, dass die Wärmeperiode sich verlängert hat.

Die Maßzahlen den Aktiv-Temperatursummen [3] sind im Vergleich zum Klima-Durchschnittswert auf 148°C (>0°C), 220°C (>5 °C), 313°C (>10 °C), 406°C (>15°C) gestiegen. Die Effektiv-Temperatursummen höher 5°C zu 2015 betragen 2015°C (mehr als Durchschnittswert auf 139°C), 1170°C (>10°C, mehr als Durchschnittswert 102°C), 526°C (>15°C, mehr als Durchschnittswert 74°C).

Die Niederschlagsmange während der Wärmeperiode des Jahres verringerte sich zum dritten Jahrzehnte auf 6 mm, die Niederschlagshöhe bei den Temperaturen höher 10°C war die Geringerste in 30 Jahren (215 mm). Der Seljaninow-Koeffizient nahm zum III-en Jahrzehnte bis 0,72 ab und bezeichnet die Periode wie fein dürre gefährdet.

In der Tabelle 1 ist die Überschreitungswahrscheinlichkeit der warmen Periode mit den Temperatursummen, Tagen mit verschiedenen Temperatouren, Niederschläge und mit dem Seljaninow-Koeffizient im Gebiet Tambow zu III-e Jahrenzente dargestellt.

Tabelle 1.Verschiedene Überschreitungswahrscheinlichkeiten der warmen Periode im Gebiet Tambow

Werte	Wahrscheinlichkeit, %									
	10	20	30	40	50	60	70	80	90	100
Temperatursummen > 10◦C	3075	2849	2752	2726	2676	2614	2482	2385	2303	2261
Temperatursummen > 5◦C	3213	2976	2909	2888	2857	2766	2678	2607	2506	2472
Temperatursummen > 0◦C	3234	3005	2931	2909	2889	2796	2708	2648	2542	2527
Tage mit den Temperaturen > 15◦C	129	125	119	115	111	110	108	97	80	71
Tage mit den Temperaturen > 10◦C	187	177	165	163	160	157	154	152	145	139
Tage mit den Temperaturen > 5◦C	221	203	200	195	192	188	186	182	177	169
Tage mit den Temperaturen > 0◦C	292	260	247	241	239	234	227	223	218	206
Niederschlage, mm	424	377	344	298	282	269	239	202	171	159
Niederschlage bei den Temperatouren >10◦C, mm	333	317	282	264	257	245	236	199	173	134
Seljaninow-Koeffizient	1,32	1,14	1,03	0,93	0,9	0,87	0,82	0,69	0,61	0,44

Die anführenden Erfolgen zeigen, dass die Landwirte in diesem Zusammenhang die Ordnung der Fruchtfolge, den Kulturen und den Kulturpflanzensorten mit der Berücksichtigung den Wechsel den agrarmeteorologischen Charakteristiken neu schätzen müssen.

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HARMFUL OR BENEFICIAL WINDOW OF PVC?

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Disputes about harm and benefit of plastic windows are very long. Experts say that plastic is very dangerous for our health. But the manufacturers of plastic windows don't agree with them. The construction industry is one of the largest consumers of synthetic polymers. Therefore, the use of polymers in construction and production of materials based on them is increasing from year to year. Polymeric materials possess the necessary set of valuable physicochemical properties. Therefore, the construction materials of the last century become less popular. What can we do? You believe the environmentalists or manufacturers?

Plastic windows, which became widespread in Russia in the 90-ies, in fact, appeared about 100 years ago. For the first time in 1835, a powdery residue of vinyl chloride received scientist Henri Victor Renew. He conducted experiments in his chemical laboratory. It was the first in the history of the polymeric material, which was obtained by artificial means [1].

But this discovery long remained useless. In 1913 German scientist Fritz Klatt gave to this discovery the road in life. He has conducted research and received a patent for the production of PVC. The mass distribution of PVC started in Germany in 1959.

In particular, the windows were more environmentally friendly. The first plastic windows in Russia were expensive. It is because is not available for a large class of consumers. However, with increasing competition, prices have started to decline. Therefore, the beginning of 2000-ies became available to most Russians.

Polyvinyl chloride (PVC) – get radical polymerization of vinyl chloride. The average molecular weight of the polyvinyl chloride 62-155 thousand. Polyvinyl chloride is one of the most common polymers that are used in construction. This material, which belongs to the group of thermoplastics. That is, such types of plastics that can be recycled. PVC you can get synthetic way. It is a white powder.

In the processing of the powder are added various stabilizers, they can be lead, calcium and zinc and other materials. It depends on the future purpose PVC. In general, the production of finished products of PVC in the initial powder added another 10-15 components. Due to this, yield a material that is resistant to aggressive atmospheric agents, acids, alkalis, solvents and other substances [1].

But in spite of the modern plastic windows they have disadvantages. The harm of plastic Windows in the first place is that they do not allow air to circulate freely. To help in the solution of this problem is ventilation and regular airing of the premises.

Also, at high temperatures, the PVC will release toxic gases. The release of toxic substances from PVC – dioxins and phthalates into the air occurs only at very high temperatures, from 225 to 475 degrees Celsius. Another disadvantage of plastic windows is the reduction of light transmission by about 30%. To solve the problem is the refusal of the third glass in the window. Also, the window should be selected in accordance with the room size, and level of light transmission must be suitable for the type of premises. The next problem, at the temperature of -35 ℃ plastic may crack. Frost can also cause separation of the window from the foam [2].

But despite all the shortcomings, the plastic windows are very modern and useful invention. The use of plastic windows in the construction significantly reduces the weight of building structures. Also, PVC windows do not require regular painting and do not require special care, easy to install. PVC windows do not require regular painting and do not require special care, easy to install. Another advantage is that the windows are long, more than fifty years, the lifetime in the conditions of temperate climatic zone. Polyvinyl chloride (PVC) due to the chlorine content practically does not burn and emit little heat, which makes it faster to localize and extinguish the fire. Besides, plastic windows have high sound insulation properties. Thanks to the tightness of plastic windows in the housing misses street dust, and street noise, long kept warm [3].

To summarize, we can say that PVC windows are the best option. They are harmless, in the absence of high temperature and very easy to operate. Plastic window attract consumers, primarily: high strength, durability, fireproof qualities, easy operation, attractive appearance, different design [3]. The price of plastic windows is quite low, especially considering their lifespan. However, the plastic window will last a long time and reliably only if it is made of quality materials and are properly installed.

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THE MAIN DIRECTIONS OF IMPROVING ENVIRONMENTAL SAFETY OF AUTOMOBILES

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Transport is an important condition for the functioning of social production and people's lives. Passenger traffic in cities is growing faster than urban populations. A large share of the total volume of transport is carried out by industrial transport, in which 30-35% of transport is carried by railways, about 60% of cars, and the remaining 5-10% - pipelines, conveyors, river and sea fleet.

Special government bodies of many industrialized countries carry out a comprehensive study of environmental and other problems and formulate a system of norms, restrictions, requirements and incentives for producers and consumers of products. This is done in order to minimize the negative impact on nature. The concern of the world community, the governments of many countries, on the pace of technical development has been reflected in a number of international, European and national documents on environmental security and protection of the environment. Therefore, most scientists and practitioners are taking urgent measures to reduce the toxicity of the exhaust gases of the engine. And first of all - reducing the amount contained in them mono and carbon dioxide, as well as nitrogen oxides and unburned hydrocarbons [1, 45].

Road transport occupies a leading position in the transport of goods. The forecast of the development of Ukraine's fleet of vehicles shows a tendency towards a steady increase in the number of cars and fuel consumption. In the near future, Ukraine's motor transport will mainly be provided with imported petroleum raw materials. Consequently, in the field of production and consumption of mixed automotive fuel, the problem of resource conservation and the search for alternative sources of raw materials will be decisive, of course, together with the solution of environmental impacts. At the same time, the needs of vehicles make up 12 million tons of gasoline per year and up to 15 million tons of diesel fuel.

Among the unconventional fuels, the use of which is possible in diesel engines, oil fuels and fuels produced from alternative sources of energy are emitted.

Bioethanol is one of the most promising alternative fuels that can be produced and used in large quantities in Ukraine.

Bioethanol is essentially different from gasoline in its physical and chemical properties (it has lower heat of combustion but greater detonation resistance and corrosion), and at concentrations of more than 12% can negatively affect the engine's performance. When using a 5-12% admixture of alcohol to gasoline there is no need for changes in the design of engines, increases octane motor fuel, leading to reduction of energy costs in its production, 4-5% increases engine efficiency and reduced by 30% non-combustion of fuels and emissions of combustion products to the atmosphere that meets the requirements of environmental protection. Modern regulatory regulation, in particular the existing DSTU 4063-2001 and DSTU 4839-2007, limit bioethanol content to automotive gasoline by five percent. As noted above, active work is being undertaken to amend the legislative acts regarding the widespread use of bioethanol in Ukraine as a fuel. It should be borne in mind that the properties of bioethanol do not allow it to be used as a complete substitute for gasoline without adaptation of the car and its engine. Therefore, at the first stage, the most expedient is expanding the production of bioethanol and the introduction of mass use of blended gasoline (with additives bioethanol and other compounds), suitable for refueling vehicles in operation. In this plan there is a useful experience of expanding their production and use in the industrialized countries of the world [3, 55].

Biodiesel is the most economical alternative fuel for production. It is fully compatible with existing vehicle engines and commercial fuel distribution and consumption systems. Produced from a mixture of vegetable oils and methanol. The heat of combustion of vegetable oils is close to the heat of combustion of traditional diesel fuels. They can be used for combustion in diesel engines in the original form or after special chemical treatment, as well as in a mixture of petroleum and alternative fuels. The main component of vegetable oils are fatty acids, which are high molecular weight compounds containing oxygen, with a carbohydrate base. In the cold period of the year it is necessary to heat fuel coming from a fuel tank to a fuel pump, or to apply mixtures of 20% biodiesel and 80% diesel fuel of mark B20. The main disadvantage is the limited shelf-life after manufacture - 3 months due to the high content of water in diesel fuel. Water is expanded when diesel fuel is stored and is collected below, because the density of diesel fuel is less than 1 kg / l. Ukraine has a very promising raw material base for biodiesel production. It is planned that during the expansion of rape crops, 9.0 million tons of rapeseed can be obtained, which can provide almost 3.0 million tons of biodiesel fuel (75% of the annual needs of the country's agro-industrial complex

The solution of the above-mentioned problems will enable in the coming years to introduce widespread use of alternative and biofuels in the field of motor transport of Ukraine. Biodiesel is a highly efficient lubricant used as a 5% fuel additive by the three leading French oil companies to compensate for the lack of lubricating power in very low sulfur oil fuels [2, 32-36].

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GLOBAL WATER SCARCITY

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The scarcity of fresh water is already critical in many arid regions of the world and will be increasingly important in the future. It is very likely that the need for fresh water will soon be considered, in the same category as oil and energy resources, and to be one of the determining factors of world stability and the prosperity of nations. As our world populations grow we need to be able to guarantee this basic need and avoid shortages of fresh water.

Water covers 70% of our planet, and it is easy to think that it will always be plentiful. However, freshwater—the stuff we drink, bathe in, irrigate fields with—is incredibly rare. Only 3% of the world's water is fresh water, and two-thirds of that is tucked away in frozen glaciers or otherwise unavailable for our use.

There are millions of people across the globe who spend their entire day searching for water. Inadequate sanitation is also a problem for 2.4 billion people—they are exposed to diseases, such as cholera and typhoid fever, and other water-borne illnesses. Two million people, mostly children, die each year from diarrheal diseases alone. Yet, people who have access to safe, clean drinking water take it for granted and don't use it wisely.

Water shortages may be caused by the growth of population, increased pollution, climate change, deforestation, insufficient irrigation, inadequate wastewater treatment and increased human demand and overuse of water. The term water crisis labels a situation where the available potable, unpolluted water within a region is less than that region's demand.

There are different approaches to water scarcity solutions:

Education: There are plenty of opportunities out there that people can use in order to learn more about the world around them. Those who are dealing with it can get educated on how they can prevent the problem from becoming even worse in

the future. Water must be carefully managed during every part of the water cycle: from fresh water abstraction, pre-treatment, distribution, use, collection and post-treatment, to the use of treated wastewater and its ultimate return to the environment, ready to be abstracted to start the cycle again.

Recycle Water: There are plenty of technologies that allow recycling rainwater and other water that you may be using in your home. Mainly in developing countries, a large proportion of wastewater is discharged directly into the closest surface water drain, sometime without or with very little treatment. However, water used by a municipal authority for irrigating green spaces or cleaning streets does not need to be treated to a potable standard. Treating wastewater to a water quality standard appropriate to its intended use increases the potential for cost recovery.

Improve Practices Related to Farming: Farming and irrigation are often a huge culprit when it comes to water scarcity. Pollution of groundwater and surface water by agricultural use of untreated or inadequately treated wastewater is a major issue in many developing countries where such irrigation is practiced.

One of the best solutions of this problem is **Drip irrigation**. A widespread use of this method was first obtained in Israel, where there is a great shortage of water. Its goal is to place water directly into the root zone of plants, save water and nutrients and minimize evaporation. Drip irrigation systems distribute water through a network of valves, pipes, and emitters.

Improve Sewage System: Clean drinking water starts with a good sewage system. Without proper sanitation, the water in an area becomes ridden with disease and any number of other problems. By improving the sewage systems in these areas, we can prevent water scarcity from becoming any worse.

Improve Wastewater and Industry System Treatment: Wastewater is now seen as a potential resource and its use, or recycling after suitable treatment, can provide economic and financial benefits. Industrial water consumption is responsible for 22% of global water use. Businesses can directly use some wastewater, for instance, using process water for cooling or heating, or rainwater from roof collection or concrete aprons for toilet flushing, irrigation or vehicle washing.

Desalination: is the process of changing sea water into drinkable fresh water. This means taking out the salt and any bacteria and pollution. Desalination is rather expensive process, but because this technology is improving fast, the costs are beginning to fall, making it more affordable to countries that need it. There are about 16,000 desalination plants around the world, the largest of which are in Saudi Arabia, the UAE, and Israel.

Another key in the water savings puzzle is the ongoing need worldwide for infrastructure monitoring and repair to prevent loss of water through delivery

systems. These small amounts become increasingly larger over time. Monitoring aging infrastructure and creating new technologies — such as wireless smart valves and pipe defect and leak-detection sensing devices — are helping, but they must be used along with water policies such as routine reporting and repair plans.

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MACHINE BUILDING

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AUTOMATION OF MEASUREMENT OF THE EXCESS AIR FACTOR AT THE TEST STAND OF 6G4N 13/14 GAS ENGINE

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To study the working processes of the gas engine 6G4N 13/14 with depleted working mixtures, at the Department of ICE of KNAHU a group of scientists creates a measuring complex «SPARKING & COMBUSTION ANALYSER»

Today, a personal computer is an effective tool for measuring, calculating and compiling test reports. To automate the measuring system, one needs these software and hardware functions:

• A quick program for processing shot indicator charts.
• Measurement of spark discharge parameters in the cylinder.
• Processing of signals from gas, air, pressure and temperature sensors.
• Transfer of processed values for each cycle to a personal computer.

The uniqueness of this complex lies in the cyclic measurement of parameters with synchronous processing of the cyclic indicator diagrams.

When testing internal combustion engines, an important component is the instantaneous determination of the excess air factor, since this parameter affects all the parameters of engine operation [1].

To automate the measurements of the excess air factor, on the gas engine 6G4H 13/14test stand, it is necessary to measure:

1. The volumetric use of gas $V_г$ $\left(\frac{м^3}{hour}\right)$, the absolute air pressure P_0 (МПа), the absolute gas temperature T_0, (К).

2. The volumetric use of air $V_п$ $\left(\frac{м^3}{hour}\right)$, the absolute air pressure P_0 (МПа), the absolute air temperature

$$A = \frac{V_{air/n}}{V_{gas/n} \cdot L_o},$$

Where $V_{air/n}$ is the use of air reduced to normal conditions,

$V_{gas/n}$ is the use of gas reduced to normal conditions,

L_o – theoretically required amount of combustion air 1 Kmol (1 M^3) ,

The use of air that is reduced to normal conditions is determined by the formula

$$V_{air/n} = \frac{V_{air} \cdot 273}{0{,}1013 \cdot T_0}$$

The use of gas, which is reduced to normal conditions determined by the formula

$$V_{gas/n} = \frac{\rho_{gas} \cdot V_{gas} \cdot 273}{0{,}1013 \cdot T_{gas}}$$

Theoretically, the amount of air required for combustion of 1 Kmol (1 M^3) of gas is calculated, using the formula given below.

$$L_0 = \frac{1}{0{,}208} \cdot (2CH_4 + 3{,}5C_2H_6 + 5C_3H_8 + 6{,}5C_4H_{10} + 8C_5H_{12} + 0{,}5C + 0{,}5H_2)$$

Where CH_4 , C_2H_6 , … CO are volumetric parts of gas constituents.

For measurements of the volumetric use of gas, DELTA DN40 series 2040 flowmeter is installed on the measuring stand of the gas engine 6G4H 13/14. The absolute gas pressure is measured by the IS3 sensor with measurement limits of 0-25 bar. The signal from the sensor is within the range from 4 to 20 mA. [2]

Absolute gas temperature

$$T_{gas} = 273 + t_{gas}$$

where t_{gas} - temperature, which is measured by the sensor TR34 (0-150 C°)

The registration of the air use is carried out by the air mass meter RG 1000. This meter consists of two main units: a meter and a counting device. Two

kinematically connected rotors of an eight-shaped form are placed in the body of the meter. On the oval flanges the body is closed by walls, in which the bearings are mounted - the supports of the rotors. The synchronizing gears are installed on the rotor shafts, which ensure the proper position of one rotor relative to the other one. The gears are sealed with lids, which together with the body form the chambers of the gears. The axis of one of the rotors is connected to the gearbox of the counting device located on the front cover of the meter. The counting device is closed by a hermetically sealed cover and operates in a gas environment. The measuring by meter is carried out as a result of rotation of the rotors, which occurs due to the difference in pressure at the input and output of the meter. For each complete rotation of the rotors, the chamber is filled twice and the gas is ejected twice [3].

The main advantages of a flowmeter of this type are as follows: high accuracy, low pressure loss and the ability to measure the gas flow at excess pressure up to 2,5 $\frac{\text{kg}}{\text{см}^3}$. The error of a meter of the RG type, with a capacity of 100 $\frac{\text{м}^3}{\text{h}}$ or more, does not exceed $\pm$ 1,6 %. This design allows remote measurement, for this purpose the counting mechanism can be replaced by any rotation sensor, which is scaled in flow units.

The absolute pressure is measured by sensor A10 with a measurement range of 0-1.5 bar, with a sensor signal within the range of 4 to 20 mA.

$$T_{air} = 273 + t_{air}$$

where t_{air} - temperature, which is measured by sensor TR33 (0 – 150 C°).

The signals of flowmeters, pressure and temperature sensors are transmitted to an analog-to-digital converter (ADC), then used to calculate the excess air factor and transmitted to a personal computer [2].

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SYSTEM OF CHANGING THE COMPRESSION RATIO OF MODERN AUTOMOTIVE INTERNAL COMBUSTION ENGINES

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One of the main directions of the development of road transport is to reduce its impact on the environment. Due to their prevalence, automobile power plants are the main source of environmental pollution and the consumer of energy resources. It should be noted that a decrease in specific fuel consumption leads in most cases to a corresponding decrease in specific emissions of toxic substances. The main reserves for improving fuel efficiency and reducing emissions of toxic substances from internal combustion engines (ICE) lie in the area of partial loads and transient regimes. One way to improve the performance of an internal combustion engine is to regulate the compression ratio depending on the load conditions of the engine [1].

The compression ratio is an important characteristic of the internal combustion engine, determined by the ratio of the volume of the cylinder when the piston is at the bottom dead center to the volume at the top dead center (the volume of the combustion chamber). Increasing the compression ratio creates favorable conditions for the ignition and combustion of the fuel-air mixture and, accordingly, the effective use of energy. At the same time, the operation of the engine on different modes and different fuels assumes different values of the compression ratio. These properties are fully used by the system of changing the degree of compression.

Increasing the compression ratio creates favorable conditions for the ignition and combustion of the fuel-air mixture and, accordingly, the effective use of energy. At the same time, the operation of the engine on different modes and different fuels assumes different values of the compression ratio. These properties are fully used by the system of changing the degree of compression. The system provides increased engine power and torque, reduced fuel consumption and emissions. The main merit of the system of changing the degree of compression in the ability to work the engine on different grades of gasoline and even different fuels without degrading the characteristics and detonation [2].

By regulating the degree of compression with the use of several types of fuel, including liquefied gas, in partial operation modes of the internal combustion engine, it is possible to achieve an increase in the efficiency (efficiency) while reducing fuel consumption. To date, there is a large number of design solutions for engines with variable compression ratio, which differ in the principle of regulating the degree of compression and the duty cycle. The following schemes were developed and tested:

- Axial combustion engines [3].
- ICE with variable piston stroke [4].

- ICE with a traverse mechanism [5].
- ICE Saab Variable Compression (SVC) [6].
- ICE of the French company MCE-5 Development [7].
- ICE from PARSS [8].
- ICE Infinity Variable Compression (VC-T) [9].

Adjustment of the compression ratio should ensure the maximum (according to the conditions of the start of detonation combustion) compression ratio at any speed or load mode of the engine operation. Exceeding the maximum compression ratio leads to detonation combustion, and a decrease to a deterioration in the economy of the engine. When designing a motor with a variable compression ratio, it is necessary to pay special attention to the choice of design parameters that provide the best conditions for the flow of the working process at different compression ratios that correspond to certain operating modes of the engine and the fuel used. In addition, the geometric and operating parameters of the mechanism for changing the compression ratio must be selected, due to which it will provide the necessary sensitivity and high speed [10]. As a great influence during the operation of the engine with a variable degree of compression have technical difficulties and have a number of disadvantages:

- Complexity of construction;
- Low reliability of mechanisms for changing the compression ratio;
- Incomplete shape of the combustion chamber in some modes of engine operation;
- Increased mechanical losses mainly due to the presence of additional kinematic links;
- Complexity of balancing of multi-link mechanisms;
- Low speed of the mechanism;
- The small sensitivity of the mechanism, which leads to a short-term detonation of gasoline engines with a sudden increase in load.

Elimination of the above mentioned shortcomings is one of the most complicated scientific and technical tasks that can be solved only by joint efforts of science and production. Quite complex and requiring a separate investigation is the question of obtaining the optimum shape of the combustion chamber at a variable compression ratio. Other disadvantages can be largely eliminated by applying a rational motor scheme with an adjustable compression ratio. The main requirements for compression ratio control systems can be:

- The adjustment of the compression ratio in a multi-fuel engine is carried out depending on the type of fuel used, gas, gasoline. At maximum load, the compression ratio should be minimal.
- Adjustment of the compression ratio at partial operating modes of the ICE.
- Minimum inertia of systems.

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Asaian V. G.

WEB APPLICATION FOR AUTOMATIC CALCULATION OF TRACTION AND SPEED PROPERTIES OF A CAR

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The infrastructure of a large settlement has unpaved and improved roads, highways and colonial roads, thus, road transport plays an important role in the life of a modern country. Motor vehicles could participate in all spheres of human activity: national economy, transportation of passengers, transportation of cargo, etc.

Motor vehicles bring significant benefits in the most important aspects of urban and rural life. They are used to solve many tasks, but in addition to the advantages it also gives obvious disadvantages: every day there are a large number of accidents with serious consequences.

Motor vehicles can be divided into cargo, passenger and special (according to destination), or can be classified according to their manoeuvrability into the cars of ordinary manoeuvrability (non-wheeled), cross-country (four-wheel drive), moving through snow and bogs and amphibias.

They are also distinguished by the type of engine: petrol, diesel gas, gas-generator, electrical, etc.

Manufacturers allocate a significant part of the budget for research in the field of road safety – motor transport is the most dangerous means of transport. Designers do everything to increase control over internal and external factors that affect the controllability of the car.

