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Philosophical problems of ecology

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Abstract: Man has been continuously interacting with the nature surrounding him since he began to live on Earth. This interaction is both direct and indirect. The basis of a person's direct interaction with the natural environment that surrounds him is the biological metabolism common to all organisms in the process of food intake, breathing and various excretory functions. But what is more specific and important for people as a social being is the mediated method of interaction with nature through the application of various technical devices, starting from newly hewn stone pencils and ending in modern atomic reactors. In this type of interaction, there is also an exchange of substances between man and nature, but the speed of its development and the increase in its scale and size are significantly different from direct exchange, so that its increase is not limited to the natural dimensions of organisms, the development of knowledge and the corresponding technical devices applied by people. conditioned by improvement. Thus, in this case, the interaction develops with the principle of positive feedback. The more techniques and technology improve, the more mass of natural substances are set in motion by them, and this process can go on with continuous growth as long as there are no external insurmountable obstacles.

Keywords: Nature, Environment, Ecology, Biosphere, Noosphere.

1.Introduction

The level of human impact on the environment depends primarily on the technical capabilities of society. At the beginning of human development, it was quite weak. However, with the development of society and the growth of productive forces, the situation began to change fundamentally. The 20th century was the century of scientific and technical progress - due to the qualitatively new interaction of science, technology and technology, the possibilities and real scale of society's impact on nature increased significantly, and a number of new, very acute problems, primarily environmental problems, stood before humanity.

In the 19th century, Haeckel assumed that ecology, the new science, would be the science of the interaction of living organisms with their environment - this science would only study the interactions of animals and plants with their environment. This term entered our life more deeply in the 70s of the 20th century - today, when we say environmental problem, we are mainly talking about social ecology - the science that studies the problems of the interaction of society and the environment. Man has never been in complete harmony with nature and has never been satisfied with just adapting to it. This is nothing more than a religious myth about the primitive paradise inhabited by Adam and Eve. For some reason, this myth has even passed into the scientific literature on environmental problems. If our ancestors had limited their activities only to adapting to nature and adopting its ready products, they would never have been able to get out of the animal state they were originally in. Only a confrontation with nature, a constant struggle with it, and a great change carried out according to one's own requirements and goals could form the being that passed from animal to man. Man, as is often said, was not created only from nature. The beginning of man was motivated by labor, which is not a natural form of activity - the main feature of labor was the creation of other objects (food) by the subject of labor with the help of one object (tools). It was labor that became the basis of human evolution. American scientist B. Franklin expressed this idea more successfully - he called man a tool-making animal. Labor has given man great advantages over other animals in the struggle for survival, but at the same time he has put his personal life in danger of becoming a force capable of gradually destroying the natural environment. It is assumed that this danger arose together with man and reached a high level on the eve of the second and third millennium of the new era. Ecological philosophy and the problems of the formation of social ecology. The entire previous history can be

viewed from the ecological point of view as an event with the acceleration of the process of accumulated changes in science, technology, and the state of the environment - which ultimately led to the state of the modern ecological crisis. The main symptom of this crisis is the sharp qualitative change in the biosphere that has occurred in the last fifty years. In addition, the first signs of the transformation of the ecological crisis into an ecological disaster have appeared recently - the processes of irreversible destruction of the biosphere have already begun. Most experts point to the fact that in the mid-1980s, the destruction of the ozone layer in the upper layer of the atmosphere, the further increase of thirst in the continental territory of the planet, the loss of climate stability and many other trends from the change of the natural environment were recorded as this sign. The ecological problem has put humanity in front of the choice of the next development path: humanity should still be directed to the endless development of production, or this growth should be coordinated with the real capabilities of the natural environment and the human body, and social development should be aligned not only with the near future, but also with distant goals.

All these issues require a deep philosophical understanding, so that a borderline situation has arisen in an unusual way: *first, it does not apply to an individual person or a human collective, but to humanity as a whole; *secondly, the extraordinary speed of development of events - it precedes their understanding not only at the ordinary level, but even at the level of scientific-theoretical thinking; *thirdly, the problem cannot be solved by the simple application of the means of force, as was often the case before: in many cases, the solution to the environmental problem requires, rather than the increase in technical power, the abandonment of the types of activities that do not have the necessary conditions for the existence of more people - if they involve the use of large volumes of natural resources if connected, it is necessary to reduce them to the ecologically permissible framework or to stop them completely. The types of activities for people's living should be considered and determined in a fundamental way, taking into account the ecologically deviant regime in relation to both natural resources and human health. Subsequently, we see that man himself is assumed to have such a new meaning to his place and role in the natural universe that it would not be possible to do this only within the framework of the previous philosophy. Philosophy itself must fundamentally change in the sense of nature and man's attitude towards it. In fact, we are talking about a new philosophy of nature and man - for this, several new names are required, which are formed by combining the previous term with the prefix "eco" [9].

Ecological philosophy gives a new direction to the philosophical thought in the understanding of the ecological situation that has already arisen - the novelty and specificity of the ecological situation is investigated, a plan of measures is prepared so that it does not reach the most tragic situation for people, and does not turn into an ecological disaster. However, philosophy has begun to fulfill a mission of greater practical importance than in the previous period. It turned into a field of knowledge aimed at saving humanity from destruction, took a critical look at all directions of human activity and the fields of knowledge and spiritual culture that serve them, and at the same time the demands offered to it by the biosphere. These requirements are as follows: * adaptation to the biosphere based on knowledge and biosphere protection laws; *moderation, mildness in the use of natural resources, elimination of extravagance in the consumption structure of the society; *mutual tolerance and peacefulness among the peoples of the planet; * Adherence to the global goals of universally important, ecologically thought out and consciously set social development. All these requirements imply the movement of humanity towards a single global entity based on the joint formation and protection of the new planetary cover, which V.I. Vernadsky called the noosphere. The scientific basis of this activity should be a new field of knowledge - social ecology. It is interesting to study the main features of the subject of social ecology and its interaction with other fields of knowledge. The concept of "social ecology" was not immediately accepted by the scientific community for a number of reasons: *first, caution was shown in relation to the biologization of social life, and for many years it was noted that this was inadmissible from the standpoint of Marxist philosophy; *secondly, in the 1920s, the concept of "social ecology" was initially used by R. Park and E. Berdges, sociologists of the Chicago school, in a different sense - mainly urbanization (the accumula-

tion of material and spiritual culture in large cities to the detriment of rural development) of the environment to man and the human collective was applied for the purpose of studying the uniqueness of its effect. The concept of "ecology" was first proposed by the German naturalist E. Haeckel in 1866 to characterize the totality of the self-regulation process that occurs in the community of organisms mainly through the interaction of organisms with each other and with the surrounding abiotic environment. Thus, immediate attention is directed to a systematic approach to the study of biological phenomena and the ability to act purposefully not only at the level of individual organisms, but also in relation to highly complex supra-organism associations - biocenoses, the biosphere as a whole as a global system.

The main concepts of ecological science include those that characterize the systematic organized interaction of people and their totality based on the exchange of substances, energy and information, respectively. The concept of "ecological system", which was introduced to science by the English botanist A. Tensley, was used to characterize a stable system integrity with the environment (biotic and abiotic) inhabited by any organism. This is a very convenient concept, it is true that it is not distinguished by its great certainty in relation to its boundary. The ecological system refers to both the elementary parts of the biosphere, the part with the forms of life interacting with the environment, and the biosphere as a whole as a global phenomenon. German hydro biologist K. Mebrus proposed the concept of "biocenosis" in 1877 in order to characterize the systematic interaction of various types of organisms within a certain unity with the aim of maintaining life activity. In 1940, the term "biogeocenosis" was added at the suggestion of the Soviet botanist and landscape scientist V.N. Sukachev. However, the important role of abiotic environment in the created community of organisms was noted. In social ecology, the material of concepts accepted in general ecology is used and the basic regularity of the interaction of a community of organisms with the environment surrounding them is taken into account, so that even though a person and society as a whole have different characteristics from others, they are also organisms, and therefore they are the most fundamental laws of life preservation studied by general ecology. remains in effect. Of course, people must implement the requirements of these laws in a specific form in the course of their activities, as various technical adaptations play the main role in ensuring the exchange process with the environment, but the observance of the law of preservation and protection of life by people is as mandatory as the protection of the smallest organisms on the planet. Until recently, the development of society took place in complete ignorance of the laws binding on it, and this was possible only because the influence of people on the biosphere was not so significant that it would have affected its condition as a whole. In a fairly large area of the biosphere, local destruction began a long time ago. Suffice it to say that modern deserts on the planet are the result of human activities that are destructive to nature. It is no coincidence that all anthropogenic deserts are located in the area where the oldest civilizations of the planet exist. It is believed that the almost simultaneous extinction of the land giants of the animal kingdom, about 10 thousand years ago, was mostly due to the inefficient hunting activities of ancient people, and at the same time, the widespread practice of burning forests in order to free up land for agricultural work. was. However, despite all these devastation and destruction processes, the biosphere has not completely lost its ability to maintain its condition suitable for life and to regulate it. The situation changed dramatically when people switched from using wood fuel to mineral fuel for energy, that is, during the event known as the industrial revolution in the history of society in the 17th and 18th centuries. These phenomena produced two results that fundamentally affected the state of the biosphere: *first, machine production replaced manual production, the rapid development of enterprises began, the growth of cities accelerated, and new social classes with a different way of life and a different attitude to nature appeared; *secondly, energy based on mineral fuel created a noticeable imbalance in the chemical and thermal state of the biosphere, so that in short decades, a lot of substances and energy mass accumulated in the biosphere for many hundreds of millions of years were reduced and thrown into the environment [8].

The works that started with the industrial revolution gained a wider scale with the scientific and technical revolution of the 20th century, after machine energy, machine informatics was born. From this time, the development of society began to go so fast that it

affected the state of the biosphere in a noticeable way, in all life-important parameters. First of all, it manifested itself in drinking water resources, air, soil, and biological resources. The population of the planet has grown rapidly, and now their number is more than 7 billion. It became clear that the spontaneous use of the biosphere by man has led to serious consequences. The modern generation must switch to a legally regulated and normatively organized use of the biosphere. What are these laws and regulations? How to form them and use them competently? Social ecology should undertake the mission of teaching people to all these things - its subject is the compatibility (coexistence) of society and nature.

The central concept in social ecology is "system-society-nature" or "social ecological system". This concept implies the transfer of the law of mutual relation of part and whole to the society. Of course, the relation to the society is the complete biosphere, so the society must be functionally important in relation to the system of which it is a part, i.e. the biosphere. At the same time, obeying the laws of the biosphere should solve such tasks for people in the organization of their activities, so that society becomes a necessary part of the biosphere. Although the people who have inhabited the earth so far are intelligent, they do not have the basic feature that is mandatory for any living organism - the feature of ecological self-sufficiency. This featureless person has no future, but if he has this feature, he will change a lot with his views, his value system, his attitude towards nature and those similar to him, he will be a completely different being, outwardly reminiscent of the previous one. This is why a new name, Homo ecologies, will be required for this new creature. As a whole, the modern world is undergoing a glorious transition from the pre-ecological era to the ecological era. This transition must happen because the fate of the human race depends on it. Whether a person lives on Earth or not depends on whether he can be an ecological being. It's almost a kind of test of whether a person is truly intelligent. At one time, Kant made very high demands on intelligence - he assumed that only in unity with moral duty, the ability of thinking of a person acquires the characteristic of intelligence and wisdom. The time has come to combine the logic of thinking and moral feelings as a condition of self-preservation by maintaining the human living environment. Of course, such a change will not happen in a person. For this, a new education system and the education of a person of the ecological era are required. Acquiring socio-ecological knowledge, joining this knowledge is a mandatory condition of the new education system, so first of all it is important for a person to know what to do and how to behave in new conditions. But this is not enough, as the change must cover the entire emotional sphere of a person - he must develop a high sense of responsibility, he must feel his responsibility towards nature and the future generation, he must realize that he will leave the Earth suitable for the conditions of life for the generation that will replace him.

2. Experimental details

Features of the biosphere and the ecological basis of economic activity. The concept of "biosphere" entered science as a system of Earths in 1926 with the publication of academician V.I. Vernadsky's work "Biosphere". Until then, the word "biosphere" was used in the works of the Austrian geologist E. Zyussa, however, due to the lack of certainty in its content, it could not gain a place in science, and most importantly, the need to use it along with the expressions of the geosphere, which has been known for a long time, was not sufficiently substantiated. not only the content of the concept of "biosphere" has been revealed, but also how important this concept is to understand the nature of virtually all events occurring on the Earth's surface. In his later works, Vernadsky developed the teaching of the biosphere to the point where it was necessary to use it as a comprehensive concept indicating the next, higher stage of the development of the biosphere. For this stage he proposed the name "noosphere", meaning "realm of the mind" - a literal translation from the Greek. The mentioned name was previously used by the theologically minded French scientists E. Leroy and P. Teilhard de Chardin, who meant only the realm of the mind, which actually functioned independently of the material world. And when Vernadsky said the noosphere, he meant not only the spiritual world, but also the material reality changed by human labor.