The most popular security systems are the following: pedestrian detection system; brake force distribution system; emergency braking system; anti-slip system; stability control system; anti-lock brakes; electronic differential lock.

The existent security systems have become normal and are considered compulsory, but not all of them are available for a common consumer – many high-tech functions are only present in expensive models.

Do not forget about the features that any responsible driver can take into account. When using a car from a driver, you need responsibility and constant concentration, since tragedy often happens due to mistakes not on the side of the equipment. According to official data, among all types of road accidents, a significant percentage is due to speeding. The motor transport movement is determined by a number of external and internal factors.

In the study of any operational properties, a car is replaced by a computational model, since taking into account all the relationships between the individual elements of the car for predicting the parameters of motion is a task of a large degree of complexity [1]. When working on a calculation model, you need to determine the goals of the assignment, in some cases, for example, you need to know the qualitative characteristics of the transport as a whole – so you can not take into account the links of individual elements with the body or frame and build a fairly simple calculation model [2].

Traction-speed properties are a set of properties that determine the permissible ranges of speed changes according to the characteristics of the engine or the coupling of the driving wheels to the road. Also, they determine the limiting intensity of acceleration and deceleration in road conditions.

Knowing the traction-speed properties of a particular wheeled vehicle, it will not be difficult to establish the degree of its suitability for use, the possibility of each transmission. This will reduce the chance not to manage the control due to untimely braking, poor adhesion, etc. during the trip, however, to calculate them you need to own additional information, which, more often than not, is available to the average user.

During the calculation, a number of specific indicators and some characteristics of the car are used. Take into account the height, width and length of the body, the area of the windshield, tire size, weight, power and type of engine and other data [3].

External factors influence the behavior when moving. The adhesion of wheels to the road depends on its inclination, such as the surface (ice, snow, pebbles, sand, asphalt) and weather conditions, the strength of resistance to recovery, the strength of resistance to acceleration and the force of resistance to wind.

All the parameters required for the calculation of traction-speed properties are present in the developed database for a web application that is designed to facilitate the process of designing or modifying a vehicle and its further operation. The user has enough knowledge of the site address. The data obtained after calculation helps to choose the most effective speed and acceleration of traffic in the selected road conditions, determine the limits of the permissible conditions of movement.

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Babina A.

ANWENDUNGEN DER MASCHINENBAU-TECHNIK

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Fahrzeugtechnik ist ein Fachgebiet des Maschinenbaus, das eine eigene Ingenieurdisziplin darstellt. Während der Fahrzeugbau sich mit der Produktion von (Kraft-) Fahrzeugen befasst und die Verkehrstechnik in der Hauptsache die Lenkung von Verkehrsströmen behandelt, geht es in der Fahrzeugtechnik um umfassende Betrachtung der Konzeption, Konstruktion, Simulation und des Betriebs des Gesamtsystems Fahrzeug und dessen Einzelkomponenten.

Die Fahrzeugtechnik wird allgemein am ehesten mit Personenkraftwagen in Verbindung gebracht. Sie beschäftigt sich jedoch mit sämtlichen Fahrzeugen, auch wenn sie spurgeführt sind oder nicht von Kraftmaschinen angetrieben werden: Fahrräder, Krafträder, Personenkraftwagen, Nutzfahrzeuge, Schienenfahrzeuge, Arbeitsmaschinen, Anhänger [1].

Das Fach Fahrzeugtechnik fußt wie der allgemeine Maschinenbau auf Naturwissenschaften wie Mathematik, Physik, Thermodynamik und Fluidmechanik sowie klassischen Maschinenbaufächern wie technische Mechanik, Werkstoffkunde, Elektrotechnik und Konstruktionslehre (bzw.

Maschinenelemente). Ergänzt wird das Grundlagenwissen durch EDV- und Programmierkenntnisse, Fahrdynamik, Betriebswirtschaftslehre, Regelungs- und Fertigungstechnik [1].

Fachspezifisch hebt sich der Fahrzeugtechniker vom Maschinenbauer beispielsweise durch die Kenntnisse in Fahrwerktechnik, Motoren- und Antriebstechnik, Karosseriekonzeption und -konstruktion, aktive und passive Sicherheit von Kfz (gesetzliche Rahmenbedingungen und konstruktive Integration am Fahrzeug), Assistenzsysteme, Fahrzeugsimulation und technische Akustik ab [1].

Nutzfahrzeuge zum Personentransport werden im öffentlichen Personennahverkehr (ÖPNV) als auch im öffentlichen Personenfernverkehr sowie von privaten Personen-Transportunternehmen und Gewerbebetrieben genutzt.

Beispiele für Nutzfahrzeuge zum Personentransport: Kleinbus, Omnibus, Gelenkbus.

Nutzfahrzeuge für die Lastenbeförderung gibt es in vielen verschiedenen Formen. So werden leichte Nutzfahrzeuge oft für den Transport des Materialbedarfs zum Beispiel eines Handwerksbetriebs oder für den Post-Zustellbetrieb genutzt, während für den Schwerlastverkehr spezielle Nutzfahrzeuge auf Lkw-Basis nötig sind, die über einen entsprechenden Fahrzeugaufbau verfügen. Weiterhin gibt es unter anderem auch Nutzfahrzeuge für den Transport von Flüssigkeiten und -gasen. Sie müssen die Regeln des Güterverkehrsgesetzes einhalten. Fahrer müssen in Deutschland das Berufskraftfahrer-Qualifikations-Gesetz (BKrFQG) einhalten. Manche Nutzfahrzeuge zur Lastenbeförderung haben Einrichtungen zur Verladung des Transportguts an Bord (Anbau-Hebebühnen, Kräne, Kleinstgabelstapler, Saugpumpen etc) [1].

Wenn über den Zusammenhang von Straßenverkehr, Klimawandel, Luftverschmutzung, Lärmbelastung oder Staus gesprochen wird, haben die meisten Menschen zunächst einmal die Millionen von PKWs vor Augen, die unsere Straßen bevölkern. Dass auch der Transport von Gütern für das steigende Verkehrsaufkommen verantwortlich ist, wird häufig unterschätzt. Dabei bildet der LKW-Transport das logistische Rückgrat der täglichen Versorgung von Bevölkerung und Industrie mit Gütern aller Art. Man mag sich darüber ärgern und aus vielerlei Gründen eine drastische Reduktion des LKW-Verkehrs fordern tatsachlich ist dieses Transportmittel auf absehbare Zukunft kaum wegzudenken [2].

Deshalb ist es auch aus einer grünen Perspektive notwendig und sinnvoll, sich Gedanken über eine Optimierung des Güterverkehrs auf der Straße zu machen und zwar sowohl hinsichtlich der Fahrzeuge wie der gesamten Transportkette. Dabei geht es um eine drastische Reduzierung von Energieverbrauch und Emissionen wie auch um die für die Verbesserung der Sicherheit [1].

Güterverkehr ist eine Begleiterscheinung unserer arbeitsteiligen, globalisierten Wirtschaftsweise und unserer Konsumgewohnheiten. Importe und Exporte erzeugen Verkehr; auch die selbstverständliche Verfügbarkeit einer Fülle von Konsumgütern ist ohne Transport nicht zu haben. Zugleich liegt die

Bundesrepublik im Herzen Europas und ist somit ein Transitland zwischen Nord und Süd, Ost und West. Alle Prognosen gehen davon aus, dass der Güterverkehr auf absehbare Zeit weiter steigen wird. Grüne Politik fordert zu Recht, die Hauptlast des Gütertransports auf den energetisch effizienten und relativ klimafreundlichen Verkehrsträger Bahn zu verlagern. Das erfordert enorme Investitionen in die Kapazitäten und Effizienz des Schienenverkehrs [1].

Auch wenn dieser Kraftakt gelingt, wird der LKW nicht verschwinden. Zwar sind Bahn und Schiff umso effektiver, je weiter die Transportwege und je grösser die Mengen sind, die von einem Ort zu einem anderen Ort geliefert werden sollen. Das Verteilen von Gütern in einer Stadt und ihrem Umland wird in absehbarer Zukunft jedoch ein Aufgabenfeld des LKW bleiben.

Die Reform des Systems LKW ist nur ein Baustein, um eine drastische Reduzierung von Emissionen im Verkehr zu erreichen. Nur im Zusammenspiel einer Neuausrichtung der Infrastrukturplanung von Bund und Ländern (mitsamt ihrer Finanzierung), technischen Innovationen im Automobilbau, eines Ausbaus des öffentlichen Nah- und Fernverkehrs sowie einer intelligenten Vernetzung der Verkehrsmittel wird der Übergang zu einer umweltvertraglichen Mobilität gelingen.

Die Bauweise heutiger LKWs entspricht nicht den veränderten Anforderungen eines zunehmenden Güterverkehrs mit steigenden Transportleistungen und zunehmenden Transportweiten. Das Potential, den Fahrwiderstand und besonders den Luftwiderstand zu verbessern, ist groß. Gleichzeitig lasst sich durch eine angepasste Formgebung auch die Sicherheit schwerer Nutzfahrzeuge deutlich verbessern [2].

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COMMON RAIL SYSTEM DIAGNOSTICS

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During the operation of diesel engines, a large number of problems of the working process are associated with fuel system malfunctions, which is up to 25–50% of all malfunctions. Unambiguous recognition of a malfunction, even with normal operation of other systems, is impossible. It should be borne in mind that the dense layout of the engine block is the main reason for the high and labour-

intensive repair complexity. The need for repair is necessary only after a thorough check of the fuel system.

For the correct testing, the following troubleshooting procedures are suggested:

1) to check the delivery of low pressure fuel by the scanner on mistakes; by the amount of reverse fuel flow injector using the static and dynamic methods;

2) to check the supply of high-pressure fuel: a regulator and a high-pressure pump, to check the injectors on the stand [1, 46−48].

Checking the fuel system for the presence of error codes is the fastest method of finding faults. Error codes are numbers (or combinations of letters and numbers) that correspond to a particular problem of the system. It is carried out by a special scanner. The scanner is connected to a car, and then the software is launched on the computer. All you need is to select a car model and a type of the system, then start the scanning. Scanning will occur automatically. After its completion, the monitor displays the diagnostic results in the form of a list with errors and their explanations.

The static method for checking the amount of reverse fuel flow of the injector is carried out on an engine that can not be started. The method allows checking the efficiency of the injector for correct operation, blockage, jamming of moving parts. The advantage of the method is a significant time saving, ease of execution, no need to remove the injector from a car. For this method, specialized diagnostic sets are used [2, 143−152].

In place of the regular system of reverse fuel flow injectors, transparent tubes and containers from the set are installed. The electrical connectors of the injectors are also removed to avoid their operation during the testing. To the sensor and the pressure regulator, a measuring controller is connected which will record the pressure in the system. Next, it is necessary to scroll the engine with the starter for 6 seconds, to record the value of the pressure controller and the amount of fuel in the tanks, and to compare the obtained data with the operation one.

The dynamic method of testing is similar in principle to the static one, the only difference is that this method is carried out on a running engine. The connection of the diagnostic set is identical to the static method. After this you need to start the engine for 3 minutes, then increase the speed up to 2500 rpm, kep them for 2 minutes and to record the pressure values of the controller and the amount of fuel in the tank and compare with the standard ones [3, 221−229].

The fuel pump is checked for the ability to create the necessary fuel pressure for the fuel system to work properly. To do this, the regular tubes of the injectors are disconnected from the fuel cell and sealed with plugs; a safety valve is installed to avoid the destruction of a fuel cell. After this you should connect the controller to the sensor and the pressure regulator. Then you need to start the engine for 3−4 seconds, fix the pressure data of the controller and compare it with the standard ones.

The testing of the pressure regulator is carried out on the ability to keep high pressure in the fuel cell. To do this, you need to disconnect the fuel return pipes from the regulator, in their place, install a transparent tube with a capacity and disconnect an electric socket from a regulator, then connect the controller which is connected to the accumulator of a car to close a valve of a pressure regulator. Finally you scroll the engine with the starter for 5 seconds. After checking the fuel in the tank it should be absent.

Checking the injector at the stand is carried out using a special stand under different loads. This method is more laborious and expensive, while the most accurate. To do this the injectors are removed from a vehicle and are installed on the stand, then are connected to the injectors of the high-pressure tube and the reverse fuel flow. In the software the type and the model of the injectors are selected, and then the test is run. At the end a detailed report with malfunctions is received [4, 257−264].

Thus, the use of the present modern methods of testing diesel fuel systems makes it possible to quickly find faults in common rail elements by reducing the complexity of repair work, wasting time and money.

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ANALYSIS OF DEMAND FOR SERVICES OF MOTOR TRANSPORT ENTERPRISES

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In modern conditions the analysis of tendencies of developing a market and its components where it functions plays the great role for developing an enterprise,

particular in car services. For compliance to the current tendencies of market supply and demand an enterprise should conduct monitoring and the analysis of developing a market, reveal and study the closest and major competitors, choose strategic alternatives, develop marketing programs, define technical, financial and personnel capabilities.

Demand setting and sales promotion of motor transport enterprise services play an important role for its successful activity. Due to the increasing market competition in the field of car services the car maintenance and service enterprises make compromises to their consumers in providing services by stimulating the demand [2].

The marketing analysis of a market of car services first of all requires the analysis of its consumers, the number of vehicles in a specific segment of a market, and the demand for specific services. The analysis of demand for car services gives the chance to estimate the popularity of different types of services. It gives the chance to choose the direction of developing a motor transport enterprise. On the basis of the analysis of demand for services it is possible to make conclusions what processing equipment and what quantity motor transport enterprises require. The analysis of demand for services shows the loading of different divisions of a motor transport enterprise [4].

The demand for services has been studied on the basis of the analysis of statistics of Google requests for different types of motor transport enterprise activities. To analyze it Trends Google applications were used [3]. The results of the analysis are shown on Fig. 1.

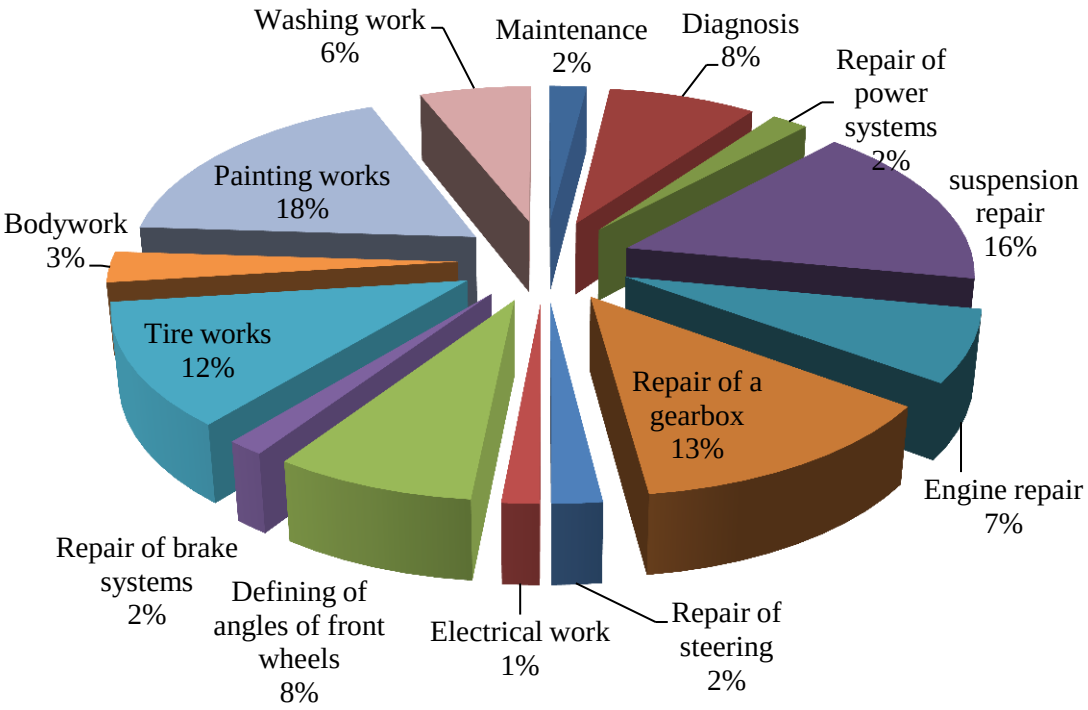

Figure 1. Demand for services of motor transport enterprises

Also the important factor influencing its loading is the seasonality of demand for some types of works. The seasonality of demand for some types of works of motor transport enterprises is presented on Fig. 2.

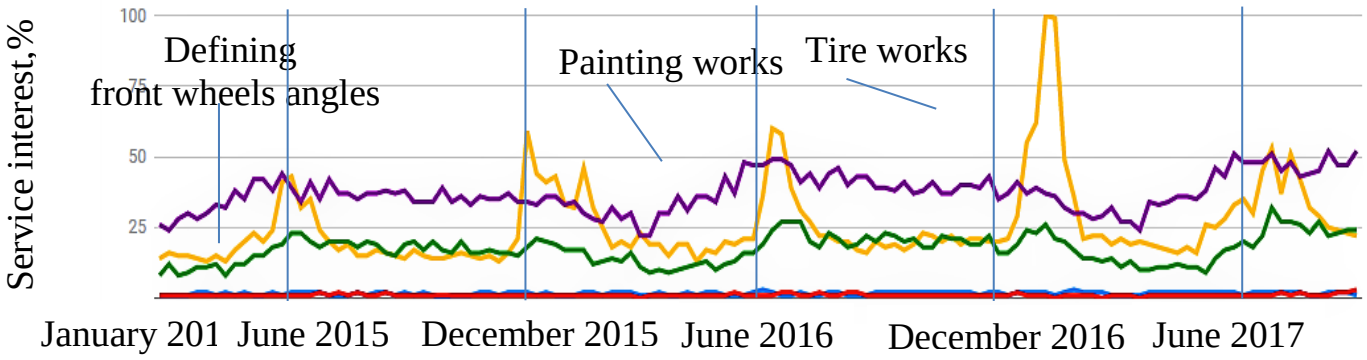

Figure 2. Seasonality of the demand for services of motor transport enterprises

For example the seasonality of tire works is brightly expressed, twice a year, before the summer and winter periods, the high point in demand for these works is shown. The equipment is used at a full load only for 2 - 3 weeks. Then there is a recession of its demand. The similar dependence is observed for works defining the angles of front wheels during seasonal wheel changing, when as a rule these types of works are carried out. For painting works another dependence is observed. The recession of demand falls during the winter period and increases in demand during the summer period.

Using the seasonality it is possible to plan the frequency of repair work during the periods when the equipment is less loaded. It will help an enterprise to work more effectively and to receive the greatest benefit [1].

The analysis of demand for services of motor transport enterprises positively influences on automobile services. By means of the analysis it is possible effectively to distribute labor and material resources of an enterprise, to choose the suitable equipment and time when it is necessary to carry out scheduled maintenance at an enterprise.

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Dazenko V. A.

ARBEITEN DES GASTURBINENTRIEBWERKS UNTER BEDINGUNGEN HOHER LUFTFEUCHTIGKEIT

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Gasturbinentriebwerke finden breite Verwendung in der Luftfahrt, in Bodeninstallationen für den Transport von Erdgas sowie in Energie und vielen anderen Industrien. In dieser Hinsicht können sie unter verschiedenen klimatischen Bedingungen funktionieren. Bei ihrer Verwendung muss der Einfluss der Parameter des Arbeitsmediums am Eingang der Gasturbine berücksichtigt werden. Einer dieser Parameter ist die Luftfeuchtigkeit.

Die Feuchtigkeit, die in den strömenden Teil des Motors eintritt, erfährt Phasenumwandlungen. Teilweise verdampft, wenn die Temperatur im Kompressor steigt, bildet es eine Mischung aus trockener Luft und ungesättigtem Dampf. Ferner am Austritt aus der Verbrennungskammer wird der Feuchtigkeitsgehalt des Arbeitsfluids durch den im überhitzten Zustand in den Verbrennungsprodukten enthaltenen Wasserdampf erhöht. Seine Größe wird entsprechend der Betriebsart der Gasturbine und dem Verbrauch des zugeführten Brennstoffs geändert. Der Zustand des Wasserdampfes in der Turbine hängt von den Parametern seines Arbeitsprozesses ab.

Es ist offensichtlich, dass eine detaillierte Beschreibung der thermogasdynamischen Prozesse der Bildung des Dampf-Gas-Gemisches und der Änderung seines Zustandes in dem Gasturbinentriebwerk ziemlich komplex ist.

In Übereinstimmung mit den verfügbaren Veröffentlichungen [1-4] wird der Einfluss der Feuchtigkeit berücksichtigt, indem semiempirische Beziehungen verwendet werden, die es erlauben, den Wert der gegebenen Motorparameter in Abhängigkeit von den Werten der Gaskonstanten und der Massenanteile von trockener und feuchter Luft im Gemisch am Eingang zum Motor einzustellen. So werden in [1] Korrekturen an der Rotordrehzahl vorgenommen. In der Arbeit [2] werden Korrekturfaktoren für die Werte der gegebenen Werte der Luftströmungsgeschwindigkeit und der Rotationsgeschwindigkeit unter Berücksichtigung der Unterschiede in den Werten der isentropischen Parameter und Gaskonstanten für trockene Luft und Wasserdampf vorgeschlagen, um die Wirkung von Feuchtigkeit zu berücksichtigen.

Anheben der Gaskonstante führt zu einer Erhöhung der Schallgeschwindigkeit, der Reduktion Strömungsmachzahlen und reduziert

Drehgeschwindigkeit des Rotors. Die Folge davon sind, wenn sich die Flussdichte am Eingang ändert, die Verringerung des Grades des Druckanstiegs und der Kompressoreffizienz sowie die Verringerung des Schubs oder der Leistung, abhängig von der Art des Gasturbinentriebwerks.

In der Studie [3] über Manifestationen der Luftfeuchtigkeit wurde das Simulationssystem von Arbeitsprozessen in Gasturbinenmotoren und Kraftwerken DVIGwT verwendet. Mit Bezug auf die geometrische und kinematische Ähnlichkeit von Turbomaschinen berechnet der Autor die Abhängigkeit von Korrekturfaktoren durch die Einführung von Ähnlichkeitskriterien für Kompressoren und Turbinen. Bei der Bestimmung von Eigenschaften der Turbomaschinen berücksichtigt der Ansatz die ihre geometrischen Parameter nicht und Verallgemeinerung, die in Abwesenheit von experimentellen Daten verwendet wird, erlaubt es nicht, die STI eingehende Analyse der physikalischen Vorgänge in dem Datenknoten vollständig zu überprüfen.

In der Studie [5] bei der mathematischen Modellierung der Eigenschaften des Kompressors ist von mir bestgestellt, dass ihre Druckzweige, wenn sie in feuchter Luft arbeiten, verschieben sich Richtung von reduzierten Kosten. Allerdings ist die Wirkung von Feuchtigkeit auf den Motor als Ganzes nicht betrachtet.

Im Zusammenhang mit dem Obigen besteht der Bedarf nach einer Berechnungsmethode, die die Wirkung von Feuchtigkeit auf die Eigenschaften des Gasturbinenmotors der Basis von Gasdynamik und geometrischen Parametern seiner Knoten auswertet.

Zur Verwendung als ein Objekt der Untersuchung wurde ein Vorentwurf des Turbogasturbinentriebwerks mit zweistufigem Gasgenerator, der die folgenden Parameter hat, entwickelt:

- Leistung N_e=17,6 MW;
- Kompressordruckverhältnis $\pi_к^*$=19,7, Kompressordruckverhältnis des Niederdruckverdichter $\pi_{к\ кнд}^*$=4,47, Kompressordruckverhältnis des Hochdruckkompressors $\pi_{к\ квд}^*$= 4,45;
- die Temperatur vor der Turbine $T_г^*$ = 1362 K;
- Massenstrom $G_в$ = 70,0 kg / s.

Das Motordiagramm ist in Abbildung 1 dargestellt.

Das Ziel dieser Studie ist es, eine Methode zur Modellierung der thermogasdynamischen Parameter und Betriebseigenschaften eines Gasturbinenmotors zu entwickeln, die es ermöglicht, den Einfluss der Luftfeuchtigkeit am Einlass unter Berücksichtigung der geometrischen Parameter von Kompressor während des Entwurfs zu beurteilen.

Um die Parameter der Gasturbine zu bestimmen, wurde ein mathematisches Modell entwickelt, das an der Nationalen Mykola-Schukowskij Universität für Luft- und Raumfahrt "KhAI" entwickelt wurde. Um die Prozesse in mehrstufigen Verdichtern mit niedrigem und hohem Druck zu beschreiben, wurde ein mehrstufiger Ansatz verwandt [6, 7]. Es gibt auch Modelle anderer Teile des Gasturbinentriebwerks.

Das mathematische Modell eines axialen Mehrstufenkompressors ist ein integraler Bestandteil des allgemeinen Modells einer Gasturbinenmaschine.

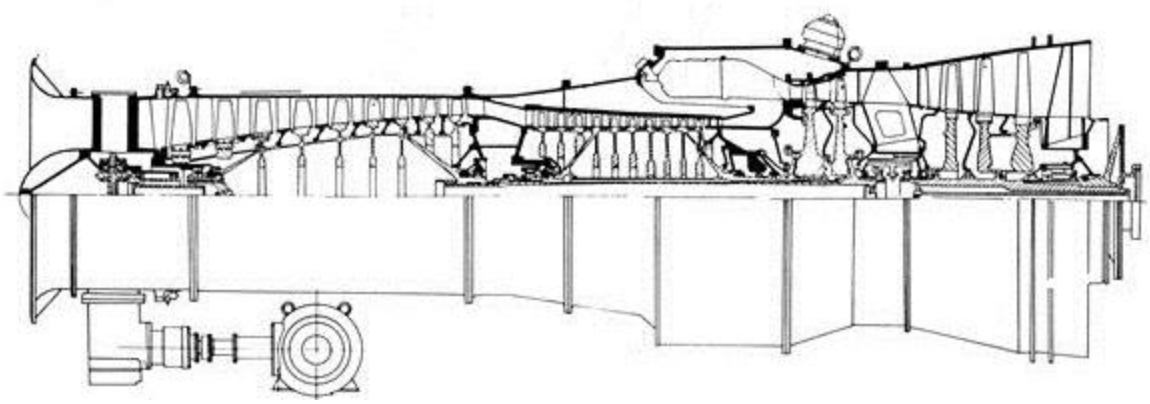

Abb. 1. Schema eines Gasturbinentriebwerks

Die geometrischen Parameter der Schaufelkränze werden als Anfangsdaten eingestellt: Die Konstruktionswinkel der Schaufeln am Einlass und Auslass sind $\beta_{1л}$, $\beta_{1л}$, ($\alpha_{2л}$, , $\alpha_{3л}$), der Profilwinkel γ, die Profilsehne *b*, die maximale Profildicke *Cmax*, die Positionskoordinate der maximalen Dicke entlang der Sehne *Xc*, Form der Mittellinie des Profils, Anzahl der Blätter $Z_л$, Radialabstand $\Delta r_{р.\ заз}$, und andere, sowie die Parameter des Arbeitsmedium von dem Eingehen in den Verdichter.

Die Parameter dampfhaltige Luft werden unter Berücksichtigung der Werte der Gaskonstanten und der Massenanteile von Wasserdampf und trockener Luft bestimmt.

Die Ergebnisse der Berechnung der Eigenschaften eines neunstufigen Niederdruckverdichters (NDV) und eines zehnstufigen Hochdruckverdichters (HDV) unter Standardatmosphärenbedingungen am Einlass und Feuchtigkeitsgehalt d = 0,04 sind in den Figuren 2 und 3 gezeigt, wo $\bar{n}_{пр.} = n_{пр.} / n_{пр.р.}$ und $\bar{G}_{в\,пр.} = G_{в\,пр.} / G_{в\,пр.р.}$ – die relativen Werte der Geschwindigkeit und der Luftströmungsraten sind.

Um den Einfluss der Luftfeuchtigkeit auf die Parameter eines Gasturbinentriebwerks zu quantifizieren, wird ein mathematisches Modell des Triebwerks mit einer schrittweisen Beschreibung des Verdichters und seiner Eigenschaften verwendet. Die Abb. 4 ... 6 zeigen die Abhängigkeit des spezifischen Kraftstoffverbrauchs *Ce*, des Wirkungsgrades η_e, der Leistung N_e von den gegebenen Werten der Drehzahl $\bar{n}_{пр.}$.

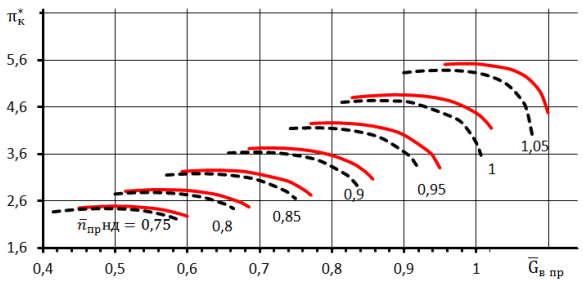

Abb. 2. Eine Änderung des Druckverhältnis NDV mit unterschiedlichen Werten des Feuchtigkeitsgehaltes:
d=0 - ———, d=0,04 –

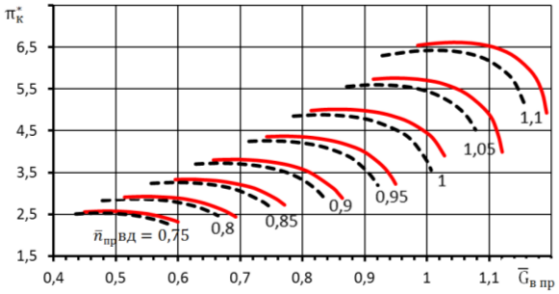

Abb. 3. Eine Änderung des Druckverhältnis HDV mit unterschiedlichen Werten des Feuchtigkeitsgehaltes:
d=0 - ———, d=0,04 –

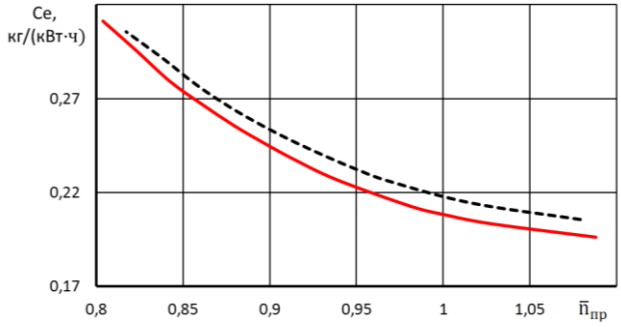

Abb. 4. Abhängigkeit des spezifischen Kraftstoffverbrauchs mit unterschiedlichen Werten des Feuchtigkeitsgehaltes: d=0 - ———, d=0,04 -

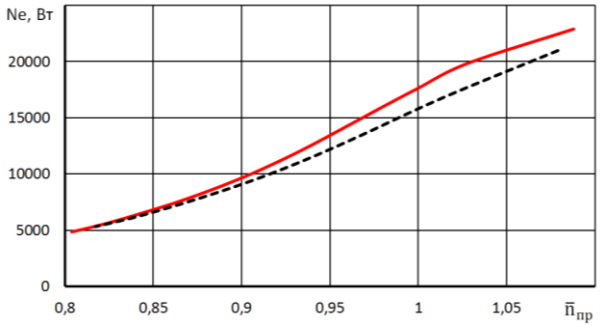

Abb. 5. Abhängigkeit des Leistungssteigerung mit unterschiedlichen Werten des Feuchtigkeitsgehaltes:
d=0 - ———, d=0,04 -

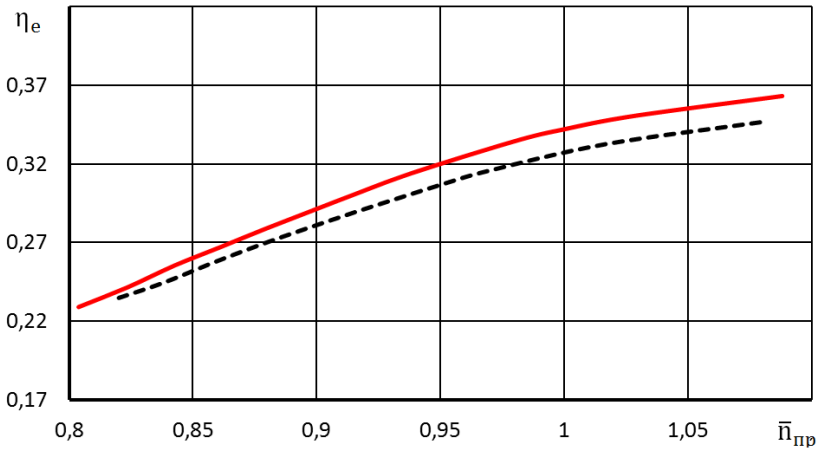

Abb. 6. Abhängigkeit des Wirkungsgrades eines Gasturbinentriebwerks mit unterschiedlichen Werten des Feuchtigkeitsgehaltes:d=0 - ———, d=0,04 -

Es wurden Drosseleigenschaften eines Gasturbinentriebwerks erhalten. Wird der Motor im Nennbetrieb in feuchter Luft (d = 0,04) betrieben, ergibt es sich: die Leistung N_e wird um 4,02% reduziert, der spezifische Kraftstoffverbrauch C_e um 2,93% erhöht, der Wirkungsgrad η_e um 2,83% reduziert.

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Dobrovolskyi V. A.

THE DESIGN FEATURES OF VEHICLE TRANSMISSION OF SPORT-TOURING TYPE

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Cars of sport touring type are a special sector of the automotive industry. The design of these cars is different from most cars. Cars of sport-touring type include harmony, high comfort and easy control along with a sporty dynamism and high speed.

Research and further improvement of the design allows developing new technologies in the automotive industry, to meet the needs of both motorists and professional drivers. Also, cars of sport-touring type are a cause of great

engineering interest, are a testing ground for new systems and mechanisms. Therefore, cars of sport-touring type are gaining increasing popularity, both for research and for everyday use as a vehicle.

Unfortunately, in our country the production of such vehicles has not been launched yet, however, the high interest will lead to the development of cars of sport-touring type.

The name “Grand Turismo” comes from the Italian word combination “Gran Turismo” - a great journey. The so-called journey of young European aristocrats in the 15th century across Europe in light horse-drawn carriages. Over time, the name Gran Turismo has been used for high-speed comfortable cars.

Due to the specific design of cars of “Grand Turismo” class in-depth information on design features is, unfortunately, not available. One can obtain information on these cars from sources that are being advertised or commercial in nature. To design the most optimal structure of the powertrain of the sport-touring type vehicle, one needs, first of all, to build the analogues of the next generation vehicle powertrain. Such cars include Audi R8, Lamborghini Gallardo, Ferrari 599 GTB and others.

On the basis of the most similar analogues, one should develop the kinematic scheme of the transmission. The transmission of the sports coach is depicted in figure 1.1, it is a mono rear-wheel drive. Thanks to a rear-wheel drive layout the powertrain of the engine is installed longitudinally, which reduces vibration to the vehicle body, thereby increasing the comfort during the trip. During acceleration, the weight is redistributed to the rear axle that allows for greater traction of the wheels with the road. The transmission sport tourism car consists of a double clutch 2, dual robotic gearbox 3, gimbal transmission 4, the main gear 5, the differential 6, the axle 7, wheels 8.

Most often in cars of the “Grand Turismo” type they use a piston internal combustion engine. In engines, which are mounted with a double clutch transmission with, they use two massive flywheels. The flywheel in question has a vibration damper, which reduces torsional vibrations that occur due to uneven rotation of the crankshaft. With this in view, setting of the torsional vibration damper at the leading clutch plates is not required, thereby reducing the manufacturing cost and the size of the clutch is relevant.

When choosing a gearbox (KP), it is necessary to take into account the time shift, because this setting affects the acceleration of the car. Switching gears using a manual transmission on the averages takes 0.8 seconds, when there are two inline KPs it takes about 0.08 seconds.

The optimal transmission for the vehicle of the sports tourism type is a robotic two production KP. Such a transmission requires a dual-clutch automatic clutch, which allows for the torque transmission without interrupting the flow of power. The double clutch is designed to speed the shift and ensure the lack of discontinuity of the power flow. The principle of operation of the double clutch is to alternately enable the even and odd number of gears. When enabled only one disc works in only one clutch. At the same time the, the clutch only works at

shifting. The clutch in the transmission with a continuous flow of power can be of two types: dry and wet. In connection with high heating and the need for greater heat removal off the friction discs it is better to use a multiple-disc clutch in oil bath, however it will significantly increase the cost of the given design. Such a clutch has two friction disc packages. The first clutch package is associated with the primary shaft of the odd gears of the KP (the first third), the second clutch package is associated with the shaft and the even gears and reverse one. The diagram of the double clutch is shown in figure 1.2.

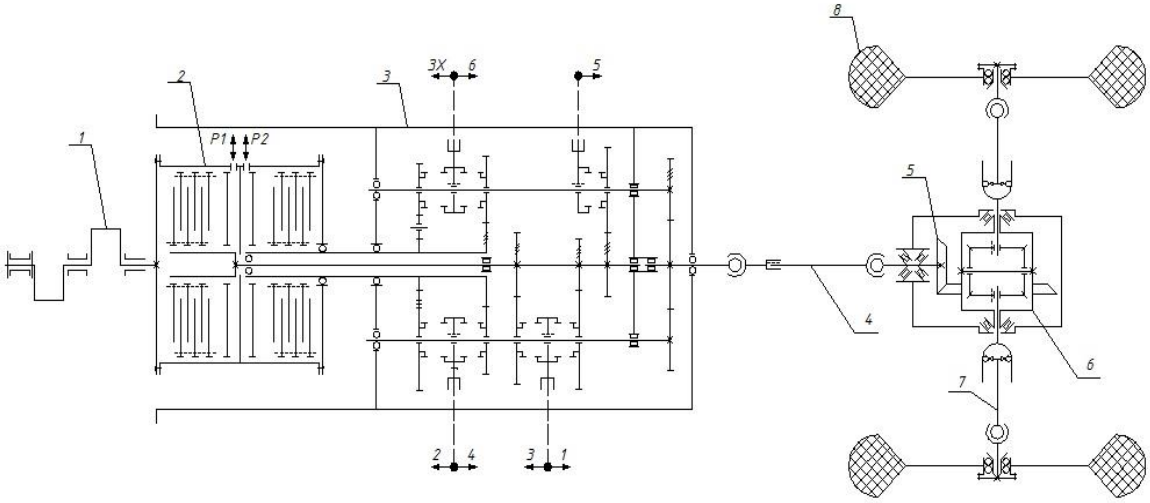
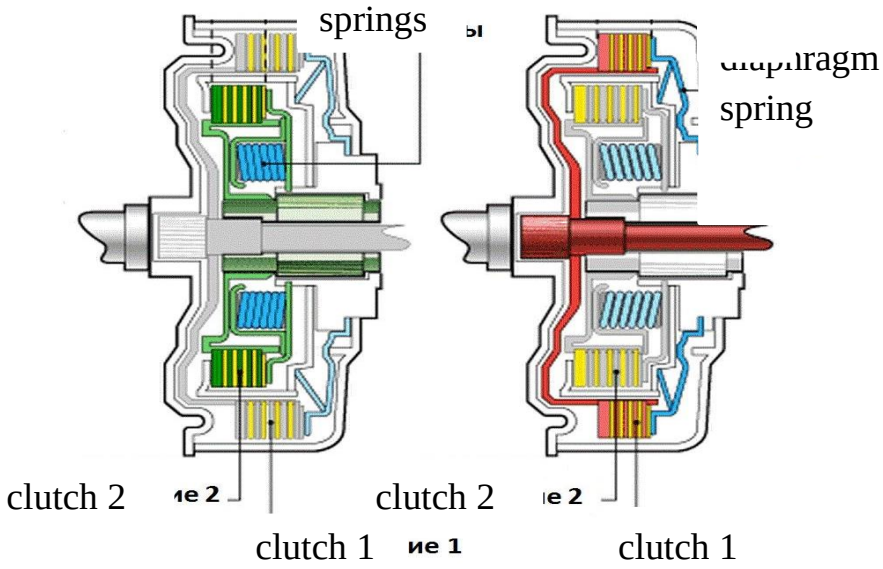


Figure 1.1 – Kinematic diagram of the vehicle transmission of sport-touring type



a – grip 2 is engaged, clutch 1 is disconnected; b – clutch 2 is disengaged, clutch 1 is engaged

The gearbox is equipped with the input shaft 2. On one shaft a pinion gear of even-numbered row and the reverse gear on the second shaft are mounted, the

pinion gear is not an even number. Structurally, the main shaft odd gears are located inside the hollow shaft of the gears, the even gears. The KP has two output shafts. The scheme of the transmission with a double clutch is shown in figure 1.3.

When engaged, a second transfer torque produced by the engine is transmitted via the flywheel to the hub of the clutch hub to the clutch housing. The clutch housing, in turn, transmits the torque to the pressure clutch package, and from it, due to frictional forces; the torque is transmitted to the driven clutch package, which is connected with the input shaft of the KP. The clutch disc via a splined connection rotates the input shaft of the KP.

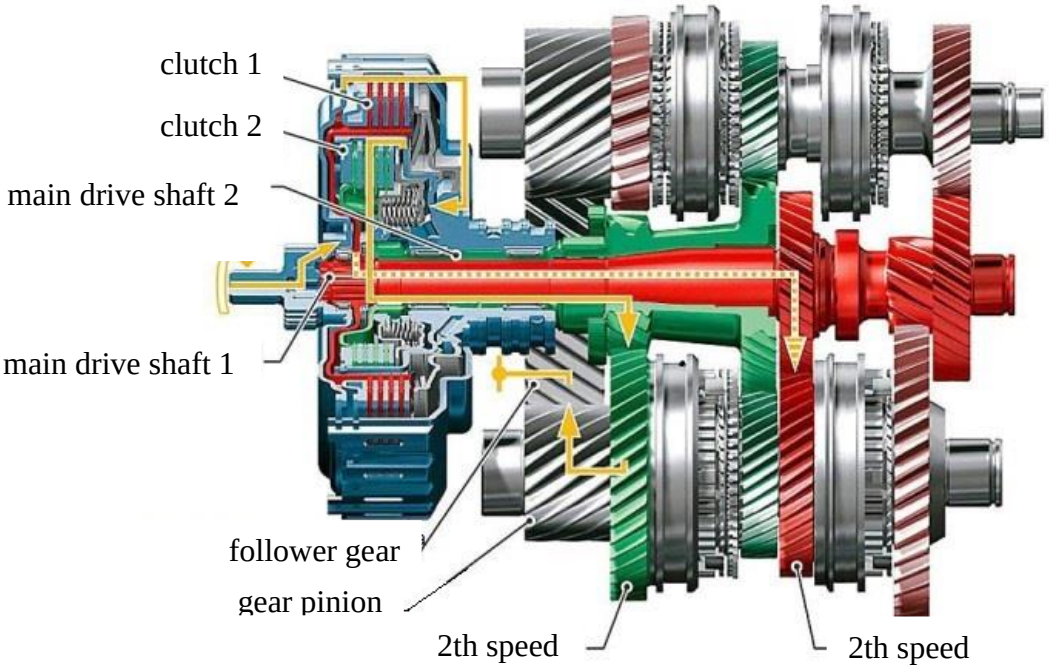


Figure 1.3 - Scheme of a transmission with a double clutch [3]

In open sources in-depth information on design features of the propeller and the main gear of sports coaches is not available.

The studied design of the vehicle transmission of sports coaches effectively implements the high dynamics and increased comfort during movement over long distances.

Such a design of the transmission is used in cars of leading producers of sport-touring type, such as Audi, Lamborghini, Ferrari, etc.

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Dodonov Ye. M.

DESCRIPTION AND STATIC CALCULATION OF THE TOWER CRANE

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Tower crane is a rotary crane with an arrow fixed to the top of a vertically located tower. The main parameters of the tower crane are: load capacity, takeoff, cargo lifting height, depth of cargo lowering, speed of lifting (lowering) of cargo, speed of rotation of the tower, speed of moving the crane.

The tower crane consists of the following main units: a tower, a running frame with wheels, a supporting and pivoting device, a turntable with a cargo and a winch, with a counterweight; the mechanism of rotation and electrical equipment, the mechanism of lifting the load, the mechanism for changing the departure time, the mechanism of movement of the crane, etc.

Static calculation of operational stability and determination of crane lifting capacity is as follows:

The reach of the boom for different angles of inclination is determined as

$$L = r + L_{cmp} \times \cos\alpha \text{ , where} \quad (1)$$

where r – is the distance from the axis of rotation to the root hinge of the boom;

$L_{стр}$ – is the length of the boom;

α- is the angle of the boom lift (from 10 ° to 60 °).

The arm of the load weight located to the right of the vertical tipping axis is determined as

$$l_{гр} = r - b + l_{cmp} \times \cos\alpha) \quad (2)$$

The horizontal projection of the distance from the vertical axis of the tilting of the crane to the center of gravity of the boom lc is hereby determined as

$$l_c = r - b + (L_{cmp} / 2) \times \cos\alpha \quad (3)$$

The vertical projection of the distance from the head of the track to the center of gravity of the boom lc is then determined as

$$h = h_r + (L_{cmp} / 2) \times \sin\alpha \quad (4)$$

The vertical projection of the distance from the head of the crane rail track to the boom head hgr is hereby determined as

$$h_{гр} = h_r + L_{стр} \times \sin\alpha \quad (5)$$

The wind load on the crane arm also depends on the angle of the boom lift and is determined as

$$W_c = W \times F_c \times \sin\alpha \quad (6)$$

The wind load on the remaining elements of the crane from the boom angle does not depend on it and is determined as

$$W_i = W \times F_i \quad (7)$$

The weight of the crane elements is determined as

$$G_i = g \times m_i \quad (8)$$

The shoulder of the restraining forces (the weights of the elements located to the left of the vertical rollover axis) is determined as

$l_i = l_{iuu} + b$, where (9)

$L_{іид}$ – is the distance from the center of gravity of the element to the axis of rotation of the crane;

b – is the distance from the axis of rotation of the crane to the vertical axis of the tipping forward

The moment created by the wind load is determined as

$$M_{wi} = W_i \times h_i \quad (10)$$

The moment created by the weight of an element is determined as

$$M_{gi} = G_i \times l_i \quad (11)$$

The load-resistance factor is determined as

$K_{гу} = \frac{\sum M_y}{\sum M_o}$, where (12)

Mu – is the holding moment;

Mo – is the tipping point.

As a tipping point, only the moment created by the weight of the load is accepted in the calculations. The moments from all other loads applied to the crane are considered as holding moments with the corresponding signs.

When the conditions are fulfilled, Kg is taken equal to 1.4.

Thus, the mass of the lifted load for different angles of boom lift can be determined as

$$m_z = \frac{\sum M_y}{1{,}4 \times g \times l_{гр}} = \frac{M_{gвн} + M_{gпп} + M_{gпп} + M_{gб} - M_{gс} - M_{wнн} - M_{wпп} - M_{wпп} - M_{wб} - M_{wс} - M_{wгг}}{1{,}4 \times g \times l_{гр}} \quad (13)$$

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WALKING EXCAVATOR

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A walking excavator or popularly spider excavator is a special type of all-terrain excavator. Like the regular excavator it consists of a boom, stick, bucket and cab on a rotating platform known as the “house”. However, the house sits atop a different type of undercarriage. It is in the undercarriage where most of the differences lie. The undercarriage consists of leg or arm-like extensions with or without wheels. All can move in increments hence the name walking excavator comes from. Its main feature is the ability to move in a crab- or spider-like fashion and hence overcome any terrain obstacle. The undercarriage design varies widely from model to model and between specialized roles. The number of legs or wheels can also vary from e.g. three (Menzi Muck 5000T2) to four. The “leg” design can also vary from fixed to telescoping arms. The walking excavator’s standout capability is the independent movement of its legs. With a set of wheel accompanying each one, it has got all the freedom of a spider on roller skates. Most modern walking excavators have rotating or powered wheels allowing them to roll or drive depending on the need.