There were important methodological reasons for the introduction of new concepts such as "biosphere" and later "noosphere" into science, they played a key role in the development of the scientific theory about the Earth and were important for the further development

of science about nature and society. In natural science, the study of the biosphere could not be created until sufficient information was gathered about the close interactions of the phenomena of the organic and inorganic world. In Vernadsky's works, the concept of the biosphere does not have the universality that was once given and later defended by him, but the whole course of his judgments allows us to consider that the biosphere is the entire geological cover of the Earth, where there is a qualitative change directed to the formation and improvement of life-giving and life-giving properties. Organisms do not just live on the surface of the planet as some kind of abode, they are also genetically and intrinsically connected with their environment by thousands of threads through the process of continuous exchange of matter and energy. With the help of teaching about the biosphere, it is possible not only to understand the dynamics of matter-energy processes on the Earth's surface, but also to correctly distinguish the most important determining factor in its complex set of events and facts. According to Vernadsky, they are the living substances of the planet, i.e., the totality of the organisms inhabiting the Earth taken as a whole. Such an approach was new and fundamentally opposed to the generally accepted views in Earth sciences [1]. According to traditional views, the decisive role in the changes taking place on the planet is played by inanimate natural factors - tectonic (the structure of the Earth's crust and the geological changes that occur in it), hydroclimatic, zonal, space, etc. was leaving. Life was seen as a temporary superficial phenomenon, which could be ignored compared to the effectiveness of the interaction of abiotic factors in the image of the Earth. However, despite not being very important, the mass of organisms has a qualitatively new spatio-temporal characteristic of existence, as a result of which they develop the intensiveness and efficiency of metabolic processes due to the purposeful regulation mechanisms that constitute the distinguishing feature of the living being. Moreover, while life is a continuous self-protecting and self-creating process, the course of life creates a very large cumulative effect of changes in both the organisms themselves and the environment. If we take into account not only the quantitative, but also the qualitative aspects of the phenomena, then it is possible to correctly understand the various and diverse picture of natural processes and distinguish the main contradictions in the development of the biosphere. This is the contrast between animate and inanimate nature. The resolution of these contradictions during the exchange process between organisms and the environment ensures the process of self-development of the biosphere as a whole material system. There is no process as important and important as the continuous process of synthesis and decomposition of organic matter on the earth's surface. All other processes of the biosphere are in any way related to this basis and are determined by them. The main contradiction of the biosphere is manifested in the example of the interaction of dialectical opposites. The processes of synthesis and decomposition of organic matter exclude and require each other at the same time, in the same fundamental relationship, precisely in the relationship of the interaction of the same starting elements.

The exchange process between living and non-living nature in the biosphere differs in its sheer speed and scale and has a global character. In fact, all substances of inanimate nature participate in it within the framework of the biosphere, passing through the body of the organisms that inhabit it to one degree or another. Therefore, the role of organisms in the movement and division of substances on the Earth's surface is great. It corresponds to geological factors, but according to some parameters it can even surpass it. Based on the information about the geological role of organisms on the planet, it can be said that living things do not stand before us as random events, they stand as an important part of the whole system, obey it in their activity and ensure its integrity in a qualitatively new state. Thus, the idea of the biosphere arose on the basis of the understanding of the global functions of organisms on our planet. The new concept was required to reflect the qualitatively new state of the Earth's surface caused by the activity of living substances in the theory [5].

In biogenocenosis, the interaction of different types of organisms is such that the products of the life activity of one species are harmful to them, and act as conditions for the life activity of others. Thus, a chain of uninterrupted succession of food is created, each link is quite important and it is impossible to completely replace it. In the generalization of species, this ring can be imagined as a chain from heterotrophs and saprophages to autotrophs, which, by breaking down organic substances, ensure the return of chemical elements back to non-living nature. So, in biogenocenosis, the periodicity of the

exchange process is ensured, and then it is closed. But this periodicity is relative, since in the struggle for the success of living in inanimate nature there is a continuous process of improvement of species. Each organic species tries to increase its biogeochemical energy. Only species that achieve anything in these processes live and thrive. As a result, each evolving species contributes to the general process of accumulation of matter and energy in the biosphere. The rise of the matter-energy level of the biosphere due to the opposite effect of the effect on the cause gives the organic world a new impetus for development. As a whole, an integral process of increasing development occurs in all living nature. According to the doctrine of the biosphere, all its components stand before us as a process of exchange that arises in a lawful manner and is necessarily related to each other. Each component plays a specific and indispensable role in maintaining the integrity and orderliness of the biosphere as a system. Even the slightest change in any component is reflected in the others and causes them to change accordingly. Due to this, the self-regulation of the biosphere and the regular nature of its changes over time are ensured.

As a system of interconnected biogenocenoses, the biosphere presents itself as a derivative of the whole, where properties that do not exist in its constituent parts develop, but most importantly, most of the properties of the parts themselves are the result of the development of the biosphere itself as a whole. Therefore, the biosphere can be attributed to the organic complete type. Unfortunately, this situation is not always taken into account in the study of the economic use of the natural environment. It is usually overlooked that all parts of the biosphere are the product of the development of the process of its interaction with the environment and the constant interaction of separate parts with each other - as a result of which a highly organized system has been formed, no part of which can exist in this quality outside of the whole. The biosphere, like any whole, complete system, is in equilibrium not only with its environment, but also with the interaction of its parts, otherwise they could not exist. But this balance is dynamic, it develops from the pole of less activity to the pole of higher activity by the struggle of conflicting processes. The living substances of the biosphere act as a more active pole of interaction due to the peculiarity of its structure and the superior movement of matter and energy from the inanimate nature to the organic world. This tradition in the development of the biosphere is strengthened by the emergence of mankind. As a higher, qualitatively special stage of the development of matter, human society goes beyond the framework of living nature. The surrounding nature changed by them also acquires qualitatively special properties. This found its expression in the concept of "noosphere" organized by V.I. Vernadsky. Vernadsky believed that with the emergence of man and the development of his production activity, the role of the main geological factors in all changes occurring on the surface of the planet begins to pass to humanity. In this regard, people face not only scientific and technical, but also complex tasks of a social nature, aimed at one goal - to prevent the change in the natural environment from harming people themselves and other forms of life, to give them an intelligently oriented character [7].

The noosphere is the whole, complete planetary cover of the Earth inhabited and efficiently modified by people in accordance with the laws of maintenance and protection of life for the harmonious existence of society and nature. The concept of "noosphere" will become an interdisciplinary central concept and will play an important role in building a whole system of knowledge about the interaction of all its parts of the nature that surrounds society. In the event that the concept of "noosphere" characterizes the direction of changes occurring in the biosphere due to the influence of people, it has great worldview importance both in theory and in the organization of practical activities. The concept of the noosphere played such a role in Vernadsky's own worldview: "The noosphere is the main regulator of my understanding of the environment." As can be seen from his other judgments, based on this concept, the idea of the non-destruction of civilization is more justified for him - the law of preservation of conditions corresponding to the system of existence of the environment applied to the desired material system is applied here. The civilization of civilized humanity is a form of organization of a new geological force that has arisen in the biosphere, so it cannot be stopped and destroyed, as it is a great natural phenomenon that responds to the historical, more precisely geological, organization of the biosphere. Vernadsky well understood not only the fundamental difference between society and nature, but also the necessity of a close, organic connection of a systematically organized society with the

environment. From this interaction and mutual agreement of the laws of society and nature, the laws specific to the noosphere as a socio-natural unity should gradually emerge - where the social-natural will play a determining and organizing role in the relationship. The leading role of anthropogenic processes in the entire set of changes occurring in the biosphere has recently begun to manifest itself as a well-known fact. At the same time, it should be noted that the leading role of anthropogenic factors in the system of biosphere processes is currently manifested more quantitatively, but it cannot be considered qualitatively leading, rather it shows the opposite. Society's influence on the biosphere does not yet contribute to the stability of its organization and the increase of its integrity and completeness, that is, it does not ensure its quality characteristics. It cannot continue like this for long. There is a limit to the organization of the biosphere, it is dangerous not to reckon with it. The creation of the noosphere means, first of all, ensuring the connection between the processes taking place in the biosphere and the social processes. It is difficult to achieve, but it is possible in principle, and most importantly, it is necessary.

Qualitatively separated from nature, people are closely connected not only genetically, but also with all their lives, most importantly with material production, biosphere. Human society, by its activity, was sharply separated from all previously existing components. For the first time in the history of the biosphere, there is a movement of atoms that is not necessarily related to the passage of living matter conditioned by the production activity with the help of a labor tool. Along with the geological and biological cycle of substances and energy, there is a production cycle that occurs in people's lives. Taking into account the large-scale impact of man on nature, it is necessary to develop a scientific basis for human economic activity, adhering to the principles of teaching about the biosphere as a complete system - where even the individual consequences of each of the major changes made by man on the landscape should be considered within the scope of possibilities. Due to the interaction of all parts and elements of the biosphere, any impact of society on nature returns after a certain time in the form of a response of nature to society. According to the law of repulsion, the stronger this feedback effect, the more justified human intervention is. From this we can come to the following conclusion: the more powerful a person has in influencing nature, the more thoughtful and scientifically justified his activity in relation to nature should be [3]. A practical man follows the path of simplifying natural synopses by shortening the food chain to the extreme. It destroys all organisms except those it needs. At first glance, this makes sense from an economic point of view. However, scientific truth does not lead to expediency, it is true, it unites it, and the relationship with nature cannot be established only on the basis of immediate benefit. Also, as it is long overdue, it is impossible to proceed only by the simplification of biocenoses - especially in the work of nature protection. Such united groups lose their stability and become vulnerable to attack by other species. This is indeed a complex issue – it is a complex task to create stable, widely distributed rich biocenoses, but also in conditions of complex compensatory influence by other members of the group. In the creation of such groups, both chemical and biological means of influence and regulation of natural processes should be widely and skillfully used. Unfortunately, the biological method of influencing the natural environment is still poorly used, even research in this field is not carried out widely enough - in fact, these methods are more in line with the laws of the biosphere and therefore do not cause as much damage as the chemical method.

It seems that when influencing natural processes, the following methodological principle should be followed: the methods that are more consistent with the objective logic of the natural complex itself are considered the most effective, and the more complex the object is controlled, the more complex the effect on it should be. The development laws of the noosphere create an optimal synthesis of natural and social regularity with the qualitatively leading role of social factors in accordance with the complexity of the system itself. Accordingly, the formation of the noosphere is a complex and long process that requires certain initial conditions and conditions of both objective and subjective nature. Among all the initial conditions of the noosphere, the most important and, at the same time, social condition, the necessity of transition to a higher level of social integration of all humanity can be noted as the new state of the planetary cover. Humanity can only live as a single whole. This provision consistently passes through the views of V. I. Vernadsky, in fact it acts as a natural-scientific justification of the new state of society.

The ecological imperative of modern culture. The historical fate of civilization has directly depended on how people interact with nature. It is assumed that the decline of the culture of whole peoples is significantly determined by the violation of the natural conditions of living as a result of excessive and improper exploitation of natural resources. K. Marks, who got acquainted with Fraaz's research on the role of land cover and climate in the history of society, noted that if civilization develops spontaneously, it inevitably leaves a desert behind, thereby making it difficult to live its existence. During the period of scientific and technical revolution, the sharp increase in the scale and speed of production relations sharpens the contradictions between nature and society, reveals the limitation of natural possibilities to ensure the scale and accelerated consumption of resources. In order to optimize the exchange process between society and nature, there is a need to increase and strengthen the natural possibilities of the biosphere by artificial means of human-controlled influence. At the same time, in the development of interaction between society and nature. At the same time, a new important stage opens in the history of civilization as a whole. If until now the concept of "culture" covered only the areas directly mastered by people, now it is necessary to apply it to the entire natural environment in which a person exists, first of all, the biosphere, then the areas under the Earth adjacent to it and outer space. In this case, when we say culture, first of all, it is the change in the character of people's attitude towards nature, which is understood not only for the purpose of using its individual events and processes, but also as understood on the basis of the entire system of communication that exists in the natural environment and ensures its integrity and useful character. It is intended. Such an attitude to nature implies a qualitatively new level of its understanding and practical use - at this time, the subject of research and the main activity are environmental laws, that is, laws of self-regulation of the biosphere and its components, along with the previously considered laws of nature. The only way to take into account the requirements of the self-regulating laws of a complex system is a systematic change of the entire structure of our activity, which means a change of its culture. Culture is one of the most complex concepts that characterizes a person not only as the creator of material and spiritual values, but also as the method of his creative activity. If previously the nature-changing functions of culture were mentioned and it was even defined by being opposed to nature, now it is necessary to consider the no less important function of culture to protect nature and define it by mixing it with nature [4].

The great naturalist scientist I.M. Sechenov liked to repeat the idea that "a person is 90 percent a product of education", so the natural possibilities of transferring social knowledge and experience are limited. The information received by a person during his life is quite complex, if we take into account its updating during the development of society, then it is clear that no means of encoding and transmitting information can be formed and changed in such a fast and complex manner. Therefore, unlike other organisms, the human whose behavior is more than 90 percent genetically programmed acquires the social program of behavior mainly in the process of upbringing and education. First, the social program is given to children from their parents, then they get it from the people around them, then from teachers and colleagues. Of course, historical traditions collected by family, national and society in general play a big role in the process of personality formation. This is how the succession of generations is formed and the connection is made in the history of society. As this relationship develops and the transfer of historical memory takes place, any society appears as a solid monolith. This situation is also valid for environmental education and education, but this feature of it should always be remembered.

Ecological knowledge and habits in many cases not only differ from the traditional, but even stand against it, so it implies the formation of a completely different system of values and priorities - which is the moral basis of personality. Of course, the spiritual and daily traditions of the society are large and diverse. Among them there are those who can be considered the embryos of ecological culture, but they are fragmentary, unsystematized, most importantly, they are not leaders in modern society, they still tend to conquer nature and try to subordinate it to their own purposes. This is now a very dangerous pastime, it can lead to very dangerous consequences for the people themselves. After that, it is up to the educator - teacher to overcome the difficulties in the direction of conquering nature in the minds of those who are being educated, to form a new worldview paradigm of the personality's cooperation with nature, to pay attention to the needs and requirements of the personality - at the last

moment, this becomes the demand of everyone, so that despite our difference from nature, we live in it. we continue and obey the laws of its systematic structure. Communication with this new psychological and mental direction must begin very early, almost from the cradle where the spiritual skeleton of the personality is formed. Curriculums for all subjects should be carefully analyzed and revised - they should be given an ecological orientation, if this has not already been done, it should be solved immediately, and a special course on the problem of social ecology should be taught starting from high school, and an hour should be devoted to it - it is a question of social natural development. it should proceed from the harmony of its most general fundamental laws with the natural environment. The transition from spontaneous use of nature to conscious, organized and normative use involves communication with a new system of knowledge and habits of people - which is directed towards understanding nature as a whole organism according to the laws of self-regulation and self-preservation - people must enter it with their activities and thereby treat it as their personal abode. they should help protect the biosphere. It is in the process of ecologically oriented upbringing and education that such a property must be formed - the property of ecological self-sufficiency, without which a person cannot live on the planet for a long time. For now, man carries within himself the property of ecological self-destruction, which leads him to destruction. Overcoming this direction in a person shows the main difficulty of the task of forming the ecological culture of the personality - today the activities of all educational and educational organizations, as well as the mass media, must be subordinated to it. All these enterprises collectively have the power to influence people and will help to form a new type of personality. If the issue of protecting the biosphere and the people themselves is taken seriously, the state should order the formation of an ecological identity to the listed enterprises.

In ancient Greece, the civic education of people was a well-thought-out program in the spirit of patriotism and commitment to the duty of service to society. It is also explained by the fact that the country, which is not very big, became one of the world leaders at that time and maintained a leading position in culture, production, trade and military affairs for a long time. The civic education program was called "Paydeyya" and had state status. It is time to adopt a global program of ecological civic education and education of the people of the planet, not only within the framework of a separate state, but at the international level, and it should be put forward as an important condition for everyone to live according to this Program. It is impossible for a person to spontaneously form an ecological culture, so it takes several generations for a new system of moral values and rules to dominate the consciousness. , but also requires the state of the biosphere. It is in the hands of the people and will be according to the will of the people. Nature and society are part of a single global system, social and natural in nature. It is responsible not only for the planet, but also for future generations. It can be hoped that he will understand the real situation with man, make a wise decision, and follow the motto "as long as possible, save and protect nature and yourself". Civilization is a cultural-historical community of people or a community of people united in a certain type of material and spiritual culture. The main sign of civilization is the existence of the state structure of society and writing. The state unites a large mass of people, writing, protection and transmission of information is the accumulation, dissemination, improvement of the development of knowledge-skills (culture). The history of the last few thousand years is the history of successive-parallel existence of different civilizations [6].

Recently, people are more oriented towards the object, the objective reality, and try to remove the subjective from their consciousness, put their own participation in what is happening in the background, and look for the blame for the difficulties outside. The older generation blames the youth for the predicament facing humanity today, they distance themselves from the objective assessment of time by glorifying their era. They forget that they were energetic in their youth and had a different outlook on life - their exaggeration of their youth and criticism of modern times is a reality far from objectivity. I think that the only correct assessment is a philosophical reflection of the period. "Man is the measure of all things" - we must not forget the motto - there have always been people who were dissatisfied with the state of the times. Rather than complaining about the time, we should not forget that people have come to improve this time. The current meaning of culture characterizes its ecological meaning as a way of uniting people and nature, in contrast to its original meaning - to separate man and

nature to the point of opposing each other. The change of culture in accordance with the ecological beginning requires a radical change of the entire value system of society and, first of all, a new paradigm of the moral and behavioral structure of a person. The main axis of traditional culture is anthropocentrism, which is considered as the basis of humanism. Ecological culture is built around the paradigm of biospherocentrism, or ecocentrism as it is sometimes called. At the last moment, this paradigm also enters the person as the main goal of social development, but not directly, as before, but directly, as the task of protecting the natural foundations of society. The mentioned difference is very important, as it determines the prevailing system of preferences in the economic, political, legal and other spheres of social life. It is clear from what has been said that the position of the opponents, who accuse the ecological system of values of standing against humanistic ideals, is wrong. In ecological culture, humanism is deeper and more fundamental in the face of ecological threat. He takes into account the real possibilities of the biosphere, which provides real human conditions for the population of the planet. A person should not only understand himself as a part of the natural cosmos, but also, most importantly, understand his role as a creator and defender of this cosmos. From such a position of understanding, it was possible to move from the self-destructive concept of anthropocentrism to a more constructive and visionary concept of vitacentrism, the responsibility inherent in all forms of human life. However, the system of values is arranged in such a way that it is the opposite of the traditional one, but it is the only permissible and savior in the modern conditions: it realizes what is from the task of protecting nature to the tasks of social development [2]. Instead of the annoying slogan "Everything is for man" comes the wise slogan "everything is for the biosphere, nature and only then for man" - a person who understands all this can protect himself from many troubles and useless actions.

3. Conclusion

Today, the ecological problem in the world has reached a critical level - such as global environmental problems, the destruction of thousands of species of plants and animals, the destruction of forest cover, the depletion of useful underground resources, the destruction of the world's oceans as a result of the destruction of living organisms, and the destruction of the environment. excessive pollution of the environment, the almost absence of clean air, the gradual destruction of the ozone layer, the increase in the danger of cosmic radiation to the living world, the continued pollution of the earth's surface, and the increase of man-made obstacles on the Earth. To solve the global environmental problem, it is necessary to find ways of harmony with nature - for this, work should be done in the direction of the formation of ecological consciousness.

One of the most serious problems facing humanity in recent times is the environmental problem - the author of which is man. The word eco means home in translation - we are talking about a person's home. The ecological problem is not only the protection of the environment, it also means treating animals and plants, living nature in general with love and respect, re-creating the lost elements of nature, improving the cultural environment, the second nature created by human labor. In the 20th century, humanity found a not very good solution to the housing problem - the rapid growth of multi-story skyscrapers became a real black hole for humanity as a biological species. The decrease in birth rates is due to the fact that more people live in multi-story houses. The apartments in these houses are like cages for animals in a zoo - they prevent the growth of a person as a living being. With these apartments, we are separated from Mother Nature, and our physical, biological, and mental connections with her are severed. Environmental pollution of urban dwellers results from their lack of positive communication habits with nature. We see the first nature only through the prism of the second nature - road surface, walls of houses, bad weather, etc. appears with The negative energy we get from communicating with second nature causes us to be unable to communicate with first nature. By polluting the environment, we increase the ecological tension around us, we forget our eco - our home, we put human care in the background, its development and improvement are forgotten. Environmental stress has made the slogan "Back to Nature" relevant and has turned it into a major issue facing us today.

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General characteristics of renewable energy

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Abstract: Alternative energy is not only important for the environment. Depending on the nature of the regions, one or another source dominates in the structure of alternative energy use. Regardless of the source, obtaining electricity from environmentally friendly alternative and renewable energy sources is very important for the country's sustainable development.

Keywords: Renewable, Energy, Sources, Potential, Capacity, Hydropower.

1.Introduction

Azerbaijan is one of the countries with high potential for renewable energy sources. Thus, the potential of the country's economically viable and technically usable renewable energy sources is 26,940 MW, including 3,000 MW for wind energy, 23,040 MW for solar energy, 380 MW for bioenergy potential, and 520 MW for mountain rivers. evaluated. Despite being rich in energy resources and being recognized as an exporter of energy resources in the world, the use of renewable energy sources has always been in the spotlight in the Republic of Azerbaijan. One of the main steps taken in order to effectively use the renewable energy potential of our country was the adoption in 2004 of the "State Program on the use of alternative and renewable energy sources in the Republic of Azerbaijan." The adoption of the State Program has created ample opportunities for the implementation of fundamental changes in the use of renewable energy sources and the assessment of the country's potential in this area. Azerbaijan's total electricity generation capacity is 7,516 MW, and the capacity of renewable energy power plants, including large hydropower plants, is 1,278 MW, which is 17% of the total capacity. A number of steps are being taken to assess the potential for the production of electricity from renewable energy sources and the steps to be taken and measures to be taken to use this potential. Eight sites with a total capacity of about 1,000 MW were selected to identify and prioritize areas with renewable energy potential. Compared to wind energy, it is planned to implement projects in the regions in the coming years to use the potential of solar energy throughout the country, to use lands unsuitable for agriculture, and to distribute electricity generation capacity from renewable energy sources. Work has begun to assess the potential of renewable energy sources in Karabakh and surrounding regions. Eight perspective areas with a total potential of more than 4,000 MW for the construction of solar power plants (HPPs) have been identified in 6 districts (Fuzuli, Jabrayil, Zangilan, Gubadli, Lachin and Kalbajar) in the liberated areas. In the mountainous part of Lachin and Kalbajar regions on the border with Armenia, there are large areas with an average annual wind speed of 7-8 m / s at an altitude of 100 meters. Taking into account the infrastructure, geographical relief and other factors of these areas, the initial wind energy potential is estimated at 500 MW. Taking into account that 25% of the country's natural water resources are formed in the Karabakh region, the prospects of using the main rivers such as Tartar, Bazarchay, Hakari and their tributaries for electricity generation were considered by the Ministry of Energy and BOEMDA. data were collected. The existing hydropower plants are mainly located in Tartar, Lachin and Kalbajar districts. Preparations are already underway to begin repair work at some small hydropower plants. The 8-megawatt Gulabird Hydroelectric Power Station, located on the Hakari River in the Lachin region, has already been commissioned. Renewable energy sources are important for Azerbaijan. However, except for hydropower, few renewable energy sources are utilized. One of the alternative sources of energy is wind energy. It is also more profitable due to the cost, ecological cleanness, and its renewable properties compared to other alternative energy sources. Important research in the field of renewable

to the acquisition of new generation materials and the development of devices based on them [8-11].

2. Experimental details

Depending on the nature of the region, one or another source dominates in the structure of alternative energy use. The object of research can be considered all the areas that can be restored in the country

Renewable energy sources are: 1.Biomass energy (biogas); 2. Wind energy; 3. Solar energy; 4. Water energy, 5. Geothermal energy; 6.Wave energy; 7. Hydrogen fuel energy.