This is different from an early 20th century dragline excavator where a set of feet plate are alternately lifted and lowered. Most traditional excavators have tracks or wheels as undercarriage which limits their usability on steep inclines, uneven terrain or inaccessible positions.

Walking excavators are the mountain goats of the machine world. No matter how crazy the terrain is, these agile excavators have the skills to traverse it. Despite the advantages of the design it failed to be widely used due to little gain in mobility, considering most work are in urban areas, less comfort, expensive design plus expensive electro-hydraulic control and maintenance. For urban construction, these spider-legged machines are overkill. But in forestry and remote applications, the multi pedal machines (there are three and four-legged varieties) come into their own. When producers say that these spiders can tackle all-terrain, it is not a joke.

Control is achieved through the use of joysticks and foot pedals. There is little risk of someone stealing the excavator as they'd need to figure out how to get it moving first.

While it might take a bit of getting used to for those who has never encountered a spider excavator, the low availability of these machines make them a prime opportunity for rural contractors.

Yet their application is so specific, not a lot of people even know they exist. Here is a brief history of the walking excavator.

Back in 1960s, a couple of Swiss blokes who lived and worked around mountains decided there ought to be an excavator that could handle the awkward terrain of Alpine slopes. So, Edwin Menzi (1897-1984) and Joseph Kaiser (1928-1993) teamed up to invent an excavator that could walk.

The first series of ten walking excavators, type designation MUK 3000, was manufactured in Widnau in 1966. In the same year, Kaiser presented this novel machine at the Olma Trade fair in St. Gallen, which was then Switzerland's biggest exhibition for the agricultural sector.

When the first walking excavators were sold, the entrepreneurs went their separate ways. Subsequently, Kaiser AG, Schaanwal, Lichtenstein, and Menzi Muck AG, Kriessern, Switzerland, developed separately excavators and became the biggest producers and competitors.

In April 2013, Kaiser presented a new generation of mobile walking excavators at the bauma trade fair in Munich. With the S10 and S12 Allroad, the company succeeded in bringing up an efficient all-rounder onto the market, a machine which can be used as a carrier for an increasing range of applications.

The impressive performance of the new generation of mobile walking excavators is achieved with KAISERtronic in combination with the newly developed hydraulic system known as ELIS (Electronic Load-Independent System). KAISERtronic optimises the vehicle's operational and travel characteristics. ELIS enables the driver to actively influence the priority and performance of key functions via the display in order to adapt the mobile walking excavator to suit prevailing working conditions.

The system can calculate the ideal hydraulic power at any given time thanks to the constant communication between all components. The result is maximum power at the point of need plus higher speed with reduced fuel consumption at the same time.

At the heart of the S10 lies a Perkins diesel engine with high power and high torque levels plus the option of either a 110 kW or a 129 kW version. The huge torque of up to 750 Nm at just 1400 rpm enables outstanding, efficient performance from the hydraulic system. The integrated diesel particulate filter meets Stage IIIB of the European emissions standard.

The ROTOline hydraulic circuit is designed for very power-intensive attachments. A separate hydraulic pump supplies the circuit with up to 220 l/min. The flow rate can be individually set with the tool management system.

The S10 also offers some more comfort to the operator giving excellent field of vision and driver-friendly cockpit, infinitely variable travel speed up to 10 km/h, travel direction detection and remote diagnostics.

So, a mobile walking excavator is not an excavator in the conventional sense of the word. Its strengths come into their own in areas where others are unable to compete.

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CHOOSING THE TYPE OF ELECTRIC MOTOR

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The choice of the type of electric motor is determined by the technical data of the production mechanism: the frequency of rotation, its constancy or the need for deep regulation, power, conditions of start (under load or idle), etc., as well as by issues of economy: the cost of installation and its operation, the need to adjust the power coefficient, etc.

In cases where it is necessary to maintain constant frequency of rotation at significant power and rare starters, synchronous motors whose rotation frequency at constant frequency of the variable voltage remains constant at any load should be chosen. In addition, synchronous motors are simultaneously compensating devices that increase the power factor of an enterprise. They are used in pumps drives, fans, compressor plants, converters, etc.

DC motors are used in cases where a wide range of fluent speed control is required and it is often necessary to stop and reverse the engine. In the small range of regulation of the frequency of rotation DC motor with parallel excitation is helpful when powered from the DC supply of DC voltage. With a wide range of

regulation of the frequency of rotation and frequent launches, it is also convenient to use a parallel motor, but with a power supply from a separate source, whose voltage varies widely. Such conditions take place in the drives of powerful reversible rolling mills, large metalworking machines, mine lifts and elevators, high-rise buildings, and powerful excavators.

Continuous DC motors, due to their soft mechanical characteristics and big starting torque, are used mainly in electric vehicles, in lifting cranes drives, some auxiliary mechanisms for rolling mills.

Since most mechanisms do not need to adjust the rotational speed or maintain it constant, the asynchronous motors with short-circuited rotor are most commonly used. They are simple in terms of device and operation, reliable and cheap. In some installations, where it is necessary to regulate the rotational speed in narrow boundaries, where a big torque is required, there are frequent inclusions – asynchronous motors with phase rotor winding are used. They are used to drive rolling mills, lifting cranes, passenger and heavy lift trucks, forging machines and presses, and other equipment. But these motors reduce the efficiency of the electric drive when adjusting the rotational speed due to power losses in the regulating rheostats. In addition, the frequency control is possible only in the direction of decrease from the value of the synchronous frequency.

When choosing the type of engine, it is necessary to take into account the environmental conditions in which it will have to work (humidity, the presence of explosive products, dust, acid vapor, etc.). Pollution of windings by dust, reducing heat transfer, leads to premature wear of insulation. Steam of water and acids worsen the properties of the insulation. If the environment contains explosive products, then it is necessary to choose an engine of such a design, in which the spark in it does not have contact with this environment.

According to the environment, a protected, closed or explosive engine must be selected. Protected motors have devices that protect the personnel from accidental collision with current-carrying parts, from droplets of moisture, from rain and spray. In closed motors there is a fan for cooling mounted on a motor shaft.

The power of the engine is chosen according to the ratio. Similarly, the calculation of the engine power is made when replacing the engine with another value of PV. The stepped load schedule of the re-short-term motor drive mode is the power of the thermal mode, but also the equivalent power for the period of operation and the duration of the inclusion are pre-determined.

Engine power losses consist of constant losses (losses in steel, friction in bearings, ventilation) that do not depend on load, and variable losses, proportional to the squares of the current and, thus, dependent on the load. Also, under difficult conditions, the engine starts checking it at the starting torque. For short-term operation, the engine power is chosen from the condition that its maximum torque Mmax should be greater than the maximum load moment, and then it is checked by the starting torque.

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AUTOMOBILE INDUSTRY OF GERMANY

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For today it is possible to tell with confidence, that the motor industry played, plays and will play the major role in economy of Germany. The German automobile industry is one of the most advanced, if not the most advanced, branch of the national economy. Almost all innovations, investments and patents are directed and continue to flow into the automotive industry. German cars are known all over the world for their quality and reliability.

The "Big Three" of the German automakers of the premium segment sold an unprecedented number of passenger cars last year. At the same time, Mercedes regained its lost position. BMWis the champion, once again confirmed its global leadership in the market of cars of higher, business and representative classes and the fifth years in a row of the top companies , it achieved record sales. In 2015, they produced 2,250 thousand cars of brands BMW, Mini and Rolls-Royce. Compared with 2014, sales volumes increased by 6.1%. The BMW is a row of top companies demonstrates record sales: in 2015, it sold 1,905 thousand cars, which is 5.2% more compared to 2014 .

During the unprecedented sales, the major competitors of the Munich concern were also reported. At Daimler, the sales increased by 14.4% and amounted to 1 990 thousand cars of Mercedes-Benz and Smart brands, so here again the fifth record year was registered. At the automaker from Ingolstadt (Audi), the sales also increased by 3.6% to 1,800 thousand cars [8].

All three companies had unprecedented sales volumes, and for all three, the main sales market was in 2015, in China. For BMW and Audi, there is nothing new in this, but Daimler has so far lagged far behind its German competitors in the world's largest car market. However, last year it managed to sell to the Chinese at once by 32.6 percent more Mercedes-Benz cars, taking into account the conditions of the slowed down general growth of the market. As a result, for the first time in the history of the company, sales in China the exceeded sales in the US. Actually, it was this jerk that allowed the automaker from Stuttgart to push Audi to the third place.

Speaking about the European market, it should be noted that the European consumers tend to buy two types of cars: luxury cars and economy class, and the cost of economy class cars should not exceed 18 thousand euros. In Europe there is a growing demand for cars above the average and luxury levels, the German car industry by 60% consists of cars of such classes. This encourages German concerns to improve their cars, making them more competitive and more attractive for the buyer. Interestingly, fact the demand in German luxury cars Europe is growing by. Almost all luxury cars in the world are German produced in or belong to German concerns.

Along with this, in Europe, the trend is currently very much gaining momentum among cars not causing or minimizing the damage coused to the environment. People increasingly think about the harm caused by a to the nature when buying a brand-newcar. In fact, this is associated with a constant by the growing prices for gasoline, and from there the state support of diesel cars in Germany, which by the way will be soon replaced by electric cars [2, 4]. One way or another, companies are developing new models of cars, including using alternative energy sources. Of course, we mean hybrids and electric vehicles.

It is interesting that German companies do not create mostly new electronic or hybrid models, but change only their existing models by converting them from petrol or diesel cars into hybrid or electronic options. The first ones to pick up this fashion and develop it now are the Bavarians. The high dynamics of sales of BMW electric vehicles, which were on sale in 2013-2014, is also very indicative. Their sales grew by 65.9 percent in 2015 to 29,513 units. At the same time, the absolute majority of buyers, over 24 thousand, chose the compact model BMW i3, the rest - the sports car with the hybrid engine BMW i8, both are popular especially the first but the majority of them are repelled by the price and besides the models are difficult to maintain in other regions world, except Europe and America, and are accordingly limited in exports.

Daimler is the main competitor of the Bavarian concern, recently acquired the shares of the Ilon Mask Tesla Motors company, in which the first sports electric vehicle Tesla was created. Gradually, Daimler is trying to increase its share in this company, this shows its interest in developing alternative energy technologies for cars.

As for Volkswagen, they were among the first who allegedly reduced the level of harmful fumes in the car's exhausts. But as it turned out later, things are not as good as they seem to be ! The costs and losses of Volkswagen due to the "diesel scandal" are so astronomically large that Germany is already wondering whether the scandal itself threatens the very existence of the firm. No, there will not be a complete collapse, the experts are convinced. At the same time, they point to significant financial reserves of the company, its numerous assets that can be sold, to the fact that payment of fines and compensations stretch for a number of years, and most importantly - the fact that 20% of the company's assets belong to the state represented by the federal state of Lower Saxony [5].

So Volkswagen does not face bankruptcy, but it can change significantly. For example, to abandon some brands - say, Bentley, Bugatti or Lamborghini, to reduce production, investment and staff, to reduce the presence in some low-demand markets, or even to leave them completely, to review the model policy. It seems that there are possible very different, and very unexpected and radical variants of the development of events. But German business because of the scandal of the century is threatened not only by material, but also image losses: Volkswagen's manipulations can undermine the credibility of any German export products. Serious, and, perhaps, deadly image losses will be borne by the diesel technology itself, to which many German automakers. While diesel cars in Germany are very popular, including the ones, due to tax incentives. It is striking that against the backdrop of the exhaust scandal in Berlin, the statements about the need to significantly expand the state support for electric vehicles have become more frequent.

One of the keys to the further success of German automakers can be confidently called the huge growth rates of exports to developing countries, in particular to the BRICS countries. During the period 2013-2015. Germany increases exports to Brazil by 34%, to India by 60.8%, to China by 47.5%, and also by South Africa. This makes it possible to significantly expand the existing market and compensate for the decline in demand in Europe due to the unstable financial situation. Germany manages to expand its share due to the high quality of its products, high level of safety and economy. All over the world, the cars of German manufacturers are valued, and there is no doubt that such a reputation of the car building industry in Germany has a significant impact on the world demand. At the same time, a decline in Eastern Europe is expected, but it will gradually recover due to the improving economic situation in the region.

Thus, it should be noted that Germany takes an active part in the world trade, takes leading positions in the world ratings on the export of a particular product. Germany's exports are mainly formed at the expense of 4 industries, among which the most important role is played by the automotive industry. This industry is the most developed among others. If we look at the total turnover of various industrial branches of the Federal Republic of Germany, it is the auto industry that occupies the first position. In addition, it accounts for about 20% of all foreign trade. Most of the products produced by enterprises of these industries in Germany are exported.

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WORK OF TRANSPORT AND LOGISTICS CENTERS IN THE MARKET OF TRANSPORT SERVICES

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In order to develop the market of transport services, the formation of transport and logistics centers is urgent. They represent centers, which combine transport, industrial, trading, financial and information flows, as well as cargo processing, interaction of different modes of transport.

In today's market conditions there is a fierce competition in the transport services market, so every motor transport company, transport and logistics center, freight forwarding company should improve the provision of its services to consumers in order to remain competitive.

The activity of different types of transport in the market of transport services is determined by their main goal – the mission that determines their business activity and behavior in the market, which leads to their financial well-being and stability. Many of the well-established concepts and principles of work that were perfectly acceptable and catered to transport customers are beginning to significantly inhibit the dynamics of economic development and require detailed analysis and revision. In order to maintain and strengthen its market position, the transport and logistics center needs to take certain measures in the direction of increasing the level of technological efficiency and efficiency of transport and forwarding activities. There is a need to find additional opportunities for further reducing the level of transport and logistics costs and the cost of transport services, improving the quality of customer service, attracting customers through the development of the necessary set of services.

It is not always possible to fundamentally change the technology of providing transport services for greater efficiency, but it is possible to improve technology at a certain stage of service provision. With an increase in efficiency of

one link, the efficiency of the whole chain of servicing during delivery of goods will increase.

At first glance it may seem that the more services the company will provide, the more profit it will have. But this is not always the case, maybe, because that service is not very popular, and its maintenance is quite expensive and the company does not receive the necessary profit. There may also be a situation for the shipper who orders several services from one firm and several more from the other , though it is cheaper to order a "package" of services consisting of 3–5 services from one enterprise than to order 3 separate ones in different companies.

The benefits of providing a "package" service exist both for the enterprise (it will reduce the cost of organizing the work of the enterprise) and for the consumer (each company provides a variety of discounts), that is why it is necessary to evaluate the feasibility of the transport and logistics center for the provision of services.

The economic situation in Ukraine during the years of independence under the influence of subjective and objective factors has, to some extent, determined the need for the development of logistics as a science with practical application, in particular with regard to the development and implementation of transport logistics systems.

To date, in all developed countries, almost all foreign trade (import and export) flows, as well as the greater part of domestic trade, are realized through regional logistics centers. They are important for maintaining the country's economic potential. Through the logistics centers the country receives significant currency funds. Taxes levied on such centers are usually a significant contribution to the budget.

The transport process in the combined transport consists of the successive delivery of goods by various modes of transport and intermediate unloading or overloading. At the same time when creating a network of combinations of great importance are overloading points, which carry out not only loading and unloading operations from one mode of transport to another, but also other functions. Such points of overloading are called transport and logistics centers.

The concept of "transport and logistics center" is identical to the concept of "multifunctional multimodal terminal complex", also in various sources they are called cargo distribution centers, logistic commodity distribution centers, platforms.

The introduction of new advanced logistics transport technologies is based on the experience of the operation of a wide network of European transport and storage centers of the Euro-Platforms system. These centers perform all essential operations for the processing and transportation of goods with the provision of all types of services at the most up-to-date level.

The development of logistics significantly affects transport policy and structural changes in the activities of enterprises in any industry. This effect is especially relevant for the transport industry due to excessive state regulation of tariffs, transportation distances, the range of goods transported, and other parameters of the transport companies.

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NANOTECHNOLOGY IN MECHANICAL ENGINEERING

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Mechanical engineering is a discipline of engineering that applies the principles of physics and materials science for analysis, design, manufacturing, and maintenance of mechanical systems. It is the branch of engineering that involves the production and usage of heat and mechanical power for the design, production, and operation of machines and tools. It is one of the oldest and broadest engineering disciplines [1].

The engineering field requires an understanding of core concepts including mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity. Mechanical engineers use these core principles along with tools like computer-aided engineering and product lifecycle management to design and analyze manufacturing plants, industrial equipment and machinery, heating and cooling systems, transport systems, aircraft, watercraft, robotics, medical devices, and others.

Nanotechnology involves the precise manipulation and control of atoms and molecules, the building blocks of all materials. Nanotechnology refers to a new area of science in which systems are designed and manufactured at the scale of the atom, or the nanometer scale. One nm is 1 billionth of a meter.

Mechanical engineering is mainly a consumer of bulk nanostructured materials (steel, titanium and its alloys, aluminum alloys, ceramics, plastics and composite materials), materials with memory, powder materials and components for nano-products (hydro and electrical equipment, nanotechnology, etc.). A significant effect is expected from the introduction of technological processes for applying wear-resistant coatings to cutting tools, dies and molds, as well as wear, corrosion, heat-resistant and water-repellent coatings of machine parts. Important is the nanostructured products of the tribotechnical direction and equipment for processing parts with nanometric accuracy and for applying nanocoatings. At the same time, the improvement of the relevant quality indicators (strength, hardness, ductility, wear, heat resistance, corrosion resistance, etc.) can be achieved both by introducing a certain technological process (casting, pressing, coating, etc.)

nanopowders, nanotubes, fullerenes, and due to the appropriate technological modes of manufacturing blanks and products (conformal pressing, thermomechanical processing, etc.). In themselves, nanomaterials in pure form, for example, carbon pipes are not needed: serious positive changes in the economy, including in engineering, will bring in macro-materials from nanotubes or containing nanotubes [2].

Nanotechnology promises a number of benefits from large-scale introduction of mass production of cars. So every knot or component in a car's design can be greatly improved with the help of nanotechnology.

There are already easy to clean and water-repellent coatings for materials based on the use of silicon dioxide.

In the form of nanoparticles, this substance acquires new properties, in particular, high surface energy, which allows the SiO_2 particles to adhere solidly to various surfaces when the colloid solution dries, primarily to the glass related to them, forming a continuous layer of nanoscale projections.

A coating of silica nanoparticles makes the treated surface hydrophobic - on the surface with a film of SiO_2, a drop of water touches the substrate with only a few points, which greatly reduces Van-der-Waals forces and allows surface tension forces to squeeze a droplet into a ball that slides easily over an inclined glass, taking with it the accumulated dirt [2].

A nanotube is a hollow inside molecule consisting of about 1,000,000 carbon units and is a single-layer tube about a nanometer in diameter and several tens of microns in length. The use of bulk nanomaterials on a metal base makes possible the innovative rearmament of the industry: aerospace, power and transport engineering, machine tool, mining, medical industry and fuel and energy.

They are designed for unloaded elements and body parts and under the hood of the car and engine, the outer lining, internal elements, pipes and quick-release fuel delivery systems, oil supply and discharge pipes, wiper blades, tires.

At the moment, engineering and engineering are already using technologies and equipment for manufacturing machine parts with nanometric accuracy, and further research is continuing in this direction [3].

The main hope of nanotechnology is connected with the fact that it will not be possible to move "from top to bottom", but from "bottom up", to grow nanostructures, nanomaterials, nanoobjects. Nanotechnologies require large amounts of materials and it is impossible to collect their atoms behind an atom. Therefore, there are two main keys to nanotechnology.

It is necessary to organize the processes so that the nanostructures are assembled themselves. In other words, these are the processes of self-organization, self-formation and self-assembly [3].

Solving many problems of nanotechnology requires the joint activity of physicists, chemists, mathematicians, biologists - a common language, concepts and models. In addition, it is a broad interdisciplinary view that gives an insight into what, in principle, it is possible to achieve in the future.

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CRANE SAFETY DEVICES

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Hoisting and transporting machines are an integral part of modern production, since with their help the mechanization of the basic technological processes and auxiliary works is carried out. In the automated lines, the role of lifting and transporting machines has increased quantitatively, and they have become part of the technological equipment, and their influence on the company's technical and economic indicators has become very significant. The use of such machines reduces the use of heavy manual operations and contributes to a sharp increase in labor productivity.

A bridge crane is the most common type of crane.

It is used in all industries and is intended for the movement of various goods in production units, warehouses, machine halls of power plants.

The wide distribution of bridge cranes – one of the means of mechanization of production operations, loading and unloading and warehousing operations – requires improvements in their design, increased productivity, operational reliability and durability, as well as weight reduction per unit of capacity or productivity.

According to the Rules of the mounting and safe operation of cranes, all electric hoisting machines are equipped with end protection devices that automatically stop the crane mechanisms.

In the mechanism of lifting the load when the load gripping device approaches the upper or lower permissible position, the mechanism switches off the electric circuit of the electric motor. For this purpose, in the kinematic chain of the mechanism, there is a lift limiter of the type VU-250 connected to the axis of the drum.

The lifting height limiter should be installed so that after the stopping of the load-holding device without cargo, a gap of at least 200 mm between the load holding device and the element standing in the way of its movement would remain. The cams of the VU-250 stopper are installed respectively to the maximum lifted load on the one hand, and, on the other hand, the rope fully wound off the drum, except for one and a half turns, regulated by the rules for the device and the safe operation of cranes.

The device of end protection of the mechanisms of movement of cranes and freight trucks or the stopper of the crane and carts consists of a limit switch of the KU-121 type and a profiled ruler.

In the limit stops of the crane, the limit switch is installed on the crane, and the ruler is based on the crane end track; in the limiters of the trolley travel the limit switch is located on the span structure of the crane, the ruler is on the trolley.

At the approach of the crane to the extreme permissible position, the roller of the limit switch rides on the sloping part of the ruler, as a result of which the limit switch contact opens and the movement mechanism is disconnected.

The limit switch of the travel stop of the crane or truck must be installed so that it operates at a distance of the crane and truck to the stop, equal to not less than half the way of braking. If, for example, the limit switch is set at a distance equal to half the braking distance, the crane or truck can be moved all the way to the stop after the limit switch trips with a speed equal to 0.71 of the maximum speed. In this case, a further reduction in the speed of the cranes is effected by the buffer device.

To limit the movement of cranes and freight trucks along railways, to reduce shock loads when approaching the stops, they are supplied with buffers. With fully serviceable brakes and end automatic crane protection, the installation of buffers allows to extend the working stroke of the crane and trolley, and with a possible malfunction of the brakes and automatic protection, increase the reliability and safety of the crane operation.

The quality of the buffer is estimated by the energy intensity – the amount of energy that the buffer is able to accumulate due to elastic deformation or to absorb, dissipate energy, and the absorption coefficient by the ratio of the absorbed energy to the energy intensity. For a buffer having a small absorption coefficient, a high return is characteristic, since after the buffer is compressed, most of the impact energy again becomes the kinetic energy of the crane or truck. In the crane, wooden, rubber, spring, spring-friction and hydraulic buffers are used. Instead of buffers the so-called gravitational stops-pieces of track, smoothly rising up, are now used. When the gravitational thrust is hit, the kinetic energy of the crane passes into the potential energy of the raised mass of the crane, which prevents a hard blow to the supports.

Rubber buffers can be made monolithic, consisting of a single piece of rubber fixed in a steel flange. The rubber buffer has a good absorbing capacity, since 30-50% of the kinetic energy of the trolley or crane passes into heat thanks to forces of internal friction of rubber.

Spring-friction buffers have a very high absorption coefficient (0.6-0.7). However, they differ in the complexity of the design and are difficult to calculate due to some uncertainty in determining the work of frictional forces.

The most modern are hydraulic buffers, which have a large energy capacity with limited dimensions and an absorption coefficient close to unity.