2.1 Biomass

Biomass is also an alternative source of energy. There are following sources of biomass in Azerbaijan: industrial waste which has ability to burn, wastes from forestry and wood processing field, agricultural crops and organic compounding wastes, wastes of household and communal areas, wastes from polluted areas by oil and oil products. According to the research, most of the production of waste is composed of biomass products in all sectors of the economy. It is possible to obtain gas, liquid and solid biomass which are used in electricity generation from those biomass substances. Thus, more than 2.0 million tonnes of solid and industrial wastes were thrown to neutralization zones every year in Azerbaijan. Solid and industrial wastes processing can partially eliminate the difficulties of warming up of public buildings in Baku and major industrial cities of the country. The underground temperature is widely used in many countries in industry, agriculture, household and communal fields and in medicine. The territory of Azerbaijan is rich of thermal waters. They cover large areas such as the Greater and Lesser Caucasus Mountains, the Absheron peninsula, the Talysh mountain-slope zone, the Kura basin and territories around the Caspian Sea and Guba region. It is possible to cover part of thermal energy needs in household and other areas by utilizing thermal waters in the mentioned areas.

Windmills- Azerbaijan is one of those countries where windmills could be perfect fit due to geographical location. In particular, the Absheron peninsula, coastline of Caspian Sea and islands in the northwestern part of Caspian Sea, the Ganja-Dashkesan zone in the west of Azerbaijan and the Sharur-Julfa area of the Nakhchivan Autonomous Republic are favorable areas. In 1999, Japan's Tomen Company, together with the Azerbaijan Scientific Research Institute of Power Engineering and Energy, installed two towers with 30 and 40 meters in Absheron, average annual wind speed was determined to be 7.9-8.1 m/sec and feasibility study about the installation of windmills with a total capacity of 30 MWt had been prepared in Qobustan region

2.2 Solar energy

Solar panel is also one of the most favorable sources in the world, and it is especially promising for sunny areas. The natural climate of Azerbaijan also provides extensive opportunities to increase the production of electricity and thermal energy by utilizing solar energy. Thus, the amount of sunny hours is 2400–3200 hours in Azerbaijan during the year, this means that the amount of solar rays falling on the territory of Azerbaijan is superior compared other countries that can be estimated as one of the efficiency criteria for attracting investments in the use of solar energy. The development of utilization of solar energy can partly solve energy problems in several regions of Azerbaijan.

2.3 Water energy

Water energy is energy derived from the power of water, most often its motion. Energy sources using water have been around for thousands of years in the form of water clocks and waterwheels. A more recent innovation has been hydroelectricity, or the electricity produced by the flow of water over dams. In the twenty-first century scientists are developing water-based applications ranging from tidal power to thermal power. From ecological point of view, water is the purest energy in the world. The production of electricity from this source is being increased since 1990. The specific weight of production power of hydroelectric power plants is currently 17.8 percent in the total energy system of the Republic. There are wide opportunities for mastering hydropower resources that have not been used so far in the country. As a result of the construction of hydroelectric power plants, floodwater is regulated, electricity is ecologically produced, and new irrigation systems are created. The rivers in the territory of Azerbaijan are favorable for small

hydropower stations. There was no connection between Nakhchivan Autonomous Republic's energy system and the main energy system of the Republic, that is why medium, small and micro hydroelectric power stations need to be set up in the Nakhchivan Autonomous Republic.

2.4 Geothermal energy

Geothermal energy is heat within the earth. The word geothermal comes from the Greek words geo (earth) and therme (heat). Geothermal energy is a renewable energy source because heat is continuously produced inside the earth. People use geothermal heat for bathing, to heat buildings, and to generate electricity. Geothermal heating, using water from hot springs, for example, has been used for bathing since Paleolithic times and for space heating since ancient Roman times. More recently geothermal power, the term used for generation of electricity from geothermal energy, has gained in importance. It is estimated that the earth's geothermal resources are theoretically more than adequate to supply humanity's energy needs, although only a very small fraction is currently being profitably exploited, often in areas near tectonic plate boundaries.

2.5 Wave energy

Wave energy is a form of renewable energy that can be harnessed from the motion of the waves. There are several methods of harnessing wave energy that involve placing electricity generators on the surface of the ocean. Wave energy is another form of renewable energy that can be used as an alternative to traditional energy from fossil fuels – finite resources that release harmful carbon emissions into the air when harnessed for energy. Similar to solar, wind, and geothermal energy, wave energy is a renewable source. As long as the Earth continues to track around the sun, and the moon around the Earth, waves will continue to be a viable source of kinetic energy. Wave energy also produces fewer carbon emissions than energy from traditional fossil fuels, such as coal or oil, making it a more eco-friendly option.

2.6 Hydrogen fuel energy

Hydrogen fuel cells produce electricity by combining hydrogen and oxygen atoms. The hydrogen reacts with oxygen across an electrochemical cell similar to that of a battery to produce electricity, water, and small amounts of heat. Many different types of fuel cells are available for a wide range of applications.

3. Conclusion

Reduction of natural resources of traditional resources, as well as types of fuels. The volatility and volatility of prices, the political nature of resources such as oil and gas and using it as a means of pressure to serve geological interests, this fuel. The important role of the use of natural resources in disturbing the ecological balance has increased the interest in renewable energy sources.

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Study of the working capacity of cutting stamping tools for various purposes and the study of the causes of their failure

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Abstract: In the article the real working capacity of tools is determined by their characteristic operating conditions, as well as by factors of various nature and numerous. These factors include the quality of construction and preparation, type and method of lubrication, cooling, stability of dimensions and properties of the processed product, correct selection of material for cutting tools and working elements of the stamp and its physical and mechanical characteristics, quality of thermal processing and other factors. It was found that the amount and distribution of stress in the working elements of cutting tools and stamps mostly depends on their structural characteristics and the value of specific pressure. Some of the punches, pushers and punches of cold and hot pressing tools or hot volume stamps are characterized by the simplest structures, with few places where stresses can accumulate. When studying the influence of mechanical properties of materials to be processed on strength of cutting and stamping, it was found that as the strength properties increase and plasticity properties decrease, the strength of the stamping increases and that of the cutting decreases. It was determined that to evaluate the cutting ability of different tool materials, sometimes another tolerance criteria, which under stabilized test conditions (equipment, work piece size, depth of cut, tool geometry, etc.) are used at a cutting speed that will provide a specified tool uptime, often one hour.

Keywords: Tool steel, Stamp steel, Cutting, Strength, Mechanical properties, Punch cutting, Matrix, solid alloy

1.Introduction

It was found that depending on the actual operating conditions, the service time of the tools varies within a very wide range and usually tends to decrease with an increase in some properties of the material being processed. This is also affected by the increase in temperature and processing strength, as well as the speed and degree of deformation. When performing drilling, drawing, grooving and reaming operations on hard-to-machine materials, tool endurance is characterized by hundreds and sometimes tens of products. During the production of multi-responsible parts, additional obstacles are placed on the endurance of the tools, as they are taken out of service after a certain time for re-polishing (sharpening) in order to prevent the reproduction of unnecessary structures (riveted) and roughness on the

2. Experimental details

As a result of the conducted research, it was determined that the tension field formed in properly constructed and precisely prepared punches is surface of the processed material. It`s also necessary to know

that the cleanliness of the surface being processed on automatic lines with a high re-tuning time and on machine tools controlled by numerical software, together with the accuracy of the size of the prepared part, is one of the main criteria characterizing the operational endurance of the tool. No less important indicator in this case is the coefficient of change in endurance, which is characterized by reliability, the correct selection of quick tool steel, its quality and properties, and the correct observance of the technology of making and operating the tool [1-16]. The aim of the research work was to study the quality indicators, working ability and also the investigation of the causes of failure of cutting and stamping tools of various purposes. Addition of various cutting tools with carbon-based materials helps to increase their strength [17-25].

characterized by its comparative homogeneity. But cold stamping tools with a simple design have such areas (tips, cutting edges, places where the working and seating surfaces meet, etc.) where the local stress is much higher than the value of the average specific

stress. Experiments show that during hot deformation, punching, molding the tolerance of punches and pushers is 5-20 thousand, and the tolerance of the stamps that make the magnetic plates of electric motors does not exceed 20-50 thousand units. In stamping operations where high-speed hammers and presses are used, the life expectancy is lower. The formation of a high temperature gradient in the cross section of the matrix and punches or other elements during the cutting tools and stamping process, the combined effect of variable heat and cyclic stress increases the plastic deformation in their microvolumes and accelerates the diffusion process. This allows the working elements of chisels and punches to reduce their strength properties due to heat and quickly fail. As a result of research, the endurance of heavily loaded cutter and punches is often close to the minimum limit. Thus, the profitability of cutting and pressure processing in the preparation of parts decreases. High endurance and workability enable cost-effective mechanization and automation of the cutting and stamping process, along with increasing productivity. Schematic distribution of the forces acting on the sheet in impact shearing is given in figure 1.

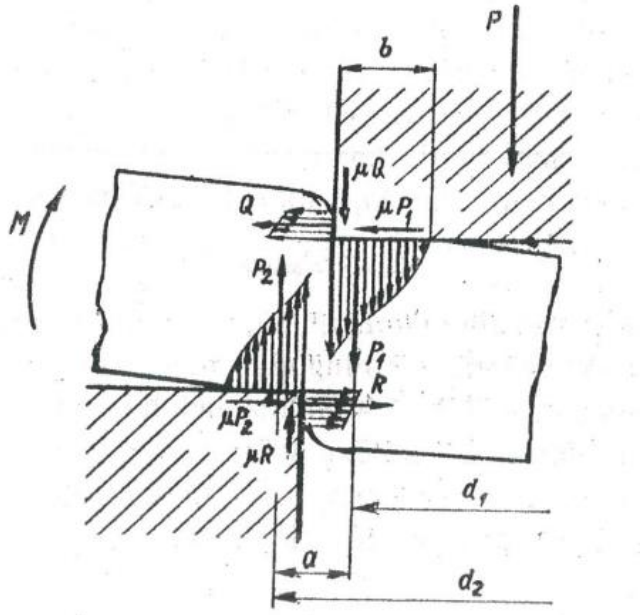

Figure 1. Schematic distribution of the forces acting on the metal layer in impact

Some technical events occurring between the cutting elements of the stamp and the processed layer determine the loading force on the punches and matrices, their wear and tolerance. During stamping, the punch is not pressed with the entire surface of the tip, but with circular cutting edges of width b. Such pressing also occurs from the matrix side. As it can be seen, impact forces of punch and matrix are not evenly distributed on the cutting edges. However, they can be replaced by equally effective special forces P1 and P2 per unit length of the circle formed by the diameters d1 and d2. In doing so, a pair of forces generated with the length a of the shearing and punching time shoulder produces a circular bending moment (M) in space. A relatively thin product folds and swells under the influence of bending moment. As a result of bending of the product, its metal exerts a pressure force on the outer surface of the punch (Q) and the cutting edges of the matrix (R). In addition to the force acting on the surface of the product, the cutting forces (μP1, μQ, μP2, μR) caused by the friction of the sheet with the cutting elements of the stamp also affect it. Because the force field generated in cutting and puncture operations is complex and heterogeneous, reports often use a conventional quantitative measure of shear resistance, which is calculated as:

$$\sigma_{sh.r}=\frac{P_{max}}{LS}$$

where, S- is the thickness of the sheet (mm) and L- is the length of the cut (mm)

In the process of stamping magnetic plates of electric machines, it is important to know the loading speed of 0.1-0.4 m/s and the nature of its change. Because during deformation and cutting, the stamp is exposed to cyclic shock loads. If we increase the stamping speed, the temperature at the cutting edges of the working tools increases, its amount and when the annealing temperature is exceeded, the cutting ability of the poisons and the matrix does not give good results due to the reduction of hardness in those areas. Sharper difficulties arise with cutting, cutting, milling, drilling, drawing and other operations on special steels and alloys. During the mechanical processing of hard-to-machine materials, in addition to continuously increasing the service life of tools, the cutting force should be 1.5-3 times higher and the rate of heat transfer in the cutting area should be much higher. This often results in a reduction of the cutting speed from 25-60 m/s to 3-15 m/s and a significant reduction in productivity. The dependence between other parameters of the cutting can be written in general, in the form of an empirical equation.

$$T=AV^{-B}t^{-C}b^{-D}$$

where, T- durability of the tool, t- yield, b- depth of cut, A, B, C, D- are constants that depend on known operating conditions. The cutting properties of tools made of different materials can be evaluated by means of a comparative fit. For example, temperature resistance.

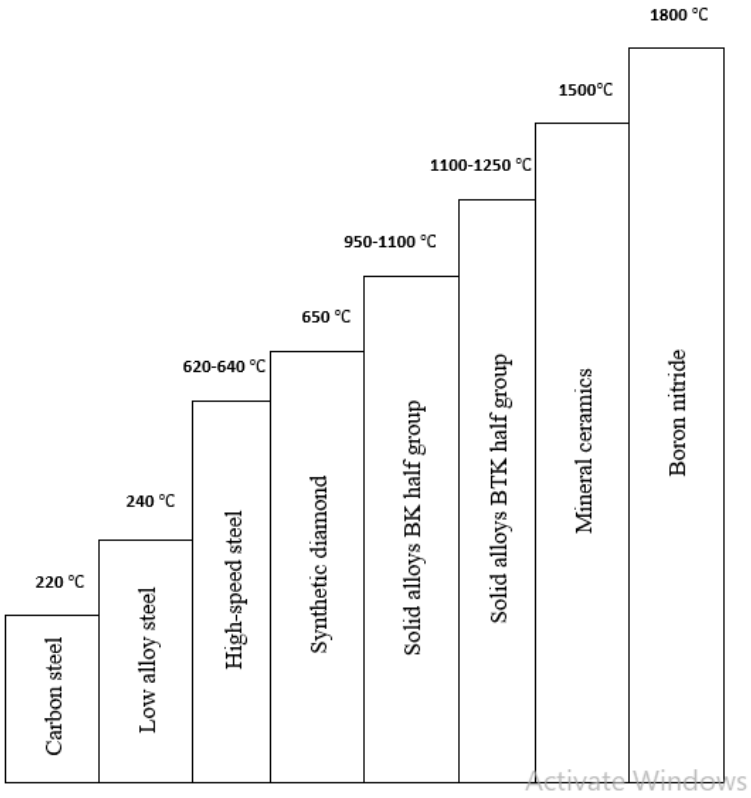

Table 1. Temperature resistance diagram of tool materials

However, temperature resistance has some compatibility with other physical and mechanical properties, which are hardness and strength. Temperature resistance increases with the increase of strength. However, there is no direct correlation. Thus, although the hardness of carbon and low-alloy tool steels is not inferior to the hardness of high-speed steels, their strength properties differ little.

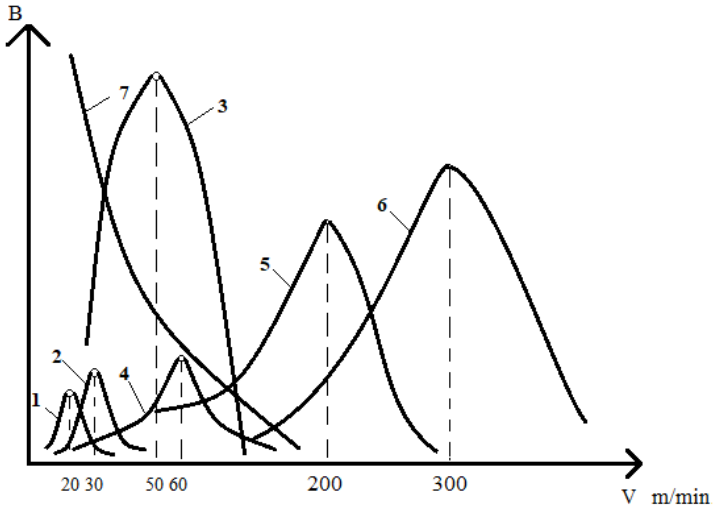

Figure 2. Dependence of tool materials corrosion resistance (B) on cutting speed (V). 1- carbon steel; 2-low alloyed steel; 3-high-speed steel; 4-solid alloy (BK); 5- solid alloy (BKT); 6- mineral ceramics; 7- solid alloy (BK) cast iron.

One of the bases of operational characteristics of tool materials, cutting properties are characterized by corrosion resistance, which reflects the aggregate state of many physical and mechanical properties. As can be seen in Figure 2, corrosion resistance of tool materials is determined by their natural chemical composition and cutting speed.

High-speed tool steels are divided into 3 groups according to corrosion resistance (figure 3). Group 1 includes steels containing 4-5% vanadium. They are more resistant to corrosion in the field of low cutting speed (V<30 meters/minute). Group 2 includes steels containing 18% tungsten. These steels are highly resistant to corrosion at a cutting speed of 30-60 meters/minute. Group 3 contains molybdenum cobalt and vanadium in addition to 6-9% tungsten. These steels have higher corrosion resistance in the area of cutting speed >60 meters/minute.

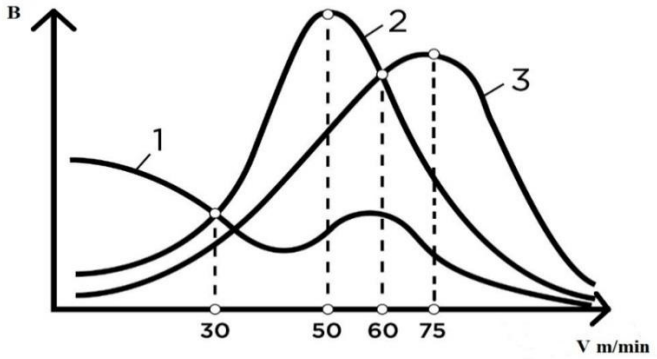

Figure 3. Comparative corrosion resistance of high-speed steels: 1- high-vanadium high-speed steel; 2- high-tungsten high-speed steel; 3- medium and low tungsten high speed steel.

When the BTK group closely examines the corrosion resistance of solid alloys, (figure 4) it`s clear that as the alloy content of titanium carbides increases, the maximum corrosion resistance moves towards higher cutting speeds.

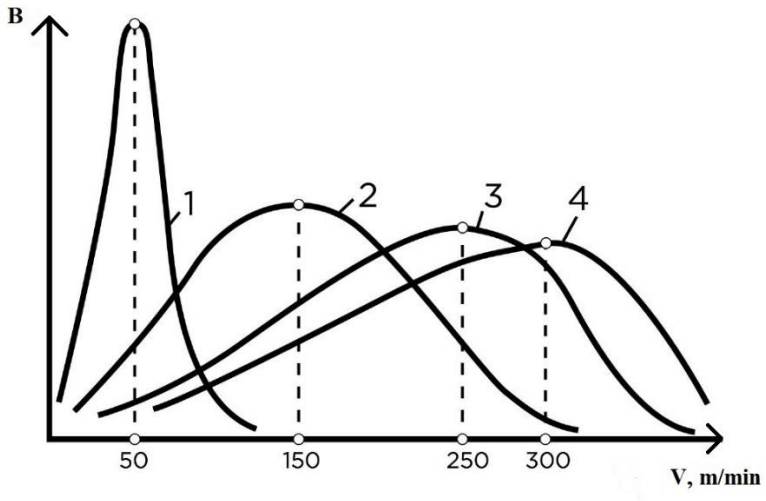

Figure 4. Comparative corrosion resistance of solid alloys (BTK): 1-high-speed steel; 2- solid alloy (T15K6); 3- solid alloy (T30K4); 4- solid alloy (T60K6).

However, increasing the amount of titanium carbides in the solid alloy from 15 to 60% allows for a 2-fold increase in the cutting speed corresponding to the maximum corrosion resistance.

3. Conclusion

The operability of heavy-duty stamps or tools used in various places, along with what we said above, also depends on a large number of technological and constructive factors that are difficult to calculate and cannot always be taken into account.

Observations show that the longevity and workability of stamps and cutters of various characteristics and constructions are mainly determined by the physical and mechanical properties of the materials from which their cutting or working elements are made after proper thermal treatment and polishing.

The most common causes of failed cutting and stamping tools are corrosion, brittle fracture, dimensional changes, and thermo mechanical fatigue crack initiation and development.

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Dissolution of reinforcing carbide and nitride phases in austenite

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Abstract: In this article, the structural transformations that occur in tool steels during heating and cooling are considered. Despite the fact that various types of materials are used in the industry, steel and cast iron make up 90% of the construction materials used in the world. Therefore, the study of the state diagram of copper-carbon system alloys has great theoretical and practical importance. The iron-carbon state diagram is used to study the properties, structure, and processes of iron-carbon alloys. should cover, that is, the components in this system should consist mainly of iron and carbon. Iron-carbon alloys contain phases such as ferrite, austenite, pearlite, ledeburite and graphite. In most cases, the purpose of heating steel in heat treatment is to obtain the austenite structure. The formation of austenite is a diffusion process, subject to the basic provisions of the theory of crystallization.

Keywords: Tool steels, Thermal treatment, Austenite, Endurance, Physical-mechanical properties, Microstructure, quality indicators.

1.Introduction

The operational nature of tool steels and the level of properties they acquire after heat treatment, first of all, depends very much on the initial structure. The structure and carbide (carbonitride) phases that are regenerated during heating and cooling in the tempering and tempering operations of finished tools are often obtained with different composition and properties, depending on the chemical composition of the material. The amount of carbides in steels is determined based on the percentage of carbon and alloying elements in their content and the type of carbides formed. In the case of high hardness, the amount of carbides in post-eutectoid steels is 5-12%, and in ledeburite steels is 25-30%, when vanadium and strong carbide-forming elements are involved, this amount increases to 32-35% in the latter. After annealing, steels usually contain more low-carbon carbides (M3C, M3C3, M23C6) and less carbon-rich carbides (MC). Regarding the effect on the structure and properties of steels, carbides are soluble and insoluble (extreme) in austenite. Eutectoid, secondary and tertiary carbides are among those dissolved in austenite. As a solution, they saturate the austenite with carbon and alloying elements, as a result, the steel's we arability, we arability depth increases, and conditions for dispersed strengthening during tempering are created. In austenite, the size of insoluble extreme carbides is much larger. They do not affect the composition of the solid solution as they are insoluble at the normal boiling temperature. Therefore, such carbides increase the resistance of most steel to corrosion and plastic flow under high stress. The purpose of the work was to study the structural phases that determine the main properties of steels, the mechanical properties of phases, the thermo-physical and thermodynamic properties of carbides and nitrides, and the diffusion study of carbides and nitrides [1-22].

2. Experimental details

The kinetics of the dissolution processes of reinforcing inclusion phases in steels can be determined to a high degree by the diffusion processes taking place in them. It is clear that the self-diffusion coefficient of metallic and non-metallic atoms has very low values in many inclusion phases, at temperatures typically used for heat treatment of steel. This is even lower than in iron-based solid solutions. Thus, the effect of diffusion processes in the entry phases can be ignored due to their very low speed. In the works of many authors, the level of T/Ter diffusion movement of components with different carbides at the same relative temperatures was compared. The results of diffusion of carbon in

niobium and tantalum, the coefficient of self-diffusion in group IV-V transition metals - niobium and tungsten carbides are given. The diffusion motions of carbon and metal atoms in different carbides are close to each other at the same relative temperatures.

Dissolution of carbides and nitrides in austenite during heat treatment affects many properties of steel: stability of supercooled austenite, tempering depth and tempering ability, as well as reduction of tempering strength, hardening, etc. determines. The dissolution reaction of carbide or nitride in austenite can be given as follows.

$$MX \rightarrow M+X \quad (1)$$

Here, M and X are metal (M) and non-metal (X) soluble in austenite. It is assumed that the reaction (1.1) consists of the following parts. Carbide (nitride) dissociation

$$MX \rightarrow M+X \quad (2)$$

Transition of metal atoms in austenite

$$M \rightarrow m \quad (3)$$

Transition of non-metal atoms to austenite

$$X \rightarrow x \quad (4)$$

In the solution reaction (1.1), the total change of Gibbs energy (XG), the individual parts of that reaction (1.2), (1.3), (1.4). The change of Gibbs energies is equal to the sum and can be written as follows:

$$\Delta G = RT\dot{I}n(y_M\, x_M) + RT\dot{I}n(y_x\, x_x) + \Delta G_{MX} \quad (5)$$

Here, ΔG_{MX}- MX is the standard free energy of MX compound formation; y- is the activity coefficient of components in austenite; Xi is the mole fraction of the concentration of components, R is the gas constant, and T is the absolute temperature.

For all elements, the solubility of carbides is greater than that of nitrides. Titanium nitride is practically insoluble in austenite at any temperature. Nibium and aluminum nitrides are also difficult to dissolve in austenite. Vanadium carbide and carbonitride are highly soluble even at freezing temperatures. It should be said that chromium carbide and nitride can transition to austenite at lower temperatures than vanadium carbide and nitride. Carbon has a greater influence on the dissolution of carbides in austenite. As the amount of carbon increases, the temperature of dissolution of carbides in austenite increases.