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FAMOUS MULTI-PURPOSE TRACTORS OF KHARKIV TRACTOR PLANT

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Industrial tractors are widely used for creating a variety of special techniques during the execution of works in road construction and utilities. Among the wheeled vehicles, a considerable part of a wheeled tractor with articulated, produced by the Kharkov tractor plant. The enterprise serially produces unified agricultural multi-purpose wheel and caterpillar tractors, ploughing and multi-purpose tractors.

The combination of high quality, reliability and fair prices is of primary importance under the new conditions of market economic relations in rural areas.
To meet these requirements "Kharkiv Tractor Plant named" Open Joint-Stock Company “KhTZ” has considerably modernized a serial model of wheeled tractor T-150K and caterpillar tractor T-150. It has also worked out and carries out production of a series of fundamentally new plowing tractors and general purpose tractors. Besides the very famous T-150K and T-150 tractors, the main elements of which have been constructively and technologically tested in the long process of their production, the manufacture of T-150K-09 and T-150-09 new tractors has been started. They may be supplied with bulldozer equipment and in addition to their primary purpose as farm tractors they could be used for different road and construction works, fodder provision and transportation purposes.

Regarding consumers' increasing demands and introduction of updated technologies in crop growing, OJSC “KhTZ” has created a family of powerful utility tractors of ХТЗ-170. In their design special attention is paid to reliability of transmission, creation of comfortable conditions for tractor drivers, installation of engines convenient for consumers due to availability of production and repair facilities.

Tractors of ХТЗ-17021 model are equipped with the engine of German Firm “Deutsche AG”. Model ХТЗ-17221 is equipped with the engine ЯМЗ-236Д of OJSC “Autodisel”, (Yaroslavl town, Russia).

Tractors of ХТЗ-170 family have better performance by 30% in comparison with their analogues made in CIS countries, and the fuel consumption per a hectare is 25% less. Attached double-cylinder hydro-system and a powerful engine provides for installing mountable and towed agricultural equipment with broad catch. If comparing with the traditional technologies of crops and vegetables cultivation, the new ones help diminish direct running costs up to 70%, and labor costs- 65%. For this purpose they use agricultural equipment with minimal efforts of soil cultivation including subsurface tillage tools and direct sowing machines.

Tractors of ХТЗ-160 family have been recently created and are in production now. These tractors can perform not only the general operations of basic surface tillage, that is the work of utility tractors, but also inter-row tillage and crops harvesting (potatoes, maize, soy, sugar beets, sunflowers, etc.).

Utilization of mountable motor free harvesters to harvest sugar beets and maize reduces costs for purchasing more expensive self-propelled harvesters and the tractor may be used as a power source for the harvester instead of such machines as “Polessiye УЭС-2-250”.

At present KhTZ tractors of joint assemblage have become integral to the system of agricultural machines, manufactured by Russia according to European technology, for production of beets, potatoes, maize, sunflowers, soy, buckwheat and other crops.

KhTZ tractors can be combined with agricultural machines produced by Ukrainian, Russian and foreign enterprises. KhTZ tractors are widely used when designing infrastructure of industrial complexes, enterprises and different production lines and also can be used as transportation means. Frontal loader T-156 on the basis of T-150K tractor has been created and is now in production. It can be used when loading loose goods and sugar beets, as it has removable aimed buckets. In the recent past forestry-engineering tractors and trench excavators were produced on the basis of T-150K. If ordered the machines can be produced now.

For farmers OJSC KhTZ produces multi-purpose wheel tractors ХТЗ-3510 with the capacity 34 h.p. ХТЗ-3510 is provided with the engine produced by a Lithuanian firm “Oruva” under the license of “Doytz” firm.

To sum up the OJSC KhTZ production meets the requirements of modern times, and the enterprise itself successfully keeps its high standards, produces machinery, which is twice or three times cheaper than the one produced abroad.

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OUTRIGGERS FOR MACHINERY

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Outriggers are various types of special equipment, such as truck cranes, aerial platforms or supports of various designs. They are designed to increase the footprint and thereby increase the stability. As a rule, they have a hydraulic drive. More rarely this term is used for other elements (console beams).

Each model of the truck crane is equipped with different outriggers, which usually depend on the length of the extension, the principle of extension and the shape of the cross section. According to these characteristics, outriggers can be divided into:

-hydraulic, fixed in any position;

-handed, fixed in any position;

-human, fixed in a certain position.

Hydraulic systems of outriggers are usually used on powerful models of manipulators. Such outriggers operate from the hydraulic system of the CMU or the base chassis, in case they have a self-contained drive.

As for the cross-sectional shape, the load index that the supports can withstand depends on it. The most common form is a circular cross section, but there is also a square, reinforcing support.

The choice of a certain type of outriggers must be made taking into account the peculiarities of the work to be performed, because this defines the appropriateness of choosing a system that can reliably fix the machine.

First of all, the stable state of the AHP is provided by specially designed outriggers. It is interesting that about 65% of all accidents of AHP are caused by improper use of outriggers. Maximum pressure on the ground according to modern European standards should not exceed 4 MPa. This norm ensures trouble-free operation, and it is quite real with the correct use of existing support devices.

Outriggers can be folding, turning, remote. The most commonly used outriggers are remote ones. More often 4 supports are used, but there are lifts in which only two front outriggers are installed.

In its most general form, the outrigger is a telescopic power pole with a lug support, hinged or rigidly fixed to the end of a transversely extending beam. There are options for turning outriggers in the horizontal plane. This design facilitates access to the elements of the running gear of the base machine, but the cost of such a design approach is quite high, so we have rotated 180 ° outriggers are not found often.

To ensure the necessary stability and resistance to rollover during the operation of the hoist, the paws are pressed against the ground, and at the end - are withdrawn from it. The movement of the supports with locating pawls is provided mainly by double-acting hydraulic cylinders that raise and lower the lug support. Supports can be of different lengths: short, from 0.7 m, medium or long, up to 1.5

m and more. The length is determined by the height of the chassis, because the extended supports should raise the base machine before the wheels break off, i.e., so that the suspension and chassis wheels are fully hung. Hydraulic cylinders are used standardized, mass-produced. Their range is very wide, and you can pick up almost any size you want. Only in Europe more than 120 enterprises manufacture hydraulic cylinders for special machinery and equipment.

The main task of the outriggers is to increase the supporting contour of the lifting installation and unload the running gear of the base machine. The outline built by outriggers can be H-shaped and X-shaped. On tight construction sites, outriggers are usually arranged according to the X-shaped scheme, which allows them to be put out as much as possible, despite the limited space. But today more and more you can meet the increase in the support contour of the AGP by using a combined X-H-pattern instead of the X-shaped support layout. In this case, the front is supported by the X-scheme, and at the rear - rectangular, telescopic H-shaped supports. Due to such a scheme, the support zone increases, the machine feels more stable, while the occupied area increases insignificantly. In AGP working at high altitudes, as a rule, H-shaped circuits of outriggers are used, since in this case the maximum area of the reference contour is provided.

The outriggers of the standard type are of circular shape. Supports of a rectangular cross-section are also used; they are applied in the strengthened outriggers. Beams, to the outer sides of which are mounted on the bolts, the cylinders lowering and raising the support legs are pulled out from the base of the AGP on the supporting rollers and held in the final positions by the fixing device. These beams can consist of several telescopic sections. To prevent their spontaneous extension, the locks have an additional lock. The length of the extension of the beams is adjustable; usually the design specifies 2-3 options for the size of the extension. The beams can be retracted manually, with fixation either arbitrarily or in certain positions, or hydraulically, with fixation in an arbitrary position.

One of the most stable is AGP, created by Ruthmann Gmbh & Co. KG from Germany. The company claims that the design of their mod. Steiger TTS 1000, designed to work at a height of up to 100m, allows specialists to perform their functions at the maximum height in a basket with a carrying capacity (g/p) of 320kg at a wind speed of up to 16 m/s. To date, this is a world record of sustainability.

In the management of the car lift there is a separate system that monitors the uniform load on the outriggers at any position of the working platform, taking into account the influence of external factors. Secure settings are supported automatically. The "cargo torque limiter" program installed on the on-board computer is responsible for ensuring that, under normal conditions, any, including not completely competent operator actions, do not lead to overturning of the machine. In addition, there is a system that monitors the fixation of the telescopic beams and the position of the outriggers, controls the horizontal position of the

working platform, as well as the maximum deviations from the horizon of the entire installation.

At the Bauma 2013 exhibition, the Finnish manufacturer introduced two models of the new series of AGRs of the new XR series. Novelties absorbed all the latest advanced world developments in the field of lifting equipment. The XR series was developed by Bronto specialists to replace the XDT series, which has been successfully operating for many years, but which is morally outdated. Among the many differences, the most striking is the increased horizontal reach in the models of the new series. In particular, model S 56 XR when lifting the boom to a height of 40m provides a horizontal flight of 35 m. And the maximum horizontal reach of this model is 40m.

Of course, with the new characteristics, the design of the outriggers has also changed. Outriggers of the Bronto XR series are provided with a self-leveling function. This allows Bronto Skylift installations to work confidently on inclines of up to 10°C. And this despite the fact that at an outreach of 40m the boom lift retains a working platform, designed for hp 700kg. The possibility of working on inclined planes of AGP of such a mass and with such an extension of the boom is a very important positive factor in the characteristics of the new lifts.

Other manufacturers use different approaches when working on sloping platforms. In some cases, for the purpose of slope compensation, wedge-shaped linings are used for outriggers.

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ANALYSIS OF THE MONITORING SYSTEM “AUTOGRAPH”

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Today one of the principal scopes of GPS technologies is monitoring of vehicles. The modern control systems allow obtaining operational information about exact location of an object, its stops, the speed with which it moves fuel level in a tank, etc.

Carefully worked monitoring systems of vehicles were widely adopted. They are used by the state and private transport companies, civil engineering firms and

also other organizations in which infrastructure there is a transport department.

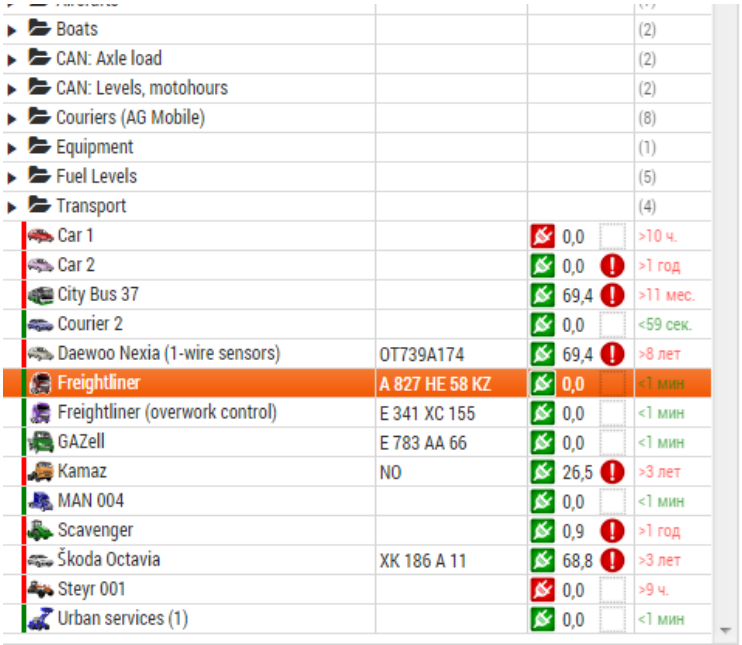
The equipment of navigation satellite systems is hi-tech, and easily integrated with other types and the software [2].

The systems of satellite monitoring of transport solve the following problems:

- monitoring the direction and motion speed of a vehicle, indices of sensors and other instruments in real time;
- accounting the statistics of use of a vehicle including passed kilometers, fuel consumption, motion speed, an operating time of mechanisms;
- monitoring the compliance of the actual route allows increasing discipline of drivers, avoiding cases of inappropriate use of a vehicle, wrapping (change of an index) a speedometer;
- monitoring indices of fuel sensors allows avoiding cases of fuel and lubricants plum;
- monitoring a geozone allows controlling finding a vehicle in the given boundaries.
- safety: knowledge of location allows finding quickly a vehicle hijacked or got into trouble.

Innovations of monitoring GPS and GLONASS are relevant presently, especially, when it comes about production and motor transportation branches. Due to competent monitoring systems they can manage to watch in real time behind all changes and processes happening with a vehicle from defining of its position to fixing run and fuel consumption.

It is possible to cope with all tasks with the help of installed system AUTOGRAPH for motor transport.



The Autograph system has an opportunity to control transport with the use of web interface, that is to get access to all necessary information by means of only

the Internet browser from any computer. For viewing of statistical information it is necessary to execute an input on a tracker on adresu:http://ag-online.ru [1].

Then there will be available a dialogue box with a group of settings for the display of information. In a dialogue box we choose a type of transport which we want to trace. And soon we open information about its location, speed and the most important fuel consumption. [2]

On the basis of the above it is possible to draw conclusions that this system is very useful and with its help it is possible to save not only money but also time.

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ON THE EFFECT OF SEALS ON THE RELIABILITY OF THE HYDRAULIC DRIVE

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One of the important components of any hydraulic drive is the sealing of stationary and moving parts loaded with working fluid pressure. If the seal separates the cavities of high and low pressure of any hydraulic device and thus prevents internal leakage of the working fluid, then the efficiency increases, the machine and the working fluid are heated up less, the speed of the working bodies is maintained. If the seal separates any cavity of the hydraulic device from the atmosphere, it prevents external leaks, which in addition to the loss of the working fluid harms the environment, and this is in some cases is absolutely unacceptable.

The first years of hydraulic drive application in construction machines, when the working pressure did not exceed 6 MPa and even when it reached 10 MPa, the required tightness was provided by rubber rings of round section or rectangular. To seal moving parts rubber cuffs are used more often.

The rubber seal behaves as a very viscous liquid. Furthermore, with the increase in pressure in the hydraulic drive to 16.25 and 32 MPa, which is justified by a reduction in the overall dimensions and

weight of all hydraulic devices, the requirements for hydraulic seals have increased significantly. Various polymers, fluoroplastic, polyurethane, polyesters, etc., which have a modulus of elasticity many times higher than that of rubber, and the coefficient of friction for steel are several times smaller, have been used as the sealing material.

Reduction of frictional forces between the seal and the sealing mobile part and the prolongation of the sealing life is facilitated by the high purity of the treatment of the friction surface of the part, achieved by grinding, polishing and plating or epilamination. The first samples of hydraulic hammers developed in the 1970s attempted to apply seals taken from the aircraft industry. These seals were a combination of a fluoroplastic cuff, in cross section similar to a channel, into which a rubber ring of circular cross-section is mounted. The rubber ring provided pre-pressing the cuff to the stem.

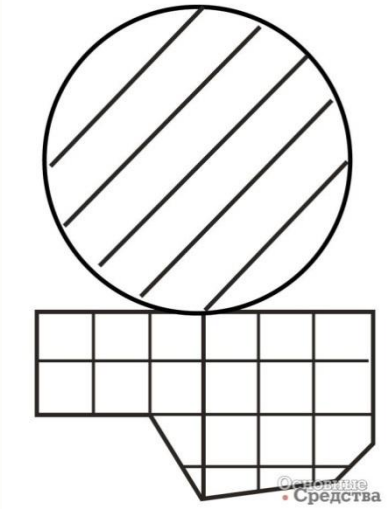

Fig.1. Combined rod seal

At the present time, combined seals (Fig. 1), in which the polymer cuff (sealing ring) is also pressed against the stem by a rubber ring of circular cross-section are used with great success, but the thickness of the cuff is 2 ... 2.5 mm, and on its sealing surface there is a denticle. The cuff comes into contact with the rod at first with a special denticle, and not with its entire surface. The sufficiently high contact stresses in the tooth region ensure high tightness, and the low coefficient of friction and high thermal conductivity of the cuff material make it possible to apply such seals with a sliding speed of up to 10 ... 15 m/s and a working fluid pressure of 20 ... 40 MPa depending on the clearance between the sealing parts.

In the 1980s in the Institute for sealing of hydraulic devices operating at working fluid pressures measured in tens of megapascals, experimental elastically deformable metal rod seals were developed. Such a seal was a thin-walled metal cylindrical shell of a certain length, made of bronze or other material with a low coefficient of friction in steel. Bench tests of an elastically deformable metal seal have shown that a much higher tightness of the friction pair is achieved. Seal performance was measured in millions of loading cycles.

Since any failure of hydraulic seals requires a break in the operation of the hydraulic drive to replace it, a partial disassembly of some components, the importance of this component is evident to ensure reliable operation of the product. Even at the design stage, it is important to correctly evaluate the working conditions of the seal: the maximum pressure of the working fluid, including the possible reactive and inertial loads, sliding speed, temperature conditions and then select appropriate compaction from the catalogs. It is necessary to provide constructive methods for the protection of seals from pressure peaks that may occur in an abnormal situation. Furthermore, when manufacturing the product, it is necessary to ensure compliance with the technical requirements for sealing locations, and, finally, in operation, the requirements prescribed in the operating manual for the corresponding product must be observed. For the successful operation of the machine with a hydraulic drive, it is advisable to have a so-called repair kit containing the entire range of seals used in this machine at hand.

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EXPENSES CONTROL AND EXPENSES RATIO

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The need for expenses control occurs when most Thermo-Gas Supply and Ventilation (TSV) systems are equipped with Automated Control System (ACS). Expenses are intended to stabilize disturbances by material flows, they are an integral part of the systems of automation of TSV systems. Often these ACSs are internal circuits in cascade control systems of other parameters. In order to provide a given composition of mixtures, maintain the material and thermal balance in the apparatus and facilities of TSV, systems of regulation of the ratio of expenses of several substances are used.

ACS by expenses have the basic features, non-inherent to ACS by other technological parameters of chemical and technological processes. The first feature is the low inertia of the TSV, which is the pipeline section between the primary flow rate meter and the regulating body. After changing the position of the regulating body, a new value of the charge is set at a time not more than several

seconds. Dynamic characteristics of the actuator, including speed, are determined by the inertia of the measuring devices, the regulator and the actuator.

The second feature is that the signal corresponding to the measured value of the cost always contains obstacles, whose level is high. In part, these obstacles are the result of physical variations of the expenses whose frequency is high. The presence of high-frequency components in the measurement signal of the flow is the result of the pressure pulsations in the pipeline, which in turn is a consequence of the operation of the pumps, compressors, flow fluctuations when the flow is throttled through the narrowing of the flow. Because of this, in order to avoid amplification in the system of random perturbations, regulators with small values of coefficients of static transformation are used in the ACS flow rate.

In the flow control systems, one of the following ways of changing the flow rate is used:

1) throttling the flow of matter through the regulating body, which is installed on the pipeline (valve, gate, shutter);

2) change in the pressure in the pipeline with the help of a regulated energy source (by changing the number of revolutions of the pump engine or the turning angle of the blades);

3) transfer of surplus substance from the main pipeline to the by-pass.

For transportation of liquids pipelines use centrifugal and piston pumps. The purpose of managing these objects is to provide a given performance.

The flow control after the centrifugal pumping is controlled by a control valve mounted on the discharge line. It is not recommended to install a primary measuring transducer, such as an aperture, on the line of suction of the centrifugal pump: throttling of the flow through the diaphragm can cause cavitation in the pump, which results in its rapid wear, reduction in productivity and pressure. The valve on the injection pump line can also be operated from other regulators, if technology requires it.

In the case of bulk piston pumps, the pressure that causes the fluid to move, is created when the periodic displacement from the closed volume is progressively moved by the piston. Piston pumps are powered by steam engines or electric motors.

For a piston pump with electric drive, throttling is unacceptable, as the regulator can shut the valve completely, which will cause the pipeline to break (or if the valve is installed on the pump shaft). In this case, the bypassing of the flow is used to control the flow, part of the liquid is redirected from the injection line to the suction. Similarly, the productivity of gears and blade pumps is adjusted.

The productivity of a piston pump with a steam drive is controlled by changing steam supply to the actuator cylinder. To do this, a valve is installed on the steam line, with different degrees of opening, a different amount of steam is supplied to the pump drive, which determines the number of piston strokes of the pump and provides performance adjustment. The controlling effect on the valve is fed from the flow controller, and the sensing element of the primary measuring transducer is set on the injection line of the pump. At frequent and sharply

changing steam pressure, a cascade control system with a correction of consumption of the product being pumped is used.

The regulation of the ratio of expenditure of two substances is carried out in the following ways:

1) with application of supervising control to ensure a constant given ratio of "leading" and "managed" expenses;

2) with regulation of the correlation of expenditure ratio by the third parameter (for example, the temperature or level in the apparatus).

One-circuit monitoring schemes for adjusting cost ratios is used in the event of an arbitrary change in "lead" costs.

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MINI LOADRES TODAY

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Very often in modern urban conditions, a variety of road repair and maintenance operations are carried out, whose condition is to perform the work as quickly as possible, but it is unlikely that anyone will be able to do it without the help of technology. One of the features of such works is limited space, small turning areas, difficulties in delivering equipment to the project site, which entails additional economic costs, therefore the use of heavy equipment is no longer appropriate. Special equipment can help in such situations; it came to us in the form of a small-sized loader, which, thanks to a huge number of replaceable working equipment and a small size, can carry out almost any kind of work even where it would seem impossible. This kind of machines is a kind of "Swiss knife" in the world of construction and road machinery. Possessing a miniature size, it easily maneuvers between structures, trees, and other obstacles that would interfere with the equipment we are used to in doing our work. Today it is used not only in construction, but also in the communal sphere, agriculture and other spheres. The use of these loaders helps not only to reduce the cost of human labor, but also to optimize the process itself, hence reduce economic costs. In the new world of overcrowded roads and rapidly developing megacities, it is successfully popular, the effect of this is the production of such a loader by all known manufacturers of construction equipment, as well as the development of new designs of such

machines. In parallel with this, the work on improving the existing equipment is under way.

In recent years, the business of leasing such equipment has reached a great turnover around the world. For the periodof 2017-2020, this trend is going to continue. Analysts predict that the world market of small-sized loaders in the future will grow by more than 10%. Having conducted market research, we can say that the leaders in production today are such companies as Bobcat, Caterpillar, Komatsu, JCB. It should be noted that already more than 20 companies in the world are developing and manufacturing small-sized loader trucks, increasing their maneuverability, carrying capacity and increasing the list of various attachments. Despite the fact that a huge amount of such equipment is produced by different manufacturers, the difference between them is not significant.

The design of small-sized loaders can differ in running equipment, the type of boom, the ability to work in extreme conditions. The main parameters of these machines are the nominal load capacity and overall dimensions. Experience in the operation of small-sized loaders shows that in 60% of cases they are used for the relocation of bulk materials (crushed stone, sand, developed soil, etc.) .The heaviest mode of operation for the loader is the overload of the main bucket with cargo. Because of its short base, it is prone to vertical overturning.

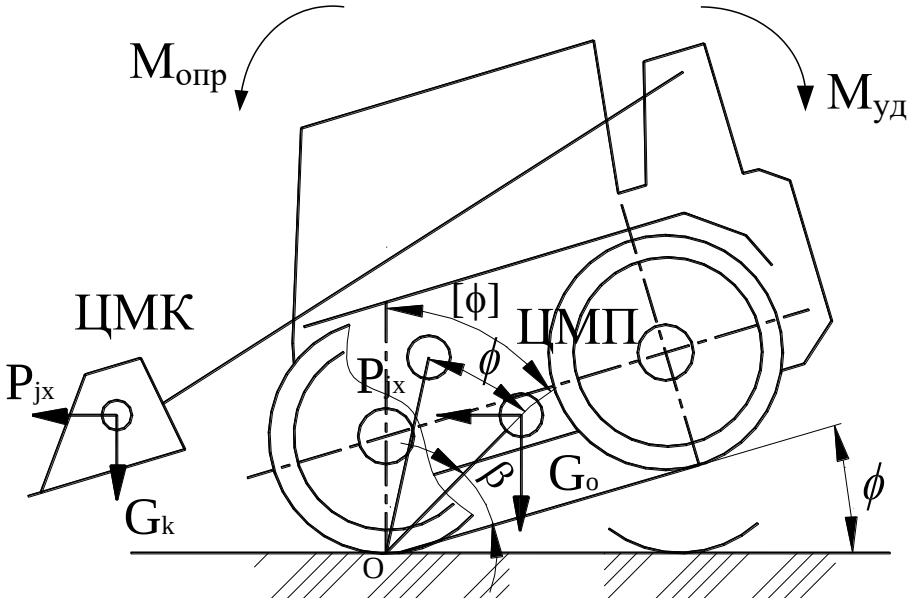

*Fig.1 Stability of the loade*r

Today, the main goal of increasing the efficiency of small-sized wheel loaders with the on-board steering system is to achieve their stability when crossing a threshold obstacle. In order to achieve this goal, a series of experimental studies were carried out, which made it possible to note some points.