Increasing the temperature and holding time in the austenite zone leads to the growth of austenite grains. The driving force behind austenite aggregate recrystallization is said to be the system's ability to lower the surface energy by reducing grain boundaries. In most steels, austenite grain size is necessary because the finer the grains, the greater the steel's strength, brittle fracture resistance, and many other properties. the higher it is taken.

Carbide and nitride-forming elements (Cr, Mo, W, V, Nb, Ti, Zr, etc.) weaken or stop the growth of austenite grains during the heating process, the stronger the element, the more stable phase it forms. Dissolution and coagulation of dispersed phases in austenite removes or eliminates the effectiveness of particle shielding. The maximum austenite grain size d depends on the size of the particles and their amount:

$$d=4/3\ (r/f) \quad (6)$$

where, r- radius of particles; and f- is their volume share.

The more the volume fraction of insoluble particles in steel is retained during heating and the smaller their size, the smaller austenite is obtained. To obtain fine-grained steel, it must be effectively alloyed with two or more carbide- and nitride-forming elements. Carbon, nitrogen, and aluminum remaining in austenite cause its grains to grow. Also, boron, manganese and silicon increase the tendency of grains to grow. During tempering, normalizing and tempering, the breakdown of supercooled austenite occurs and three types of transformations are possible: pearlite, bainite, which is an intermediate transformation, and martensite. Alloying elements have a significant effect on the kinetics and mechanism of these transformations.

As is known, the resistance to cracking of supercooled austenite is characterized by the isothermal transformation diagram of austenite.

The stability of austenite is characterized by the initial and final curves of the transformation in a C-like diagram. In pre-eutectoid and post-eutectoid steels, pearlite transformation is preceded by separation lines of extreme phases (ferrite and cementite, respectively).

Non-carbide elements (Ni, Al, Si, Cu, etc.) largely do not change the appearance of the C-like diagram. Carbide-forming elements (Cr, Mo, W, V etc.) fundamentally change the appearance of the diagram and the transformation kinetics.

Pic.1.4 shows the effect of non-carbide-forming nickel and carbide-forming chromium elements on the character of the isothermal transformation diagram. The separation of pearlite and intermediate transformation in the decomposition diagram is characteristic of alloy steels containing several alloying elements. The presence of carbide-forming elements in steel makes the property more obvious.

All alloying elements in the pearlite field. (except Co), if they change to austenite during heating, the stability of supercooled austenite increases. For the first time in the research, the effect of molybdenum and vanadium on the state of the isothermal transformation diagram of IIIX15CT steel, or rather on the stability of austenite, was studied. Comparing the C-similarity diagrams of the investigated IIIX15Cг, шIX15Cг (0.20-0.40% V) and IIIX15CFM (0.250-0.50% Mo) steels, it is clear that during austenitization, since molybdenum is more soluble than vanadium in the solid solution, the incubation period of IIIX15CFM steel, rather, the durability of austenite increases compared to other steels. Here, the increase in the stability of austenite can be explained by the fact that molybdenum and vanadium reduce the chemical heterogeneity of these types of steels. As it is known, molybdenum and manganese increase the incubation period more efficiently, and chromium and nickel a little less. Cobalt reduces it.

3. Conclusion

Depending on the degree of dissolution of carbides and nitrides in austenite during heat treatment, the mechanism of dispersed strengthening in steels is determined. The positive effect of weaker carbide-forming elements (Mn, Cr, Mo, etc.) on the process of dissolution of stable MC carbides in austenite and the depth of tabulation was studied.

It has been established that as the tempering temperature of tool steels increases, the amount of chromium in the solid solution increases, carbides decrease, and the hardness decreases sharply with a certain increase in residual austenite. It was determined that as the amount of chromium and other alloying elements in tool steels increases in the solid solution, the resistance to splitting of martensite and the value of the second strength increases during tempering.

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Development of top level management system in oil refining institutions

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Abstract: Oil refining is a set of physical and chemical processes of oil refining to obtain the quality of oil distillation products: gasoline, kerosene, diesel fuel and fuel oil that meet the requirements of the consumer's technical conditions. The formation of an organized oil products market in Azerbaijan is becoming one of the priority economic tasks today. Azerbaijan is one of the largest fuel exporters and at the same time a significant consumer of it. One of the main factors determining the characteristics of the offer is the presence of close technological connections in the production of oil products. The system of all enterprises of the Azerbaijan oil complex is based on the principle of "extraction - processing - marketing". Such construction is explained by the peculiarity of production in the industry - the continuity of the process of extraction, processing and consumption of oil. Stopping the processing is possible only in some special cases and according to the technical conditions, considerable time should be prepared. A failure in any link of the technological chain of oil production and processing immediately affects its condition as a whole. The goals of automation of oil refineries are to ensure operational control of all processes from a central control room, to exclude inertia and wrong actions of personnel, to detect equipment malfunctions in time, as well as to collect and analyze data for the purpose. optimization of the entire management system.

Keywords: Oil refinery, Automation, Management, Refining process.

1.Introduction

Various technological processes of oil refining take place in specially designed technological facilities. The final petroleum products are usually furnaces, reactors, distillation columns, heat exchangers, etc. It is purchased in a complex of such technological devices, which includes various units connected to each other. Such a complex of oil refining production is called a technological block. Thus, oil refining is a set of physical and physico-chemical processes carried out in the technological units of oil refineries (NEZ), including the processing of oil and oil products, the processes of preparing crude oil for primary and deep processing. A classic automation facility in the oil refining industry is a refinery characterized by: Increasing requirements for the management of technological processes, production and enterprises in general. High requirements for automation in the facilities of the oil refining complex (NPK) are primarily related to the danger of fire and explosion of production, the irreversibility of situations that arise in the event of violation of technological regimes;

A large number of individual technological devices (separation, oil processing, line heaters, pumping devices); Difficult conditions for placing the equipment (dust and other pollution). The main requirements for automated process control systems in the oil refining industry are the use of advanced remote peripheral systems and controllers with high-speed exchange capabilities with local control stations for process and drive equipment. There is no shortage of such systems on the market today. PLC, PTC tools and Siemens, GE Fanuc, Honeywell, ABB, etc. offered in Azerbaijan. information systems of foreign producers such as enable to ensure high level of automation and informatization of technological processes, industries and enterprises [1].

The use of high-level communication networks with industrial communication protocols allows simultaneous control of remote peripherals of many devices and provides flexibility and ease of construction, integration and modernization of process control systems. Not all communication protocols (and interfaces) provide the necessary data exchange speed. Equally important is ensuring that

the equipment is suitable for harsh working conditions. Control cabinets and automated workstations are placed in separate rooms with forced ventilation, thereby preventing a decrease in the service life of the components of the automated control system [2].

2.Experimental details

Automation conditions. Oil refineries are technologically complex and explosive devices. The development of a modern automation complex was required to properly control the technological process and prevent emergency situations [4].

Description of the technological processes of the oil refinery: Oil received from the main pipeline enters the primary processing unit (Fig. 1) to be cleaned of water, salts, and sand [3]

Figure 1. Primary processing unit for cleaning oil from water, salts, and sand

The first stage of processing is to heat the oil to about 120-130 degrees Celsius, which facilitates the process of dehydrating it. After that, the process of drying and drying the oil begins [3]. It occurs in electric dehydrators (Figure 2). Water and salts are removed from crude oil, and sand and mechanical impurities settle in them.

Figure 2. Electric dehydrators

In addition, the oil is reheated and the fractions are separated in the atmosphere-vacuum unit. Gas is separated at about 20 degrees Celsius, light gasoline fraction (light naphtha) - 28-70 degrees, heavier gasoline fraction - 70-150, kerosene - 150-250, diesel - 250-360 degrees. The remaining raw material is straight fuel oil [4].

The gasoline fraction is sent to isomerization (Fig. 3) and reforming sections where the properties of this raw material are improved. For example, the octane number, which indicates the ignition resistance of gasoline. Low octane fuel can detonate in the engine cylinder under high compression [5].

Figure 3. Gasoline fraction isomerization unit

Diesel and kerosene fractions are hydrotreated to produce diesel fuel and jet fuel. Fuel oil processing requires a vacuum to lower the boiling point. Therefore, straight-flowing fuel oil is sent to a vacuum column (Fig. 4), from which vacuum gas oil and resin are obtained, which are used for obtaining bitumen and marine fuel oil [6].

Then the vacuum gas oil is sent to the catalytic cracking unit (Fig. 5) - high temperature oil processing. A large amount of high-octane gasoline, diesel, and hydrocarbon gases are produced in the cracking process [2].

Figure 5. catalytic cracking unit

The gas received as a result of the primary processing of oil is sent to the gas fractionation unit. Light components necessary for gasoline are made from it, as well as salable sulfur, butane, propane and isobutane. All of the above is the production of components for gasoline production. They finally fall into the white tanks - the mixing park (Fig. 6). Gasoline consists of an average of 10 components. They are mixed according to the recipe and buy Euro-5 class fuel [3].

Figure 6. to white tanks - mixing park

Gasoline is prepared in two ways: sequential dosing in the tank (Fig. 7) or simultaneous dosing and mixing of components in the pipeline (Fig. 8) [5]

Figure 7. sequential dosing in a tank

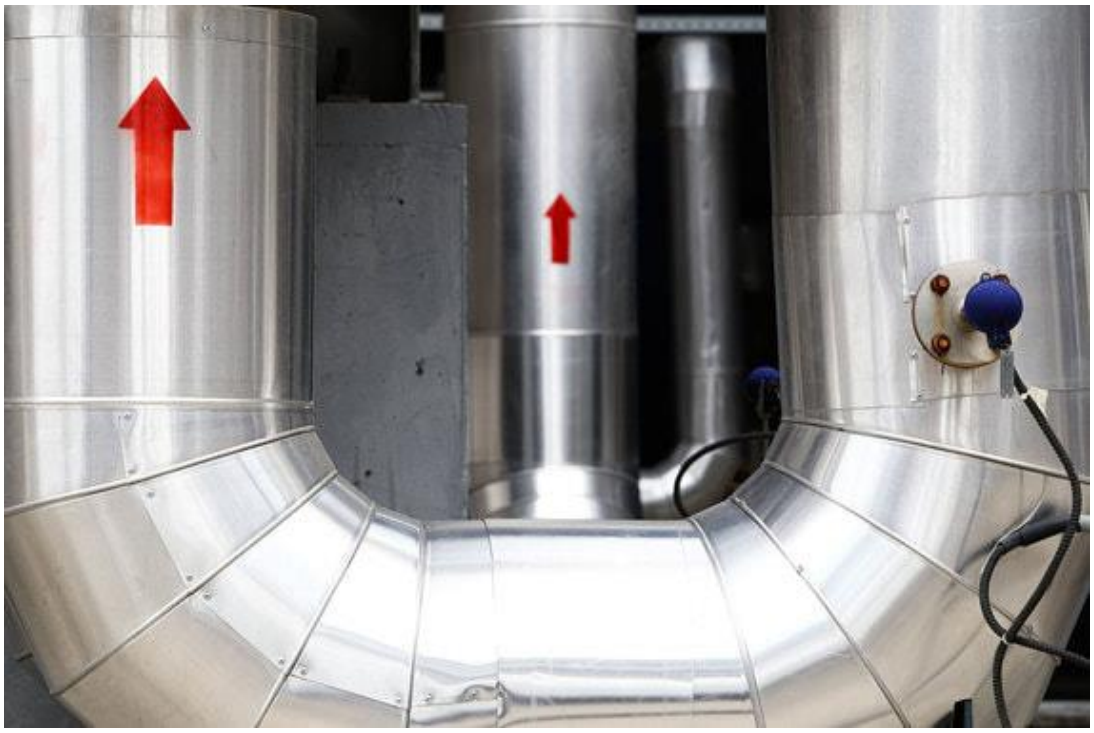

Figure 8. simultaneous dosing and mixing of components in the pipeline

Additives are added to the fuel in the blending park, which extend the life of the engine. For example, components against smoke and soot are added to gasoline, and additives that lower its pouring point are added to diesel fuel. The quality of the purchased fuel is constantly checked in the laboratory according to the content of chloride salts, the amount of water, sulfur and density. Devices where the quality of gasoline is checked are called gravel by plant workers for the appropriate sound. They are basically internal combustion engines. They check the octane number of gasoline and compliance of fuel with GOST [4].