The stability of the loader is provided when the condition is fulfilled:

$$\frac{\pi}{2} - \beta > \phi$$

$$\phi = 0.64 \frac{v_0}{h_{\text{цт}}} \frac{\tau}{2}$$

From figure 1 it can be concluded that the rollover ratio is equal to the ratio of the tipping moment to the moment of the tipping torque.

The formula for determining the coefficient of stability:

$$К_{ins} = \frac{М_{res}}{М_{dis}}$$

In conclusion, I would like to note that the current regulations do not provide an assessment of the stability of wheel loaders when performing various operations related to obstacles. Therefore, the definition of such indicators as sustainability can serve as a step towards their improvement and increase of the efficiency of work.

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RESEARCH OF THE MOTOR GRADER'S SIDE SLIP IN THE PROCESS OF FRONT WHEELS POSITION ADJUSTMENT

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Language Advisor – Asst. Prof. Hrichchina A. V.
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Side loads onto an actuating device which can lead to a derivation from the planned trajectory of movement of the car affect the motor grader in the process of implementation of work operations.

The goal of the research is definition of an impact of position of the front wheels in space on the motor grader's side slip.

To achieve the objective it is necessary to perform the following tasks:

– analysis of scientific and technical information on the indicators of road holding;

– organization and carrying out of an experimental research;

– research of the effect of inclination of the front wheels on the lateral shift of the motor grader;

– research of the effect of turn of the front wheels on the lateral shift of the motor grader;

– analysis of gained experimental data.

The indicators of road holding in excavating transport engineering [1] are directly dependent from limiting forces acting on a moldboard blade.

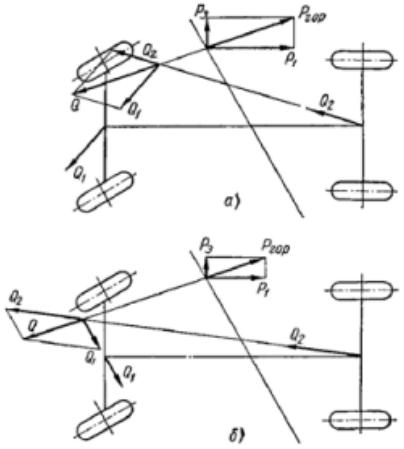

Figure 1. Dynamic pattern of the motor grader

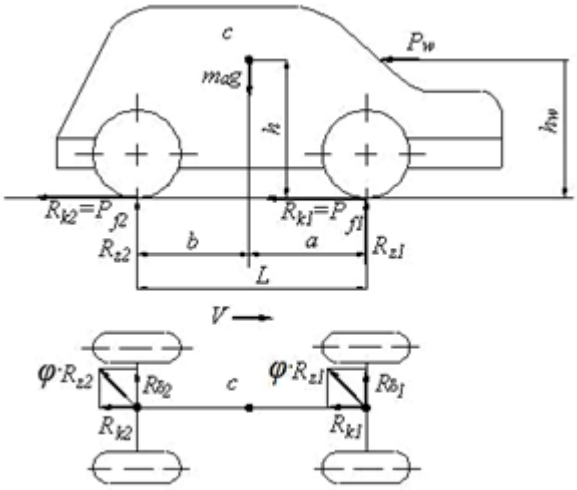

Figure 2. Dynamic pattern of the car

$$k_x = \frac{P_1}{P_{1\max}},$$

where - a marginal constituent of the reaction of a soil on a blade; in this situation a stability of the motion with this weighing is not lost;

- a marginal constituent of a soil on a blade; in this situation a stability of the motion with the most profitable weighing is not lost.

For the cars [2] an index of road holding depends on the geometric parameters of the car and the dynamic forces acting during the turning

$$K_{ycò} = \frac{b}{a} \cdot \frac{R_{\delta 1}}{R_{\delta 2}},$$

where a, b – the coordinates of projection of the center of gravity of the car on the horizontal plane;

- the cornering forces of the road on the wheels of front and rear axles.

A great number of scientific developments is devoted to the theoretical analysis of a wheel movement under the affect of a transverse force.

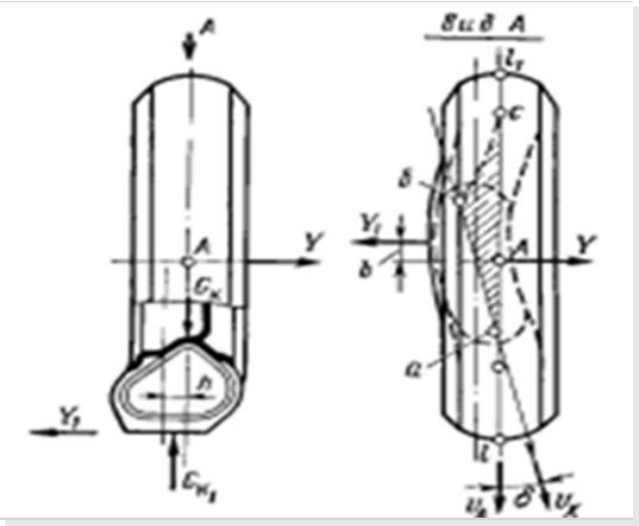

Figure 3. Dynamic pattern of the wheel

$$k_y = \frac{d\gamma}{d\delta}$$

where - a transverse force acting on a wheel;

- an angle of obliquity.

An experiment for the determination of the motor grader's side slip was carried out at the testing ground of KhNAHU. The experiment was carried out on the soil of the second category with a relative humidity of it in the range of 18%-20%. An overcut was carried out by the edge of a blade for a length of 20 m. The variable parameters of the experiment were taken:

- a wheel alignment angle in a vertical plane
- a wheel alignment angle in a horizontal plane

Figure 4. Adjustment of a wheel leaning angle

Figure 5. Adjustment of a wheel turning angle

The parameter of the experimental research was a speed movement of 1.01 m/s, with a nip angle of 90°, and a miter angle of 12°. An adjustment of the wheels in a vertical plane changed from 0 to 10, an adjustment of a wheel turn in a

horizontal plane changed from 0 to 15. The motor grader was mounted in parallel with the base straight line. The parameters to be measured, were the distance of the front and rear axle to the base straight line. The measurement was carried out at the beginning and at the end of the way of a motor grader.

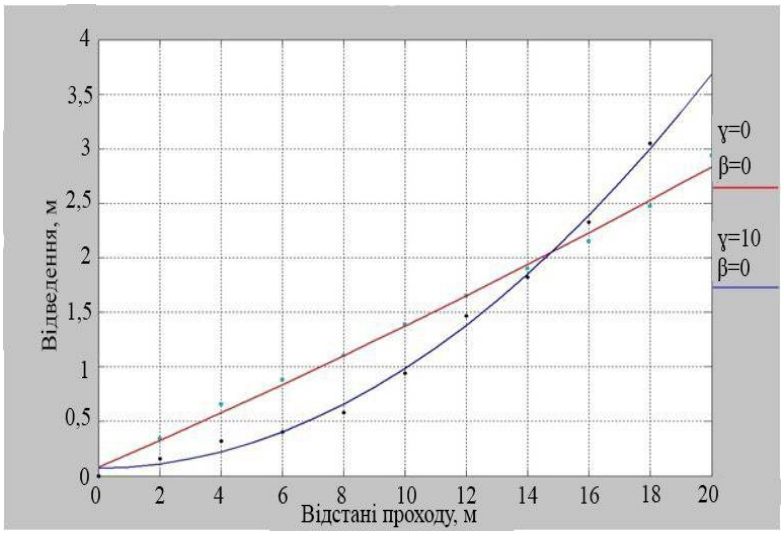

Figure 6. Diagram of a slip of a motor grader during the adjustment of the wheels in a vertical and in a horizontal planes at 0, and during the adjustment of the wheels at 10 in a horizontal plane

The diagrams (Fig. 6-8) of the car's side slip depending on the position of the wheels of the front axle in space are presented. The diagram (Fig. 6) shows the comparison of the car's side slip, a slip of a motor grader during the adjustment of a wheel lean in a vertical plane, and a wheel turn in a horizontal plane at 0°, and at wheel turning in a horizontal plane.

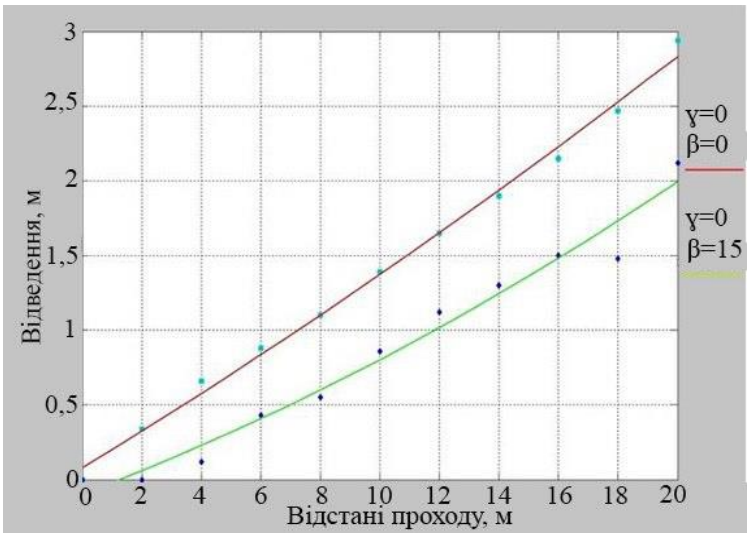

Figure 7. Diagram of a slip of a motor grader during the adjustment of the wheels in a vertical and in a horizontal planes at 0°, and during the adjustment of the wheels at 15 in a vertical plane

At first the slip was less than at zero angles, but upon reaching the mark of the 15m path traveled, it began to increase rapidly comparatively to the previous case, and changed its direction.

Analyzing the diagram (Fig. 7), it can be claimed that a slip has been decreased. Besides this positive result has been kept for the whole path of the motor grader.

A slip, with the change of the adjustment of a wheel lean in a vertical plane at an angle $\beta = 15°$, and with the adjustment of a wheel turn in a horizontal plane at an angle $\gamma = 10°$, has grown and changed its direction (fig. 8).

Planning, carrying out and processing of the results by the complete factor experiment [4] consist of the following obligatory steps: encoding of the factors (Table 1); formation of the plan-matrix of an experiment; randomization of experiments.

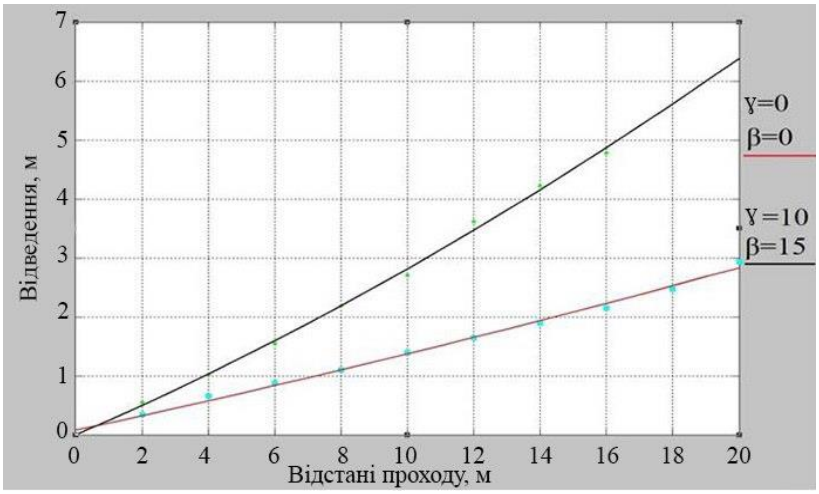

Figure 8. Diagram of a slip of a motor grader during the adjustment of the wheels in a vertical and in a horizontal planes at 0°, and during the adjustment of the wheels at 15° in a vertical plane and at 10 in a horizontal plane

Encoding of the factors is required for the transfer of natural factors (a wheel turning angle in a horizontal plane and a wheel leaning angle in a vertical plane) to the dimensionless values in order to have the possibility of forming a standard orthogonal plan-matrix of an experiment (Table 2). For conversion of the natural variables into the code ones, the table of encoding of the variables on two levels is filled in. The center of the interval in which it is supposed to carry out an experiment, is usually chosen as a zero level of the factors.

$$x_i = \frac{X_i - x_{i_0}}{\delta_i}$$

where - natural (real) value of the factor;

- value of a certain (i-th) factor on a zero level;

- variability interval of a certain (i-th) factor.

Table 1. Encoding of the factors

Variability interval and level of the factors	Leaning in a vertical plane, (β)	Leaning in a horizontal plane, (γ)
Zero level	5°	7.5°
Variability interval Table	5°	5°
Lower level	0°	0°
Upper level	10°	15°
Reference designation		

Table 2. Plan-matrix of an experiment

Experiment	x_1	x_2
1	-1	-1
2	+1	-1
3	-1	+1
4	+1	+1

Checking of the reproducibility of an experiment according to the Kochren criterion has given a positive result:

$$G = \frac{0,0081}{0,0081 + 0,0009 + 0,0036 + 0,0025} \le G_{(0,05;f_n;f_u)}$$
$$0,5364 \le 0,9065$$

The coefficients of regression were based on the formulas:

$$b_0 = \frac{\sum_{u=1}^{n} \overline{y}_u}{n};\ b_i = \frac{\sum_{u=1}^{n} x_{i_u} \cdot \overline{y}_u}{n};\ b_{ij} = \frac{\sum_{u=1}^{n} x_{i_u} \cdot x_{j_u} \cdot \overline{y}_u}{n};$$

The verification of the adequacy of the model is carried out using Fisher's criterion:

$$F = \frac{s^2_{ad}}{s^2_y} \le F_{(0,05;f_{ad};f_y)};\qquad F = \frac{1,6257}{0,377} \le F_{(0,05;1;4)};\qquad 4,31 \le 7,7086$$

Assessment of the significance of regression coefficient was carried out by using Student's criterion:

$$|b_i| \geq \Delta b_i = t_{(0,05;f_y)} \frac{s_y}{\sqrt{n}};$$

$$\Delta b_i = 2,7764 \frac{\sqrt{0,00377}}{\sqrt{4}} = 0,04$$

The regression equation has the form:

The regression equation with the natural kind of factors has the form:

$$y = 3,56 - 0,082 \cdot \beta_1 - 0,076 \cdot \gamma_2 + ,017 \cdot \beta_1 \cdot \gamma_2$$

With the help of the regression equation, the diagram (fig. 9) of a linear connection of the angular changes in space of the front axle of engines of a motor grader was built.

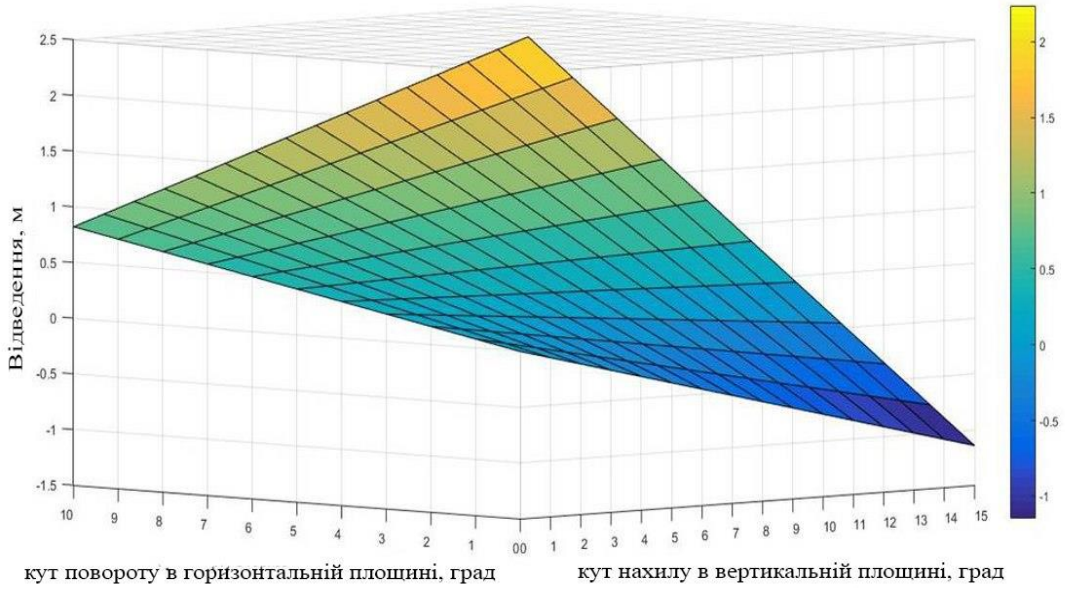

Figure 9. Diagram of a linear connection between a slip of a motor grader and the indicators of the adjustment of the wheels in a horizontal plane (0°-10°) and in a vertical plane (0°-15°).

Conclusions

1. The research recommends the common angles of turning of the front axle with the meaning from 0° to 3° in a horizontal plane, and the angles of slope with the meaning from 0° to 6° in a vertical plane, which are valid for a side slip that is not more than 0.3 m.

2. The pitch motion of the front wheels in a horizontal plane has the main influence on the road holding of the motor grader; the trajectory of the car

movement relatively to the initial direction changes, and with the appropriate adjustment of the wheel turn can exclude it generally.

3. According to the results of the experiment, the change in a slope of an angle in a vertical plane reduced the slip almost by one third, that directly positively affects on the results of work and the overall cost-effectiveness of the processes performed by the motor grader.

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Manjay K. V.

RESEARCH OF PARAMETERS OF LINEAL GUIDES POSITIONING IN MICROSPACE

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High precision treatment of constructional materials is enabled by precise equipment with extra-precise positioning, optimum modes and stable conditions of treatment. Micro treatment lathes are to meet a very important requirement of providing strict tolerance to sizes of processed parts. Micro cutting is to be performed with extra-precise lathes providing positioning of high precision along different axes.

Firstly, it requires creating new methods of transitioning working equipment in micro space, which provides high precision of positioning by using appropriate drives; and secondly – precision and high operating speed of sensors measuring this transition. Precision of transitions is a vital parameter of positioning of micro object sand is determined by precision of linear and angular transitions.

Control over transitions mainly involves measuring lineal transitions along the axis. In doing so angular transitions, which appear by lineal transition and decrease positioning precision, are often neglected. Thus, the issue of elaborating methodology for measuring transitions along the axis, as well as angular transitions, is considered topical.

The aim of the research is to elaborate methodology for measuring lineal and angular micro transitions of lineal guides with a piezoelectric engine.

An angular transition (so-called dynamic pitches) is a parameter which appears during lineal transitioning of a guide and can cause critical errors. Pitches are caused by plays, friction, etc. Such dynamic angular pitches are undesirable by precise and extra-precise treatment, because insignificant shifts and deviations of equipment can considerably affect precision of treatment. Lineal shift of a working tool is calculated by the formula:

$$Lsm = l \times sin\alpha, \quad (1)$$

where *lsm* is a lineal shi ft of a tool's working end; l is length of a working tool with a holder; α is an angular shift of a moving table.

Thus, positioning of lineal guides with a piezoelectric engine is characterized by such major parameters as backlash, hysteresis, and angular shifts along two axes, different from the axis of transition.

A measurement facility including a microscope and an autocollimator (linked with video cameras) was invented to study precision of measuring lineal and angular micro transitions of lineal guides with a piezoelectric engine. The video camera reads data from the microscope and the autocollimator and through special equipment and software transfers it to be processed by the computer. Then the data is displayed. By analyzing the image of an object it is possible to learn its lineal dimensions and transition parameters, as well as control precision of positioning.

To measure backlash and hysteresis of a lineal guide with a piezoelectric engine, the program of a cyclic movement of the table in positive and negative directions (forward/backwards) at a certain distance (i.e. random positive and negative reverses) was set.

According to the research findings, the hysteresis loop of guides resembles a parallelogram with angles varying from 30 to 90. The 90 angle represents the worst situation, when a working tool shifts perpendicularly by the reverse. This may be caused by a side play or significant angular pitches, appearing in the guide by lineal transition. By micro treatment such an undesirable situation can lead to significant errors. 30–60 angles are explained by complementary elastic components, which are changed by the guide's reverse and are caused by "excessive stretching" of the system. The angle of the hysteresis loop, which is close to zero, means that the guide provides minimum shifts of the tool, which can be neglected.

To measure angular pitches, an optical autocollimator was used, with the guide moving perpendicular the autocollimator`s normal. Deviation of light beam (a cross) from the origin of coordinate system was observed in the autocollimator field. Such deviations are caused by system errors as a result of angular deviations from a straightforward stroke.

According to the measurements, the guide`s table oscillates around Y and X axes and pitches right/left and up/down. By the table`s angular shift equaling to 4 seconds of angle (a = 4) and by the length of the working tool with the holder equaling to 100 mm (l = 100 mm), lineal shift of the working end of the tool (calculated by the formula (1)) equals to *lsm* (1,9 mkm).

The above described methodology for measuring lineal and angular microtransitions of lineal guides with a piezoelectric engine enables making extra-precise and continuous measurements of such positioning parameters as backlash, hysteresis, as well as uninterruptedly record angular shifts from a straightforward stroke directly during transition of the guide with the tool.

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METHODS FOR DIAGNOSING CAR HYDRAULIC SYSTEMS

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Hydraulic devices are very common in cars: hydraulic drives, hydraulic steering amplifiers, power cylinders, braking control systems, hydro transmissions, pumps and hydraulic accumulators. All these hydraulic transmissions are connected by pipelines, have controlling devices, and measure the pressure.

Failures and malfunctions of hydraulic transmission can lead to disruption of internal combustion engines, braking systems, suspension, transmission of vehicles and other units. Hydro drives, therefore, require careful maintenance and diagnosis analysis [1, 445-447].

Modern transport vehicles are equipped with hydraulic units. They perform various functions for moving individual parts of the mechanism, control hydraulic systems, gearshifts, pedal of hydrodrives, power steering, power cylinders, automatic control devices in power cylinders, systems for rotation, braking, frequency regulation rotation of a fan in the engine cooling system, hydraulic transmission, hydro-electric drive of vehicles with electronic control, pumps and pressure regulators in hydroaccumulators and etc. [1, 321-322].

The technical state of individual mechanisms in hydraulic systems of a car is characterized by structural functional parameters, for example, an engine, a steering, a suspension and a hydraulic transmission of a gearbox. The named hydraulic systems of a car meet high requirements for external and internal tightness. Hydraulic mechanisms of these technical systems have an automatic control using pressure sensors and microprocessors.

The choice of a set to diagnostic parameters for controlling the technical state of hydraulic actuators is one of the main tasks in solving the problems of practical diagnosis of hydraulic drives of a car under operating conditions [2, 56-58].

Particular attention should be paid to the diagnostic parameters that characterize the most frequent refusals. The selected diagnostic parameter should provide the most up-to-date information on the technical state of the site being diagnosed.

Existing methods of diagnosing a hydraulic drive can be conditionally divided into the following groups:

– diagnostics by sensory parts of a person (organoleptic methods) allows to inspect, control elements, determine the qualitative deviations of the state of components of hydraulic systems [4, 85-87].

– metaparametric method is the most time-consuming, it requires the discharge of the fluid flow from the hydraulic system. This method allows to estimate the volume efficiency of a pump and to predict the technical condition of most components of a drive.