Description of the automated control system of the oil refinery:

The automated management system of the technological process of the oil refinery is a software-technical complex that solves the tasks of monitoring and controlling the technological process and equipment at the following hierarchical levels:

1. Primary means of automation (sensors, transducers, local control devices, actuators) [5]:
• transformation of technological parameters into information signals;
• transformation of control signals into control actions.
2. Equipment equipped with local automation systems (reagent dosing units, line heaters, gas and electricity measuring units, etc.);
3. Distributed control systems (DCS):
• collection and preliminary processing of information;
• automatic control, control of program logic, implementation of protection algorithms.
4. Emergency protection (ESD):
• collection and preliminary processing of information;
• implementation of software logic blocking algorithms.
5. Upper level (visualization, archiving, processing, reporting, etc.)

The upper level of the automated process control system is conventionally divided into the following components [6]:

1. Operator's multifunctional workstation:
• real-time data collection from the management facility;
• integration of all components of the system into a single information and management system;
• implementation of human-machine interface functions;
• technological process monitoring;
• operational process control.
2. Database server:
• long-term storage of operative data;
• providing access to archival data through standard database tools.
3. Workplace of the device engineer:
• Communication with primary intelligent automation tools through the HART protocol;
• monitoring of the state of primary intellectual means of automation;
• maintenance management of primary intelligent automation tools.
4. Engineering station:
• real-time data collection from the management facility;
• integration of all components of the system into a single information and management system;
• implementation of human-machine interface functions;
• technological process monitoring;
• Change in APCS design.

3. Conclusion

The solutions used at PS Rybnaya-1 for the construction of the automation system were printed and subsequently implemented in a number of facilities and still work correctly without losing relevance and reliability. Modernization and expansion of the system (adding a new section), replacing the software package with SCADA Infinity, which passed without any problems for a system operating in 2004, can confirm the correctness of the choice of technical solutions.

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Galvanomagnetic current-frequency converter

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Abstract: On the basis of experimental examples of a digital magneto sensitive integrated circuit, a current frequency converter whose sensitive element is a two-collector magneto-transistor has been synthesized. Experimental studies were conducted on the conversion characteristics as well as the factors affecting it. Various versions have been developed for the temperature stabilization of the converter.

Keywords: Galvanomagnetic sensor of magnetic field, Magneto sensitive integrated circuit, Current-frequency converter.

1.Introduction

In the disciplines of electrical engineering, device manufacturing, intelligent sensor systems, robotics, automation, and instrument engineering, current frequency converters are employed as very sensitive sensor devices. A device for detecting energies based on a Hall element and a magnetically sensitive integrated sensor with a frequency output convert electromagnetic induction into a frequencies signal, and the output signals is modulated by a multivibrator. Galvanomagnetic individual components are used in the construction of these conversions. The most recent and intriguing magnetic sensors are those that use magnetically sensitive integrated circuits. They contain multi-sensor characteristics as well as a magnetic sensitive element and an electronic circuit for signal processing that are combined into a single technological circuit. This paper describes a work digitized magneto sensitive integral circuit-based galvanomagnetic current-frequency conversion [1-19].

2. Experimental details

The schematic electrical circuit of the converter implemented by the electronic switch of the bipolar transistor connected to the common emitter circuit is presented in Figure 1.

When the supply voltage of the integrated circuit activates its output in the logic "1" state, and the threshold voltage of the bipolar transistor enters the saturation mode. A current I starts flowing through the electromagnetic coil W. When the magnetic induction in the magnetic circuit $B=B_{ON}$ reaches the magnetic induction of the start-up, the output of the magnetically sensitive integrated circuit goes to the logic "0" state. Transient is off. The current and magnetic induction decrease accordingly, and when $B=B_{OFF}$, the output of the magnetically sensitive integrated circuit goes back to logic "1" and the processes repeat. For the stable operation of the generator circuit, the saturated operating mode of the transistor switch must be ensured. Square pulses are generated at the output of the integrated circuit, having a certain pulse-repetition rate, which depends on the magnitude of the current I and the number of windings W, i.e. f=j(I,W). The transistor switch acts as positive feedback in the square pulse generator.

Experimental studies were conducted to determine the effect of I and W on the converter frequency f, the electromagnetic system used for this purpose has the following parameters: $S=1600mm^2$. These parameters were chosen for design reasons and they guarantee a linear and uniform magnetic field. The range of the conversion characteristic is determined by the condition that the transistor switch is saturated and the induction in the magnetic circuit is greater than the magnetic induction of the BON of the magnetically sensitive integrated circuit.

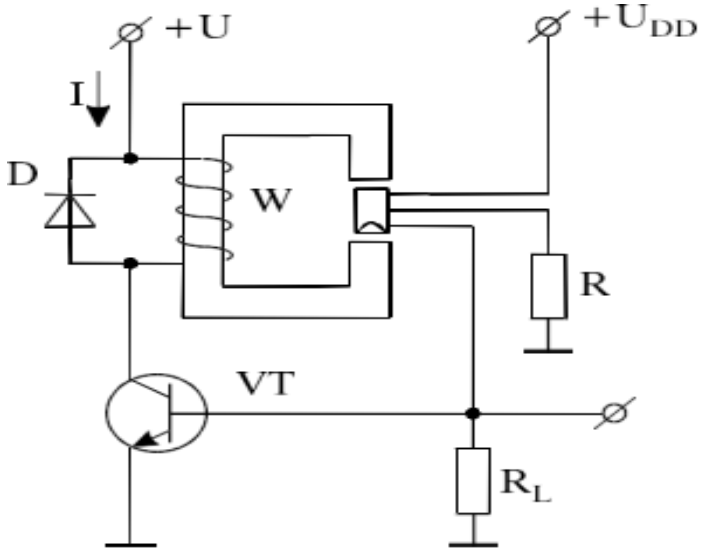

Figure 1. Schematic electrical circuit of the current-frequency converter

Figure 2 presents experimentally taken conversion characteristics when W=const.

In order to determine the analytical form of the dependence, the least squares method of $f=c.I^n$ of the frequency f was applied to the magnitude of the current I, which turns when W=const.

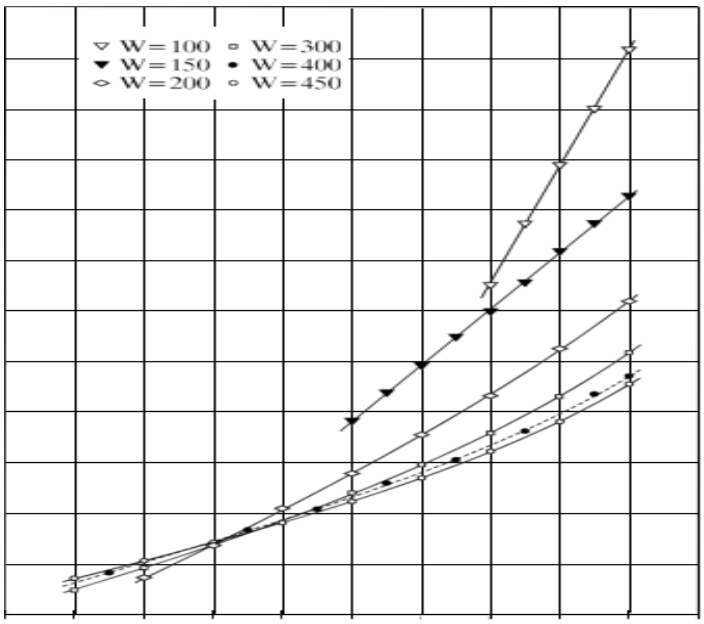

Figure 2. Conversion characteristic W=const.

Form of received theoretical-experimental models:

If the number of windings is W=200, $f = 0.5389. I^{2,016}$

If the number of windings is W=450, $f = 0.6018. I^{1,3899}$

The obtained graph and the analysis of empirical dependencies show that when W=const, the frequency f is a function of the flowing current, an increase in the current leads to an increase in the frequency. The nature of this change in f in

accordance with the change in current corresponds to the principle of operation of the converter. When the number of windings is large, the conversion characteristics become non-linear. As the number of windings decreases, the starting current of the converter increases and the conversion characteristics become linear. With a larger current, the magnetization is carried out along a curve with a steeper slope, as a result of which the output-pulse repetition time decreases and the output frequency f increases. Therefore, the steepness of the transformation characteristic depends on the number of windings in the electromagnet. In this particular converter, the optimal steepness in terms of sensitivity parameter is observed when W=100. Based on the experimentally taken characteristics (Figure 2), the following parameters were determined for the current-frequency converter discussed here: measurement range-(1. 2) A; differential sensitivity S=3790 Hz/A; relative sensitivity S_{00}=2.37.

When the number of windings is larger (W > 150), the conversion characteristics are non-linear. To implement the measurement converter, it is necessary to linearize the function f= (I,W) or choose a characteristic range that is sufficiently linear. With windings W=200, the coating characteristic is linear in the measuring range (0. 2.1)A. The following parameters are determined for this case: differential sensitivity S=1446 Hz/A; relative sensitivity S_{00}=1.7965.

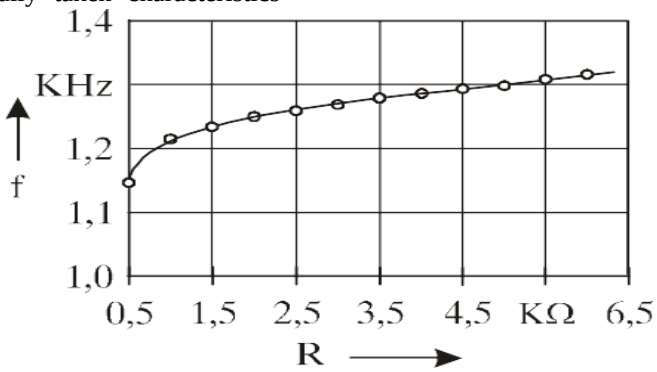

Figure 3. Effect of resistance on frequency

In order to achieve a complex and convincing assessment of the performance of the current-frequency converter, it is necessary to investigate not only the effect of the number of windings W and the current I, but also the effect of the voltage U_{DD} and the resistance R.

Experimental dependences obtained from f= ϕ(R) when UDD=12V and from f=ϕ(U_{DD}) when I=1.5A, W=250, R=4.7k and R_L=10 respectively Figure 3 and presented in 4.

When R increases, the frequency of f also increases, with smaller values of R=(0.5-2.5)k the rate of change of f becomes larger. As the supply voltage increases, the frequency f decreases.

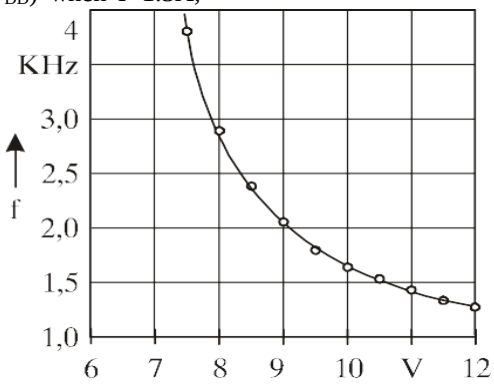

Figure 4. Effect of U_{DD} voltage on frequency

Temperature studies of the current frequency converter were also carried out. The experimentally obtained f=T) characteristic is shown in Figure 5 (curve 1). An increase in temperature from 25 to C causes a 9% decrease in frequency. Therefore, temperature stabilization should be done for the converter under discussion. The nature of the frequency variation f according to resistance and supply voltage f R) (Fig. 3) and f (UDD) (Fig. 4) shows that these dependencies can be used for temperature stabilization.

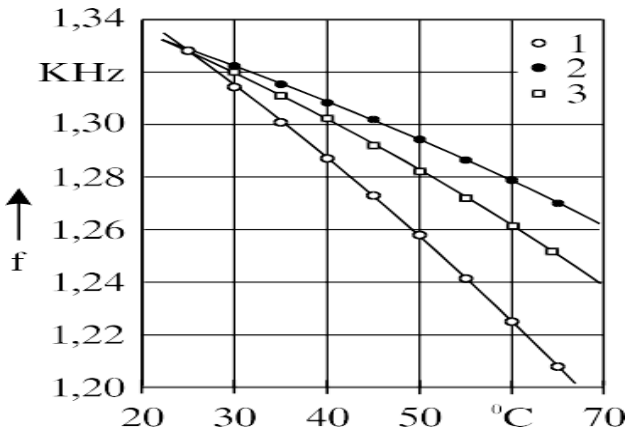

Figure 5. Effect of temperature on frequency

Two circuits were implemented for the temperature stabilization of the converter: a posistor R=300 connected in series with the resistance R and a posistor connected in series with the supply circuit.

The experimental characteristics f=(T) corresponding to both circuits for temperature stabilization are shown in Figure 5 (curve 2 - for a circuit with a posistor connected in series to the resistance R ; curve 3 - for a posistor connected in series to the supply circuit) Better stabilization of temperature, studied When the temperature rises in the range of (25C, the frequency f of the converter is obtained by applying a circuit with a posistor connected in series with a variable resistance R within 5%.