– methods of amplitude-phase and transient characteristics and thermodynamic requiring the installation of sensors in the hydrosystem with the working fluid;

– spectral analysis and indication of foreign impurities. It is necessary to determine the quantity and type of products, elements of the hydraulic drive in the working fluid;

– acoustic, vibroacoustic method for measuring the rate of force increase in the actuating element. The vibroacoustic method is based on the analysis of parameters vibrations and acoustic noise. The method is suitable for any hydraulic systems, hydraulic drives, pumps and other mechanisms and is used mainly for hydraulic units;

– kinematic method is the least labor-intensive, it does not require the installation of special sensors [3, 120-121].

The method is widely used to diagnose any type of hydraulic actuator. Its advantage is the possibility of using the information obtained to clarify the

calculations of the hydraulic drive and its elements, prediction of the resource, the definition of energy indicators, etc. In many cases, the implementation of the method does not require complicated diagnostic equipment, and when diagnosing with the use of computer technology requires only simple software, for example, for statistical processing of the results [4, 314-317].

In practice, as a rule, not all set of parameters is used. The choice of parameters for the diagnosis of hydraulic drives of machines and their components in specific operating conditions is limited to the degree of development of methods and methods of diagnosis, the level to control the suitability at hydraulic drives in cars, the qualifications of the personnel, depends on the goals and objectives of the diagnosis, etc. But in any case, the set of parameters should be minimal and sufficient for an objective assessment at technical condition of the diagnostic hydraulic equipment and the hydraulic drive as a whole.

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Oleinik K. S.

WARMING OF WORKING FLUID IN LOW TEMPERATURE CONDITIONS

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Most modern road construction machines operating in different sectors of the national economy are hydroficated, and the quality of the operation of hydraulic systems depends, among other things, on the state of the energy carrier connecting the pump and the hydraulic motor, on the parameters of the working fluid. And one of the parameters that generally affect the performance is the temperature mode of the hydraulic drive, while if the engine and transmission under low temperature conditions are pre-warmed before starting work, the hydraulic systems are most often started without warming up, which can interfere with the normal operation of the units and excavator systems and even cause them to malfunction.

The operating temperature of the fluid in the hydraulic systems lies in the range of 50-90C (depending on the brand of the liquid), which, under conditions of low temperatures, leads to a daily temperature difference in the hydraulic system up to 120C. Since the machine operation parameters directly depend on the temperature of the working fluid, the actuators can be equipped with fluid temperature control systems, such as hot air blowing, infrared burners, throttling, electrical heating elements, heating the installed internal combustion engine, exhaust gases, etc. Also, to improve the efficiency of operation of the hydraulic drive, the change in the heat transfer region, the preservation of heat by heat-insulating materials, the use of oils with improved operational properties, the maintenance of rational temperatures during the working cycle, etc. are used.

Experience in operating machines in conditions of low negative temperatures, as well as analysis of statistical data shows that about 70% of all failures occur in the nodes and parts of the hydraulic drive, which is due to the failure to provide thermal operating conditions for hydraulic drive elements (hydraulic cylinders, hydraulic motors, hydraulic pumps, hydraulic distributors and valve equipment) in communication with the use of machines of inappropriate climatic performance

In these conditions, there are problems with the efficiency of the operation of the Road construction machines: the operating time before TO and P and the change in productivity of machines are reduced. This, to a greater extent, is due to the thermal processes taking place in the machine's aggregates during its cooling and start-ups after parking.

Most of all, low temperatures affect operating fluids that become more viscous at low temperatures and can interfere with the normal operation of aggregates and excavator systems and even cause them to malfunction. So, for warming up hydraulic fluid of a hydraulic drive the following ways of increase of efficiency of a hydraulic drive can be applied. Heating of hydraulic system assemblies with gas burners of infrared radiation was not in great demand because of the low efficiency of these installations and the need for additional costs for the purchase of fuel.

Systems of heating of a working liquid by throttling, are based on a principle of passage of a working liquid through a throttle under the big pressure. The heating of the working fluid occurs as a result of throttling, when the working fluid passes through the hydraulic resistance (throttle) and, due to the loss of pressure during the deformation (moth) of the liquid, the mechanical energy is converted into thermal energy. A disadvantage of these systems is that when the throttled liquid under pressure at high speed flows through channels, directional adjusting hydraulic equipment and other local resistance, it repeatedly crumples, which has a very detrimental effect on the physical and chemical properties of the working fluid. During the throttling of oil under high pressure, molecular chains break down, resulting in a decrease in viscosity, a decrease of lubricity, and a darkening of the oil.

The system of heating the working fluid by changing the capacity of the tank and the heat transfer area, which include small and large tanks, main and additional distributors, pump, heat sensor, hydraulic motor. The disadvantage of these systems is that after reaching a rational temperature while working on a small tank when communicating with a large tank, the temperature of the working fluid drops sharply and becomes much lower than the rational one, since the masses of the cold oil are much larger than the hot mass. In addition, this direction of thermal regulation of the working fluid requires rather significant structural changes in the hydraulic system, which leads to a complication of production technologies, increase in size, weight and cost of the car.

Systems of heating the working fluid with electric heating elements, the main drawback is the mandatory existence of electric power sources for supplying the electric heating elements of the hydraulic system, which is not always possible, especially in conditions of a significant removal of the machine from permanent sources of electricity. Heaters, powered by the on-board network, have low efficiency and significantly increase the load of the automotive electrical system.

The system of heating the working fluid by the engine exhaust gases also did not become widely used, because the hydraulic system oil undergoes significant local overheating, since the temperature of the exhaust gases, after releasing them from the engine, is several times higher than the rational temperature of the working fluid. Under the influence of high temperature, the oil begins to intensively oxidize and polymerize, which is the main factor of oil aging, besides formed organic acids and asphalt substances, clog oil lines, and channels and precipitate.

On excavators of the IV dimensional group, such schemes of circulation of working fluid can be found: 1) hydraulic drive with closed circuit of circulation in which the working fluid from the hydraulic motor returns to the suction pump hydraulic line; 2) hydraulic drive with an open circulating system in which the working fluid constantly communicates with the tank or atmosphere.

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Oleinik N. S.

ENSURING THE OPTIMAL THERMAL REGIME OF THE WORKING FLUID IN HIGH TEMPERATURE CONDITIONS

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The effectiveness of hydroficated machines of various technological purposes largely depends on the temperature of the environment. Efficiency is significantly reduced both at low temperatures and at high temperatures.

The high-temperature operating mode of the hydraulic drive reduces the technical and operational characteristics of hydroficated machines (road-building and other self-propelled machines). High temperature is one of the most important factors affecting the intensive aging of the working fluid. The temperature above 70° C leads to a decrease in the viscosity of the working fluid, a sharp increase in volume losses. There is intense wear due to reduced lubricity of rubbing surfaces, a decrease in the volumetric efficiency of hydraulic machines, a change in the linear dimensions of the heated elements, as a result, the accuracy of technological operations deteriorates and the resource of hydraulic equipment is significantly reduced. All this leads to a decrease in performance and reliability of machines. Hydroficated machines operated in high temperature conditions require a number of measures to increase heat transfer and stabilize the temperature regime. The work of a modern loader is coordinated by intelligent sensors.

The volumetric hydraulic drive has found wide application in road construction machines and is operated under various climatic conditions and often under extreme conditions. Natural-production factors determine the extreme operating conditions. Natural factors are caused by the level of protection of hydraulic equipment from the effects of natural factors and the mobility of the machine.

Natural factors are caused by climatic and weather conditions of operation: ambient temperature, atmospheric pressure, air humidity, wind speed. All of the above conditions can adversely affect the operation of the hydraulic drive as a whole.

One of the main factors affecting the efficiency of hydroficated road construction machines is the ambient temperature, on which the temperature and viscosity of the working fluid depend. Natural and production factors affect the efficiency of the hydraulic drive indirectly, through the operating mode of the hydraulic drive and the temperature of the working fluid. The wide application of the hydraulic drive is due to a number of its advantages:

- Movement of working organs smooth and uniform;
- The ability to regulate the speed of movement of working organs in a wide range;
- Simplicity of transformation of mechanical energy of internal combustion engines into potential energy of pressure;
- Small inertia of rotating parts;
- Small weight and small dimensions of hydraulic equipment;
- Ease of management and regulation;
- Simplicity of hydraulic system protection against overloads;
- Relatively high efficiency;

The main disadvantages of hydraulic drive:

- The dependence of the viscosity of the working fluid on temperature, which leads to a change in the characteristics of the hydraulic drive and a decrease in the efficiency of hydroficated machines;
- Volumetric losses in the gaps of the moving and fixed elements of the hydraulic drive leads to a decrease in the efficiency of the hydraulic drive;
- Details of hydraulic drives require high precision manufacturing, which increases their cost.

Operation of hydraulic drives in climatic zones where the ambient temperature is above +30 ° C requires a number of measures. At this time, several main areas of solutions to this problem have been identified:

1. Use of working fluids with a viscosity corresponding to climatic conditions;
2. Use of modern materials and especially composite parts in the friction areas of hydraulic drives;
3. Strict observance of maintenance in accordance with the operating manual;

To maintain the required temperature range of hydraulic fluid in the hydraulic system of machines operating at high ambient temperatures, a forced cooling system is necessary.

Ensuring the optimal thermal regime of hydroficated machines that work intensively at high temperatures can be achieved by an optimally constructed hydraulic system that provides a pump with the minimum required supply of working fluid, ensuring its unloading at breaks and neutral position. The choice of the necessary volumetric oil in the tank, with the construction of the tank, it is necessary to have the maximum circulation of the heated working fluid along the surfaces of the tank. Installation of a forced cooling system in the form of an irrigated heat exchanger. Increasing the heat transfer surface and using special coatings. Using artificial circulation of air flow elements of the hydraulic drive.

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AUTOMOTIVE SENSORS

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Sensors are essential components of automotive electronic control systems. Sensors are defined as “devices that transform (or transduce) physical quantities

such as pressure or acceleration (called measurands) into output signals (usually electrical) that serve as inputs for control systems." It wasn't that long ago that the primary automotive sensors were discrete devices used to measure oil pressure, fuel level, coolant temperature, etc. Starting in the late 1970s, microprocessor-based automotive engine control modules were phased in to satisfy federal emissions regulations. These systems required new sensors such as MAP (manifold absolute pressure), air temperature, and exhaust-gas stoichiometric air-fuel-ratio operating point sensors. The need for sensors is evolving and is progressively growing. For example, in engine control applications, the number of sensors used will increase from approximately ten in 1995, to more than thirty in 2010, as it was predicted**.**

Automotive engineers are challenged by a multitude of stringent requirements. For example, automotive sensors typically must have combined/total error less than 3 % over their entire range of operating temperature and measureand change, including all measurement errors due to nonlinearity, hysteresis, temperature sensitivity and repeatability. Moreover, even though hundreds of thousands of the sensors may be manufactured, calibrations of each sensor must be interchangeable within 1 percent. Automotive environmental operating requirements are also very severe, with temperatures of 40 to 125C (engine compartment), vibration sweeps up to 10 g for 30 h, drops onto concrete floor (to simulate assembly mishaps), electromagnetic interference and compatibility, and so on.

Current driving factors that account for the increasing utilization of automotive sensors are given below.

– Needs for sensors in powertrain systems are driven by: legislation (e.g., lower emissions, improved fuel economy, and on board diagnostic requirements), best-in-class drive-ability, along with the introduction of new types of alter-native power sources.

– chassis systems needs for sensors are driven by safety, weight reduction, multiplex compatibility, and legislation (e.g., collision avoidance stability systems and tire pressure monitoring);

– body systems needs for sensors are driven by safety (e.g., advanced airbags, rollover and side crash protection), comfort, and convenience;

– in each application – powertrain, chassis and body Moore's Law is a dominant driving factor. Moore's Law states that electronics capabilities double approximately every 18 months.

Automotive electronics directly benefit and exhibit corresponding increases in computing power/memory. These increases provide greater systems demand for feedback signals, which in turn drives continually growing needs for high-performance automotivesensors.

Important automotive sensor technology developments are micromachining and microelectromechanical systems (MEMS). MEMS manufacturing of automotive sensors began in 1981 with pressure sensors for engine control, continued in the early 1990s with accelerometers to detect crash events for air bag safety systems and in recent years has further developed with angular-rate inertial

sensors for vehicle-stability 1 chassis systems [3]. MEMS make high-performance sensors available for automotive applications, at the same cost as the traditional types of limited-function sensors they replace. In other words, to provide performance equal to today's MEMS sensors, but without the benefits of MEMS technology, sensors would have to be several times more expensive if they were still made by traditional electromechanical/discrete electronics approaches.

A new feature, common to many types of automotive sensors, is "smart sensor" technology. This consists of electronics signal processing integrated inside the sensor which provides:

– automatic gain control (e.g., to compensate for air gap variation);

– conversion of internally detected time-varying waveforms into precise square-wave or digital protocol output signals;

– dynamic threshold sensing which maintains zero-offset and 50% duty cycle in a square-wave output signal;

– pulse-width-modulated and digital protocol output signals are clamped at specified upper and lower limits, e.g., at 0 and 5 Vdc;

– ratiometric output signals are provided where output signals are normalized to the level of the supply voltage;

– electronic interface with communication bus networks;

– operation using two wires in place of a three-wire connection (one wire carries a digital protocol output signal superimposed on a dc power-supply loop current, and the other wire connects to the reference side of the bus network);

"Smart sensor" features are notably incorporated into speed/timing, pressure, and inertial acceleration/angular rate automotive sensors.

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INVESTIGATION OF THE PROCESS OF STOCKPILE DIGGING WITH A SHORT LOADER BUCKET

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The operation of single-bucket loaders is accompanied by the dynamic overloads acting on the machine, which are different for each stage of the machine working cycle. As a rule, such overloads lead to a sharp decrease in the reliability

of steel structures of loading equipment. In order to correctly design the individual components of the loading machine, it is necessary to carefully study the formation of the forces acting on the bucket during its operation. Today, the methods for describing and analyzing the dynamic loading of machine aggregates have been thoroughly studied and investigated. However, with respect to particular cases of earth-moving machines loading modes (namely, loaders), some elements of the working cycle have not been studied in detail or have not been investigated at all. These include the process of intensive penetration of a short bucket loader in a stack of bulk material. Analysis of the experimental data shows that the machine in this case should be represented as a complex two-stage dynamic scheme, the motion of individual masses in which is described by a system of differential equations of the second degree.

In the presented master's work a mathematical model of the loader is developed for the process of intensive penetrationtion of the bucket into a stack of bulk material, an analysis of theoretical and experimental data is carried out. The load on the loader bucket is represented in the form of a two-stage process, and in the second stage, the dynamic scheme of the machine is interpreted as the focus of the working body in a tough, insurmountable obstacle. The analysis of the results showed good convergence of theory and experiment and allowed to develop a number of recommendations for organizations involved in the design of loading machines.

Having conducted a literature analysis [1,2,3,4,5,6,7,8,9,10], we formulated the purpose of our research: to study the process of intensive penetration of a bucket with a shortened bottom into a stack of bulk material and to determine the magnitude of the dynamic forces that arise thereby.

The following tasks were set:

1. development of an analytical dependence describing the regularity of the formation of resistances to the introduction of a bucket back wall into the stack of material in case of an abutment;
2. development and analysis of the mathematical model of a single-bucket loader for the calculated case of burial at the speed of a short bucket into a stack of bulk material;
3. analysis of experimental data, as well as an assessment of the adequacy of theoretical and experimental studies;
4. the development of an engineering technique for estimating the magnitude of the maximum dynamic load for the calculated design case. Development of recommendations for improving the design of the working equipment of a single-bucket loader.

The feature of the analytical description of the resistance force to the introduction of a short bucket into the material stack consists of 2 stages:

1. The first stage, when the bucket is recessed into the pile for a distance $x_2 \le l_{дн}$ and the stack slope does not reach the rear wall of the bucket;
2. The second stage, when the bucket was plunged into the stack of material for a distance $x_2 \ge l_{дн}$ and the slope of the material rested against the rear wall of the

ladle. At that part of the material starts to rise up along the back wall of the ladle, and a dense inelastic core of the material is formed in front of the bucket (an insurmountable obstacle).

Based on all the arguments outlined in the paper, we compiled a mathematical model of the process of intensive introduction of a short bucket loader into a stack of bulk material. In deriving the differential equations of motion of the system, Lagrange's equations of the second kind were used.

To check the adequacy of the developed theoretical model for the actual implementation of the speed of the short bucket in the stack of material, we used materials from experimental studies conducted by the staff of the Department of Construction and Earth-Moving Machines of Kharkiv National Automobile and Highway University.

As an experimental machine, a small-size loader PMTS 1200 was used.

To record the investigated processes, an information-measuring system was made, which included the following elements:

- strain gauges, pressure sensors;
- four-channel strain intensifier ЛХ 5515;
- light-beam magnetoelectric oscillograph К-1222
- remote control;
- power supply.

Based on the study, the following conclusions were drawn:

1. Comparison of the maximum theoretical and experimental values of the horizontal load on the ladle showed good convergence of the calculated and experimental data (the error does not exceed 11.4%), on the basis of which it can be concluded that the dynamic loader model of the loader, as a whole, correctly reflects the physics of the process of forming the force on ladle.

2. During the experiments, the maximum load, equal to 9579 N, was recorded with the initial speed of the machine 1.95 m / s, which corresponds to the movement in the II gear. The dynamic overload factor in this case is 1.37.

3. The horizontal load is nonlinearly dependent on the initial speed of the machine. The higher the speed, the higher the intensity of the increase in the maximum level of acting forces.

We proposed to use a shock-absorbing device on the machine, which allows to lower the maximum values of the loads acting on the machine.

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ÉTUDE DES SYSTEMES DE CONTRÔLE DE LA SUSPENSION PNEUMATIQUE DES VÉHICULES AUTOMOBILES

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La suspension pneumatique a été utilisée dans l'industrie automobile depuis le début des années 50 du 20-ème siècle. Elle a été particulièrement répandue sur les véhicules pour le transport de passagers, les véhicules lourds et les remorques. L'intérêt à la suspension pneumatique pour les camions et les autobus a augmenté lorsqu'il est devenu clair qu'elle pouvaient être utilisée en combinaison avec des systèmes de contrôle électronique. La suspension pneumatique gérée est utilisée par de nombreux constructeurs automobiles en Europe et aux États-Unis.

Le système ECS (Electronically Controlled air Suspension, ou Suspension pneumatique à commande électronique) offre un haut niveau de confort et protège efficacement le chargement. Le système se régule automatiquement afin que le véhicule conserve une hauteur constante et corrige les effets des chargements qui seraient inégalement répartis. Le pilotage automatique de l´amortissement permet d´augmenter le confort, d´améliorer la sécurité et de transporter le fret dans de meilleures conditions. Un système manuel facilite le réglage de la hauteur de la plate-forme en fonction de celle de la baie de chargement.

Actuellement, les constructeurs de suspensions pneumatiques ont conçus une nouvelle génération de suspension pneumatique à commande électronique. Les constructeurs de suspension pneumatique à commande électronique sont : Wabco WCS, Knorr-Bremse CVS, Bosch GmbH, Hendrickson et autres.

Le système ECS se compose de pièces mécaniques (la suspension), de pièces pneumatiques (coussins d'air) ainsi que de composants électroniques (calculateurs, électrovalves, capteurs de pression et de position) (Fig. 1). Les informations transmises par les capteurs de pression et de position permettent au calculateur (ECU, ou UCE (Unité de Commande Electronique)) de gérer la suspension pneumatique par un pilotage des électrovalves qui alimentent les coussins d'air [1].

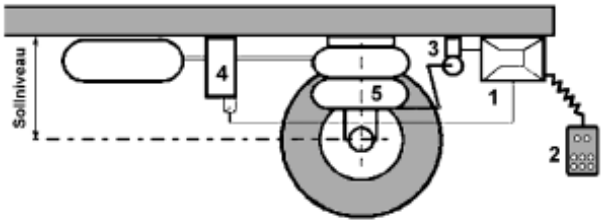

Fig. 1. Fonctions de base du système ECS:
1 – ECU; 2 – Télécommande; 3 – Capteur de déplacement; 4 – Electrovalve;
5 – Coussin de suspension pneumatique

La fonction de base du système ECS consiste à équilibrer les variations de régulation. Les variations de régulation sont provoquées par des perturbations (par ex. modification de l'état de chargement) ou par des modifications des valeurs de consigne (par ex. à l'aide de l'unité de commande). Elles provoquent une modification de l'écart entre l'essieu du véhicule et sa structure. L'ESC compare les variations de régulation à l'aide d'une régulation de niveau.

Un capteur de déplacement (3) détecte en permanence le niveau du véhicule et transmet à l'ECU (1) la valeur mesurée actuelle. Si l'ECU décèle, après traitement des signaux, un écart par rapport au niveau de consigne, elle commande une électrovalve (4) en admission ou en mise à l'atmosphère suivant le cas pour opérer la modification voulue du niveau. Grâce à la télécommande (2), il est possible de changer la position du véhicule en hauteur (par exemple, lors du déchargement à la rampe) lorsque la vitesse de conduite n'est pas supérieure à une certaine vitesse (ou à l'arrêt).

Le problème fondamental de toute régulation en cas de déviation de régulation est la détermination du temps de réponse optimal. Celui-ci représente le temps s'écoulant entre le début de la modification de la valeur de consigne et le moment où celle-ci ne dépasse plus une plage de tolérance prédéterminée (Fig. 2). Pendant cette période, le système effectue une régulation et consomme de l'air [2].

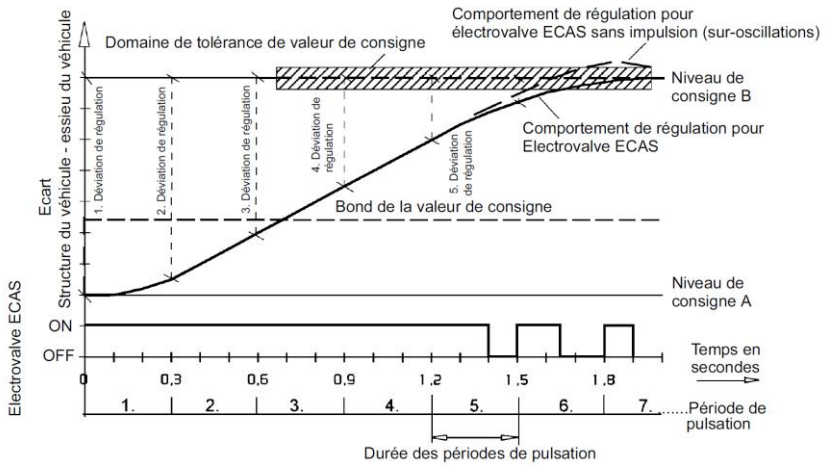

Fig. 2. Un procédé de régulation en cas de modification de la valeur de consigne

Ce flux de travail (algorithme de contrôle) est mis en œuvre pour exécuter des fonctions de base dans le système ECAS (Electronically Controlled Air Suspension, ou Suspension Pneumatique Régulée Electroniquement), qui ont été conçus par Wabco WCS. Le bloc à électrovalves et ECU ont été créés uniquement pour se système. Des fonctions supplémentaires telles que la mémorisation de niveaux du véhicule, la compensation d'écrasement des pneumatiques, la protection contre les surcharges, l'aide à la manœuvre et la commande automatique d'essieux relevables aussi peuvent être réalisées grâce à l'ECAS [3].

Des recherches supplémentaires sont nécessaires pour mieux comprendre ce type de suspension et développer plus précisément des algorithmes de contrôle efficaces de la suspension pneumatique en fonction des différentes conditions de fonctionnement des véhicules automobiles.

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Sklyarov E. Y.

STUDY IN THE SURFACE TREATMENT AREA BY SNOW-FILTER INSTALLATIONS

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At the moment, there are a number of experiments devoted to the processes occurring during snow melting in snowmaking plants.

A large number of modern technologies allows to efficiently remove snow falling on road pavings of city highways, inside quarterly passes, on sidewalks and adjacent territories.

However, as shown by the analysis, the possibilities of modernizing the elements of existing snow removal systems and finding modern energy-saving technical solutions for its disposal are far from exhausted.

Despite a large number of techniques and design developments, the problem of snow removal in large cities is far from being solved. In particular, in Kharkiv, 53% of the snow-covered mass is stored in unauthorized places, 34% are exported to river dumps, 11% – to dry landfills and only 2% is utilized in snowmaking chambers and drainage collectors.

This state of affairs is largely due to economic reasons. In addition, a significant amount of mineral particles and biologically hard oxidizing organic compounds accumulate in the urban snow mass. Snow removed from urban roads has a serious environmental hazard associated with soil contamination, surface and groundwater.

The peculiarity of winter cleaning of urban areas is the lack of places for storing snow and its pollution by emissions of vehicles and anti-icing reagents.

To solve the problems of snow removal in large cities, an integrated approach is needed. It is necessary to use not only the system of industrial processing of snow, which is exported from highways to snow-plowed points and “dry” snow-burning, but also the low-cost technologies that provide snow utilization at the expense of sites equipped with sources of low-potential heat supply.

Potentially dangerous for transport and pedestrian areas of the city streets (steep descents and climbs, entrances to the tunnel, overpasses, traffic junctions, underground passages, drives to large shopping centers) need constant care during the winter.

Substantiation and choice of economic modes on the sites of snowmaking is possible on the basis of the decision of the related problems of heat and mass transfer for the structures of snowmaking and molten snow mass. In this regard, the improvement of the design of snow removal systems, the development of energy and resource-saving low-cost technologies for the recycling of snow are the urgent tasks.

The scientist D.V. Ukhin was engaged in the development of technology for recycling of snow-ice masses from road surfaces in snow-melting stations equipped with a heat pump system of heat supply, based on prediction of temperature modes of snowmaking with dynamically changing weather factors. He created a computational algorithm and a calculation program that allows predicting the technological characteristics of the melting process and determine the most effective design parameters of snow melting devices. This scientist has developed a mathematical model for predicting the thermal state of the design for parking vehicles with built-in heating elements, which differs from the well-known ability

to account for thermophysical, natural-climatic and structural factors and allows to regulate the temperature regime depending on weather conditions.

Also, D.V. Ukhin has developed a program for calculating effective and energy-efficient modes of operation of the system of intensive snowmaking, taking into account the influence of a large number of thermophysical, meteorological and constructive factors such as: the step of laying the heating pipes, their diameter, the temperature of the heat carrier, the snowfall intensity, time of day, temperature and humidity of air.

It proved to be the principle possibility of using non-traditional low-energy heat sources (soil, surface water, waste water, exhaust air, reverse technical water, geothermal water, ambient air, groundwater, solar radiation) on the sites of snowmaking and on objects of road transport infrastructure .

Based on the results of scientific research, he developed the construction of a snowplow point using a heat pump as a source of heat, which differs in the issue that it allows to use non-traditional and renewable heat sources, and at the same time to ensure the efficient utilization of snow-ice masses.

D.V. Ukhin found that the use of the heat pump heat supply system at the sites of snowmaking and at the objects of road transport infrastructure, using as a low potential the source of the soil heat, provides reduction in the cost of utilization of snow masses.

The scientist proved that the technical and economic efficiency of the processes of snowmaking is ensured by significantly reducing the distance of transportation of snow-ice deposits from their place of collection to the place of utilization at the snow-melting point. It is especially important as high cost of land in large cities does not allow the seasonal storage of cleaned snow inside the city limits.

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Ustoyev R. A.

INVESTIGATION OF THE SMALL-SIZE LOADER MOVING OVER A SINGLE BRIDGE OBSTACLE

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The purposes of the present research are as follows:

1 Research of technical parameters of modern small-size loaders and comparison with PMTC 1200;

2 Modeling of moving a small-size loader over a single obstacle.

General overview

A small-size loader with a side-turn is a universal, compact, high-speed machine designed to operate in a confined space. According to the type of chassis, small-size loaders are divided into wheeled and crawler ones.

Due to the fact that the wheels of the left and right sides are driven by separate hydro motors and can operate in anti-rotation mode (reverse), the small loader has the ability to turn in place.

According to the principle of performing basic operations, loaders are divided into: periodic action and continuous action.

Periodic action is to fill the working body, transporting and unloading the material separately, sequentially and with cyclic repetition. The main working body of such machines is the bucket, so they are called single-loader loaders. Continuously loaded loaders have a combined filling and unloading of working bodies produced simultaneously. In such machines, the material is developed by mouth, rigid discs or paws, a multi-axle elevator with screws.

The most common are multi-wheel loaders, the working organ of which is a multi-axle elevator with screw augers.

Advantages and disadvantages

+ the ability to use in the edge of the compressed conditions, due to the ability to turn in place;

+ a set of variable working bodies that increase the degree of use of the base tractor in time;

+ performance at short distances of goods moving, comparable to the performance of more powerful machines of traditional design;

+ simplicity of management;

+ relatively low cost.

- tendency to roll over;

- high dynamic load of the machine

- poor handling of the machine on solid slippery surfaces

- closed surveillance space of the power plant and hydro transmission, which reduces the heat exchange with the environment

For the study, the parameters of the following manufacturers' loader models were adopted: BOBCAT, Caterpillar, Volvo, JCB, Komatsu, GEHL, Mustang, PUM, John Deere, New Holland. A total of 78 models of loaders.

The Mathcad software was used to calculate and construct dependencies.

Analysis and statistical processing of technical parameters show that the weight of the machine (m) is determined by the carrying capacity (q), and the speed of movement (v) and engine power (N) by the weight of the machine

From these calculations we get:

– on the power of power plants, small-sized loaders, manufactured by different manufacturers, in the same weight group, differ from each other from 1.5 ... 3 times;

– Bobcat loaders, leading in the class of cars under consideration by mass production and sales, will equip engines with 15 ... 25% more power than the average;

– the loader ПМТС-1200 in comparison with the average data has on 15% less engine power;

– the speed indicators of most loaders increase with increasing load-carrying capacity and in the group of machines weighing from 1 to 1,5 tons there is a relatively small data spread.

Conclusions

By comparing the parameters of the loader PMTS-1200, with the average figures of loaders of similar load-carrying capacity, we get that that PMTS-1200 is close to the parameters of the average machine, therefore the received data modeling can be attributed both to existing machines of this type and to the machines being designed.

The proposed approach to modeling determines the algorithm of carrying out a computer experiment of moving through various obstacles of the front-loading small-sized loader, which allows to characterize the movement of the machine in space and to determine the supporting reactions on the running gear, which is necessary to account for all possible operating modes of the machine.

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Vereshchahin A. V.

TECHNOLOGY OF ASSEMBLY AND WELDING OF THE SUPPORTING BEAM OF THE TRUCK CRANE

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The transverse beam is a part of the construction of the supporting frame of the crane KS-45717A and it is one of its main parts. The car crane KC-45717A has a carrying capacity of 25 tons for working with conventional loads and 20 tons for handling toxic and explosive loads, mounted on the chassis MAZ-6303A3. Cross beams serve for installation extensible outriggers of the truck crane in them. They also connect the longitudinal beams of the support frame, in connection with which it receives the loads from the operation of the crane (operations with the goods).

The platform metalware works not only with statistical loads from the effects of masses of equipment installed on it, traction and braking forces, but also with dynamic loads during the operation of the lifting mechanism, as well as with various vibrational loads. In this regard, the components of the structure have considerable rigidity and sufficient fatigue strength. Temperature range with reliable and safe operation is from -500 to + 400C. The beam has a box section, welded from sheet metal. Sheets of the beam are manufactured from rolled sheet hot-rolled sheet according to GOST 19903-74, namely: SHEET B-PN-0-5x1500x6000 GOST 19903-74 390-10ХСНД-св 12 GOST 71281, thickness of sheets is 5, 8, 10, 12 mm.

Information about the basic metal

Crane metal structures are now, as a rule, performed welded. The main material of the product is steel 10HCND, GOST 19281-89, low-alloyed structural steel for welded structures, used for welded metal structures and various parts, which require high strength and corrosion resistance with limited mass and operate at a temperature of -70 to 500C. Steel is not very prone to temper brittleness, therefore welded seams are not susceptible to cracking. Connections of design elements of construction must be made using electrodes according to GOST 9466-60, GOST 9467-60 or welding wire according to GOST 2246-70. In order to determine the reaction to the change in the base metal occurring during welding and the ability to provide a reliable and economical welded joint in the accepted process, it is necessary to determine the weldability of the base material. To assess the tendency of the metal to the appearance of cold cracks, the carbon equivalent is most often used, which can be used as an index characterizing the weldability, with a preliminary evaluation of the latter. The main characteristics of weldability of steels is their tendency to cracking and the mechanical properties of the welded joint. The weldability of steel is divided into 4 groups: 1 – good weldability (Se <0.2%); 2 – satisfactory weldability (Se = 0.2 ... 0.35%); 3 – limited weldability (Se = 0.35 ... 0.45%); 4 – poor weldability (Se> 0.45%). Steel 10HSND belongs to the third group of steels for weldability, i.e. Se = 0.45%, which can be welded with heating up before welding, during welding no subsequent heat treatment is needed. But the use of heat treatment is not excluded for the removal of internal stresses after welding.

Characteristics of welded joints

Welding of the beam structure is carried out by angular and butt joint types. The thickness of the welded elements varies from 5 to 12 mm, in accordance with this and with the recommendations of GOST 14771-76, the cutting of the edges (for the butt joint) and the joint seams (for lapping, angular and T-joints) is selected. In terms of the convenience of welding, the use of assembly and welding equipment greatly simplifies the conduct of welding operations. The design of the beam allows for mechanization and automation of the technological process. It is impossible to completely automate the process, since the beam has hard-to-reach welds. The seams in the structure are in different positions, namely from the side, from above, below and inside the structure. It is necessary to design the technological processes of making the structure, to provide for mechanization using the most progressive

methods of welding. As it is known, welding in the lower position is the most rational, therefore, for welding seams, which are in the design from the side or from below, it is necessary to use assembly and welding canters, by means of which welding can be done in the lower position.

Characteristics of manufacturability of the product

Technological design is evaluated by classification indicators (GOST 14.201 -73), i.e. on the main and additional indicators of manufacturability. The main indicators include material consumption, labor intensity and cost. The beam CS-45717A.30.800 provides for the wide use of means of mechanization and automation for assembly and welding operations.

Thus, the following conclusions can be made:

1) in the design, the geometric shapes of the metal structure are simplified, which will lead to a reduction in the number and total length of the seam;

2) the shape of the elements of the metal structure provides the possibility of welding the main seams in the lower position.

An important role in the evaluation of the technological nature of metal construction is played by the material consumption. The weight reduction of the metal structure is achieved using the methods of design. Application of low-alloy steel 10HSND allows to reduce metal consumption by 15-20%.

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Yefymenko A. O.

BOOSTING THE PRODUCTIVITY OF FORKLIFTS BY MEANS OF AN INTELLIGENT SYSTEM

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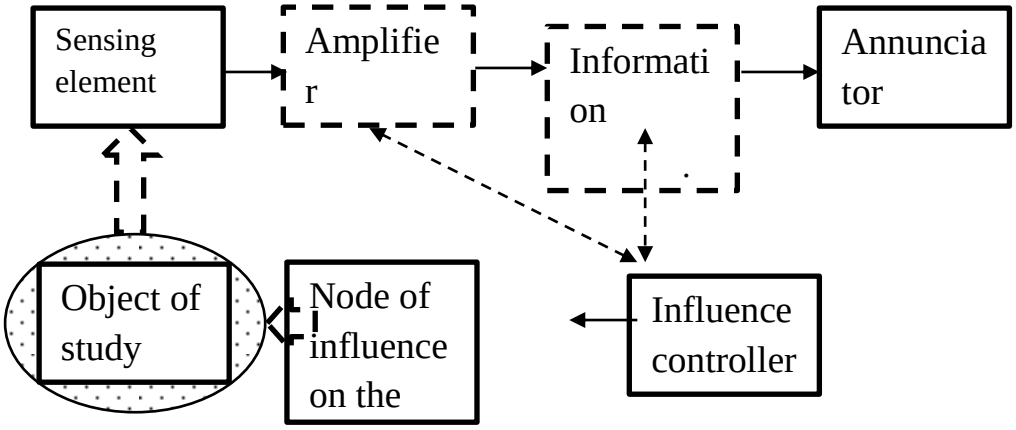
Modern forklifts possess the advanced technical characteristics, accordingly, they are very expensive. The high cost and complexity of their design require increased attention of the engineers, which will ensure that their performance and productivity are at the proper level throughout the life of the product.

Modern machines are equipped with control systems for all operational characteristics. This is necessary to ensure maximum efficiency and performance

(engine, battery, transmission, as well as protection against possible errors or incorrect operator actions).

The work of a modern loader is coordinated by intelligent sensors.



Their work can be described using a scheme of active sensors. The sensing element collects information from the research object, which in turn is affected both by the programmed action through the node of influence on the object, and by the change in external conditions under the influence of the influence node. This information passing through the amplifier is returned to the information processing node, while providing the processed information to the operator.

Intelligence system improves comfort, helping the operator to ensure the stability of the truck when working with heavy loads at high altitude, greatly facilitates control, and helps reduce operator fatigue.

When the forklift passes, the sensor determines the weight and centrifugal force, actively monitoring the rear stabilizer. The microcontroller analyzes the information and includes the locking of the slope of the rear axle. Thus, the loader maintains a stable position and does not tilt.

The active control synchronizer automatically synchronizes the mutual position of the steering wheel and the rear control wheels of the loader, so that the wheels can only rotate to the position where the loader does not lose stability.

The task is to effectively support the loader, whose solution is shifted to the intelligence of the machine itself. And also there are two typical working situations, such as: the need to ensure maximum productivity; realization of the given productivity taking into account maintenance of the maximal working capacity, minimization of failures due to rational loading of power systems.

Active monitoring of the load-lifting mechanism helps to set the loader's arrow in a strictly vertical position and avoids sudden movements when the load is raised sufficiently high. Active control of the position of the working equipment automatically returns it to the preset position. The system of smooth lowering of the working equipment controls the hydraulic subsystem of speed regulation, in fact excludes impact and rattling at the moment of equipment contact with the surface.

To simulate the actions of such systems and to study their influence on the object under study, you can use special models with a universal hardware set based on the free software Arduino. The development of an intelligent control system in

this case will be carried out experimentally through the use of a ready-made chipset, monitoring, control and diagnostics systems based on Arduino.

There are many similar systems, the main purpose of which is to simplify the interaction with the automation of workers from various specialties. One of the objectives of the study can be considered the consideration of modern intelligent control systems of robotic complexes, their element base, and technical means of implementation for the development of an intelligent control system, an algorithm for the functioning of a simulation model of sustainability.

Then, we must perform the development of the physical model of the loader and also the development of a mathematical model for optimizing work processes based on the principle of complex signals of integrated sensors.

The intelligent system of the loader must be equipped with all necessary software and equipment for monitoring the condition of the machine. When designing and developing intelligent forklift systems, it is necessary to use a modular principle that will ensure the coordination of the machine's working process with the operation of other equipment. Such a system will allow the development of high-end machines, will ensure the effective use of technology in conditions where it produces the greatest production effect and will contribute to improving the quality of work.

The developed structural scheme and mathematical model of the intelligent system of the machine, provides the solution of problems of adaptive optimization of its working processes. There is an opportunity to assess the performance of executive mechanisms, the prediction of failure-free operation of the machine's design elements.

The accumulation of data on the parameters of the workflow allows monitoring the system at any stage of operation to ensure maximum safety during operation. Development of models based on simplified intelligent systems will significantly reduce material and human resources, and significantly accelerate the adoption of the right engineering solution for simplified implementation of intelligent systems on an industrial scale.

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Yefymenko P. O.

USING AN INTELLIGENT SYSTEM FOR LOADER PERFORMANCE IMPROVEMENT

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Experience in the development of theoretical foundations and practical implementation of intelligent systems testifies to their prospects in the field of shovel loaders.

The design of intelligent support systems operator of a forklift is based on the design of individual modules into a single whole through artificial intelligence and use of modern tools.

The modern loader is coordinated by intelligent sensors.

Intelligent system improves comfort helping the operator to provide stability when working with heavy loads at high altitude facilitates the management, reduces operator fatigue.

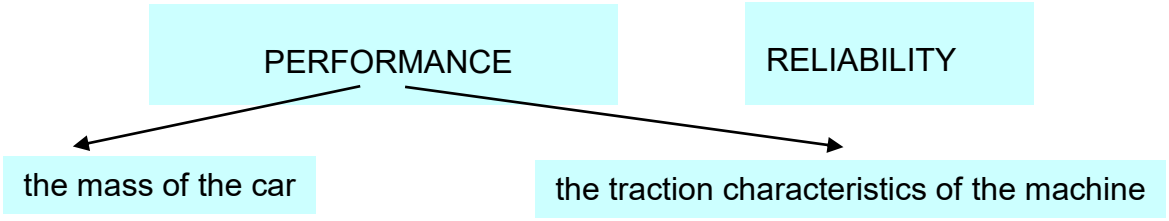
Control lifting mechanism, helps to put the loader arms in the upright position and avoiding sudden movements when the load is raised high enough. Active position control of work equipment automatically returns it to a preset position

Optimization of parameters during the creation of new technology and the selection of loaders available on the market, depending on the operating conditions in the road sector is an important scientific and industrial challenge.

The choice of parameters of technical objects depending on the conditions of operation require a scorecard that provides an objective assessment techniques.

For efficient operation of such complex structures it is necessary to use the principle of physical Metrology, information and interoperability.

THE CHOICE OF CRITERIA OF EFFICIENCY OF THE FORKLIFT



There are two typical operating situations:

1. The need to ensure maximum productivity;

2. The implementation of a given performance to ensure maximum uptime, minimizing failures due to the rational loading of the power systems.

Intelligent system loader must be equipped with all the necessary software and equipment to monitor the condition of the machine.

The accumulation of data on parameters of working process allows at any stage of operation monitoring system for maximum safety during operation.

Developed structural scheme and mathematical model of intelligent machines, provides the solution to the problem of adaptive optimization of its business processes. There is a possibility of evaluation of performance of operating mechanisms, prediction of failure-free operation of structural elements of a car.

In the design and development of intelligent systems of loaders, you must use the modular principle, which will ensure the harmonization of the working process of the machine with operation of other equipment. This system will allow to develop highly intelligent machines ensure efficient use of equipment in conditions where it yields the largest production effect and will improve the quality of work.

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Zdebskyi. K. Yu.

METHODS OF TESTING TYPE-SPEED PROPERTIES OF AUTOMOBILE

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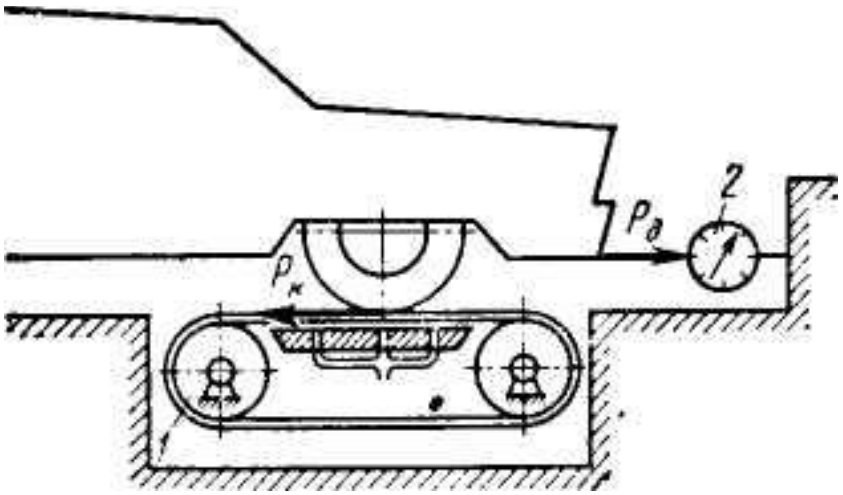
In the laboratory conditions some traction characteristics can be obtained on the testing bench, the diagram to determine the traction characteristics of a car is shown in Figure 1.



1. a drum; 2. a dynamometer;
Figure 1. Testing bench to determine the traction characteristics of a car

The free traction force is measured directly by the dynamometer. The total traction force on the driving wheels can be calculated by the formula:

$$P_K = P_D + P_f$$

In road conditions the traction-speed characteristics of a car can be obtained most easily with a torque wagon trailer towed by a vehicle under test. One can construct the curves of the dependence of P_k on V by measuring the force of traction on the hook, as well as the speed of a car with the dynamograph at the tests. Where this traction force is calculated by the formula:

$$P_к = P'_д + P_f + P_w$$

The dependence of the resistance forces P_f and R_w on the speed of a car must be obtained by pre-testing.

The resistance forces of a car are determined on the road and in the laboratory conditions. On the road the total value of these forces is most likely to be obtained using the method of escape.

The total value of the resistance forces of a car is determined by the formula:

$$P_w + P_f = jm_a - M_r/r_д,$$

The moment of friction M_r and its dependence on the frequency of driving wheels rotation are determined in the laboratory conditions under the operation of a transmission without load (neutral position of a gear gearbox). The moment of friction M_x is measured simply and with sufficient accuracy with the help of strain gauges placed on the driveshaft, and the moment of friction in the transmission is calculated by the formula:

$$M_r = M_x i_0,$$

The temperature of the transmission units in this case should correspond to their temperature during road tests.

In the laboratory testing the coefficient of front resistance is defined by purging the reduced models or full-scale models of cars in an aerodynamic tube. A model or a car in the aerodynamic tube is mounted or suspended so that all the forces acting on them could be measured. The strength of the air resistance in the movement of a car depends on the density of the air ρ, the speed of a vehicle V, the area of the *F* section and the aerodynamic properties of a car:

$$P_w = 0{,}5C_x\rho V^2F,$$

In the process of tests, the coefficient of front resistance and the area of the medley section should not be changed, while the temperature and atmospheric pressure changing the air density must be certainly fixed [3, 16-22].

In the case of experimental tests, the traction characteristics of a car can be determined by measuring the torque of driving wheels of a car. To do this semi axes are placed on the strain gauges and the end current rectifier devices are fixed. The load in these tests creates a dynamometer cart. In this method there is no need for an additional measurement of the resistance forces P_f and P_w.

The control parameters are "Maximum speed of a car" and "Time of passing 1 km from the point". The suitability of a vehicle for testing is determined by the way of its free rolling (run-off).

Tests of a car with two people in it including the driver are carried out on a horizontal straight section of the road with a solid surface (asphalt, concrete) in the dry weather and in the absence of the strong wind. All measurements are made in two mutually opposite directions with closed door windows and a closed ventilation hatch in the front of a body.

The path of free rolling (kilometres driven) of a car is determined at a constant speed of 50 km/h until the complete stop for two travels in mutually opposite directions. To move a car in the run-up mode, you should quickly press the clutch pedal and immediately move the gear lever to a neutral position. The technically fit car must run at least 420 m [2, 148-152].

The maximum speed of a car is determined by the measuring section of 1 km length. The acceleration of a car should be sufficient to reach the measured (maximal) speed before its departure. The time of passing a car the measuring area is determined by a stopwatch, the inclusion and exclusion of which are made at the moment of passing a car kilometre pillars at the beginning and at the end of the dimensional plot. The average arithmetic speed value obtained for two travels in the mutually opposite directions is taken as the maximum speed of a car.

If during the tests the maximum speed of a car will be not less than 140 km/h, and the time to travel 1 km from the place will be no more than 40 seconds, this means that the engine power is quite sufficient and it is suitable for its further operation [1, 30-32].

Reducing the maximum speed by 10-15% from normal and increasing the time to travel 1 km from a place by 20-25% in the normal technical condition of the chassis indicate an insufficient engine power and the need for a more detailed

examination of the engine state and the definition of reasons causing a decrease in power.

This method of verification really allows you to estimate the traction power of a car in two parameters – the maximum speed and the time of acceleration. The availability of standards for these indicators and admission to their deterioration makes the technique complete that is what and how to do and what to compare the results with.

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