The obtained experimental results show that the desired temperature stability can be achieved by following the proposed approaches and with a properly selected posistor.

3. Conclusion

A galvanomagnetic current-frequency (voltage-frequency) converter was developed based on a digital magneto sensitive integrated circuit with a simple circuit solution. The output frequency is constant provided the transistor switch operates in the saturated mode. With the selected design version of the magnetic system, the conversion characteristic can vary within certain limits by changing the values of the resistor resistance R and the supply voltage UDD.

The practical possibility of temperature stabilization of the conversion characteristic was experimentally proven by means of a thermo-dependent element - a posistor. The stable operation mode of the converter can also be ensured by a thermostat.

The current-to-frequency converter discussed here can also be used to implement converters with linear displacement and current measurement frequency output.

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Study and study of climate variability in the nature of Karabakh

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Abstract: Climate change is one of the global problems that worries the world. Climate changes and their impact on the living world are increasingly worrying the world community. Unstable weather conditions are felt not only in Azerbaijan but also in several countries of the world and create problems. Increasing attention to these problems is manifested in the holding of a number of international events, including scientific and practical conferences. According to the latest assessment report of the Intergovernmental Panel on Climate Change, the average temperature on Earth has increased by 0.8 degrees in the last 100 years. The increase in temperature is mainly due to anthropogenic factors.

Keywords: Geographical location, The climate of Karabakh, Mountain-valley winds, Prohibition and reserves, Ground cover, Vegetation.

1.Introduction

Located in the southeastern part of the Lesser Caucasus, this region includes Jabrayil, Fuzuli, Khojavand, Aghdam, Khojaly, Tartar, Shusha, and Khankendi territories. The terrain is mainly mountainous. The northern part of the Upper Karabakh economic-geographic region is divided by the northeastern foothills of the Karabakh range and the southern slopes of the Murovdag range (the highest peak of the Lesser Caucasus, Mount Gamish (3724 m)), the central, western and southern parts are the eastern slopes of the Karabakh range (Mount Gizgala (2843 m) , Mount Kirkhgiz (2827 m), Mount Big Kirs (2725 m)), the northeastern and eastern parts are occupied by the western edges of the Karabakh and Mil plains. It borders the Islamic Republic of Iran in the south and southeast. The Murovdag and Karabakh ridges are divided into several side branches descending towards the Karabakh and Mil plains. As a result of the division of the ridge and its side branches by rivers, deep and steep valleys have been formed. In the middle highlands, there are valley depressions in the areas where river valleys widen. Forests in the area are 187.7 thousand ha. The terrain of Aghdam area is mostly plain and partly mountainous. The maximum height of the area reaches 1365 m. Jabrayil district is mainly located in the sloping plain (Incehol, Gayan desert). The climate of Jabrayil region is mild-hot semi-desert and dry desert climate with dry summer in the southern part, and mild hot with dry summer in the northern part. Mountain chestnut, chestnut and brown mountain-forest soils are common. The relief of Fuzuli region consists of a sloping plain descending towards the Araz river in many places, low mountains in the west, gray and grass-gray, chestnut and light chestnut, mountain chestnut, and mountain gray-brown soils. Located in the western part of the Kura-Araz lowland, the surface of the Tartar region is a plain, inclined from west to east, and the climate is a warm semi-desert and dry steppe climate with dry winters. Here, mainly chestnuts, Murovdag, Karabakh, Aghdam anticlinorium's and the Toraghay chay and Khojavend synclinoriums, which separate them from each other, occupy the main place in the geological structure of the secondary tectonic elements of the Lesser Caucasus. The arch of the anticlinoriums is composed of Middle Jurassic volcanic rocks, and the far wings of the arch and the synclinal structures that make them complex are composed of Upper Jurassic limestone, The average temperature in January is 2-0 in the plains and foothills. to 5 ^{0} C, -4 in the highlands; Between -13 ^{0} C, in July it is 25-26 ^{0} and 15-14 ^{0} C, respectively . In the highlands, the annual precipitation exceeds 800-900 mm. The high peaks of the Murovdag range are

sometimes covered with snow throughout the year. Its main rivers are Kura, its tributaries - Tarter, Khachin, Gargar and Araz, its tributaries Kondalanchay, Guruchay, Gozluchay and other rivers.At the same time, 4 species of mammals, 8 species of birds, 1 species of fish, 3 species of amphibians and reptiles, 8 species of insects, and 27 species of plants included in the "Red Book of the Republic of Azerbaijan" were protected in these areas.

2. Experimental details

2.1 Ground cover

Chestnut, light chestnut, mountain-dark chestnut, brown mountain-forest, brown mountain-forest, blackish mountain-meadow, etc. lands are widely distributed. The soils of the territory of Aghdam region are mainly chestnut, light chestnut and brown mountain-forest soils.

2.2 Vegetation

More than 2,000 plant species are found in the richly vegetated area. Wormwood, wormwood-salty semi-desert in the plains, stony, sibiya, wormwood-combed steppe and semi-steppe plants in the foothills, thickets, broad-leaved forests (beech, oak, etc.) occupy a large area on the mountain slopes. There are subalpine and alpine meadows at an altitude of 2000-2300 m above sea level.The amount of sunlight during the year is 2000-2400 hours. In terms of the average temperature of the coldest month, the severity of winter is very mild (2.5-0 ^{0} C) and mild (0; -5 ^{0} C) for the area. Possible evaporation in hot periods (April - October) is in the range of 400-800 mm. In June-September, the number of dry days is 5-25 days or less. The average annual wind speed is 2-3 m/s and less. Climate continentality is characterized in the range of weak (less than 130), moderate (with a coefficient of up to 165) and moderate (with a coefficient of up to 205) continentality. The duration of the frost-free period during the year is 150-225 days, the air temperature is 0 ^{0} C -and the number of days below is in the range of 10-100 days in Jabrayil, Fuzuli, Khojavand, Aghdam and Tartar, 20-50 in Khojaly and Khankendi, and 50-100 days in Shusha. The number of days with snow cover during the year is 10-120 days in most regions of the territory. Karabakh horses are considered the oldest horse breed in Asia and the Caucasus. Researchers believe that Karabakh horses are descendants of Manna, Midian, Atropatena, and Albanian horses. The height of the withers of Karabakh horses is 148.5 cm, the girth is 165.8 sm, and the girth of the withers is 18.3 sm. They are mostly golden and brown horses. Since 1946, breeding work with the breed has been carried out at the Agdam horse breeding plant. Karabakh horses have been used by Roman, Sasanian, Arab, Seljuk, Mongolian, Iranian, etc. for centuries. Although it underwent certain changes as a result of interaction with horses, it was able to keep its original roots. In the 18th-19th centuries, the breed of Karabakh horses was significantly improved. Karabakh horses have had a great impact on equestrianism in Turkey, Iran, Georgia, the North Caucasus, Russia, Kazakhstan, as well as in Western Europe. It is also said in the "Book of Horses" that modern Don horses owe their golden color primarily to Karabakh horses. Karabakh horses have taken pride of place in a number of international exhibitions and competitions, won awards and medals. Karabakh horses "Meymun", "Toxmax", "Aghalar", "Bayram", "Zaman", "Karagozlu", "Caucasian beauty" and others were represented in competitions. participated under the names and won many times.Currently, Karabakh horses occupy a special place among the famous horse breeds such as "Arab", "Don", "Budyonni". The usual gait of the Karabakh horse is more than 8 kilometers per hour. Beshitchay State Reserve. Basitchay State Reserve was established in Zangilan district by the decision of the government of Azerbaijan dated July 4, 1974. The reserve is located in the southwest of Azerbaijan, in the valley of Basitchay. The reserve was organized in order to protect the landscape complex of the area, especially the rare natural sycamore forest. Its area is currently 107 ha. The length of the reserve territory reaches 15 km, and the width reaches 150-200 m in some places. The reserve is surrounded by the territory of the forest fund of Armenia. 79.4% of the area is covered with forest and 14% is sparsely forested. Areas without forests are 6.5%. The forested area is mostly mountainous, reaching 600-800 m above sea level. The climatic conditions of the area are very favorable for the

natural regeneration and development of the sycamore forest. Here, the annual total of sunny hours is up to 2200-2500. The average annual air temperature is 13 degrees, The amount of annual precipitation is 600 mm. The snow cover reaches 10-30 sm, in some years it reaches 70-80 sm. The relative humidity of the air is 60-70%. The length of Beshitchay is 44 km, the area of its basin is 354 km^2. It starts from Zangezur ridge (2600 m) and flows into Araza. 100 hectares of Beshitchay state reserve are occupied by sycamore forests. There are also mixed plantations. Here you can find Greek walnut, mountain ash, mulberry, willow, poplar, hawthorn, dogwood, blackthorn, etc. bushes are developing. The average age of the sycamore trees in the reserve is 165 years, the average height is 35 m, the average diameter is 1 m, there are examples of them that are 1200-1500 years old, 50 m in height, and 4 m in diameter. The wood stock of the forest is 190 m^3 in each nectar and 16200 m^3 in the total area. The annual growth of the forest reaches 1.22 m^3 per 1 ha. There are different opinions about the formation of sycamore forests. Some researchers see them as remnants of ancient cultivated forests. (according to A.A. Grossheim), and some consider it to be a remnant of the natural sycamore groves that were widespread in the river valleys of southwestern Transcaucasia. (L.Y. Prilinko, Y.S. In the Basitchay forest, sycamores grow by seeds and cuttings. 80% of the sycamores here were formed by cuttings and 20% by seeds. One of the biggest trees in the reserve is 1200 years old, 53 m high, and 4 m in diameter. 185 fruits were formed from its stem. These trees, in turn, look like huge trees, the adults are 100-150 years old and up to 40 m tall. Our people have always appreciated sycamore trees and considered it the proud "king" tree of the plant world.Just as the powder tree is a tree that has a symbolic meaning for the flora of the Russian people and the birch of the Lebanese people, the Azerbaijanis have historically chosen the sycamore as a symbol for our flora and have shown special sympathy for it. We have full reason for this. After all, the plane tree is as magnificent as the dignity of our people and nature, as old as its history. Sycamores are the beauty, decoration, pride and desire of our nature. Unfortunately, such a wealth of ours has been destroyed by the Armenian invaders since 1993, those forests are mercilessly encroached upon, cut down and used for furniture production. Karagol State Reserve. By the decision of the Council of Ministers of the Republic of Azerbaijan dated November 17, 1987, the Karagol (Sevinj) inter-republican state reserve was established. Karagol state reserve is located on the border of Lachin district and Gorus district at an altitude of 2658 meters above sea level. The total area of the reserve is 240 ha. Isikli Karagolü (Sevinc) at an altitude of 2658 m above sea level in the southern part of the Karabakh volcanic mountain range, in the source part of the Agoglan river, the right tributary of the Hakari river, at the northern foot of the Big Isikhli mountain (3548 m), from the north-west with Demirdash and small Isikhli mountains (3452 m), from the north Jangutaran (2790 m) mountain is surrounded from the east by a low moraine strip. This lake is a relic water source reminiscent of an extinct volcanic crater. Stratigraphically, the Karagol region contains rocks of Upper Pliocene age. The length of the lake is 1950 meters, the maximum width is 1250 m, the length of the coastline is 5500 m, the maximum depth is 7.8 m, the basin area is 13 km^2. According to calculations, the volume of water in the lake is 10 million m3. The water transparency of the lake is 4.6 meters. The bottom of the lake consists of stones of different sizes near the shore. Towards the center, the size of the stones (rocks) decreases and finally the central part consists of small-grained sediments. It freezes from the second half of October to the end of April. At a distance of 20-25 meters from the coast to the center, the thickness of the ice is more than 50 sm. The thickness of the snow here is 40-45 sm. There are 102 plant species and sub-species in the reserve, which consist of 68 species and 27 families. Because there is no water flowing into the lake from anywhere and the water is very clean and healing, the people looked at this lake as a holy place of worship. In 1964, the construction of livestock farms on the shores of the lake in Armenia, the construction of powerful pumping stations in the lake and the use of its water to irrigate the agricultural fields of Gorus region caused both pollution of the lake and lowering of its level. At that time, Lachin people's dissatisfaction with such treatment by Armenians partially limited their activities. Intensive use of the lake's water, which is currently neglected, can lead to

irreversible negative effects for the lake. Lachin State Reserve. Lachin state ban was established in November 1961 in the territory of Lachin district. The purpose of creating the sanctuary is to preserve and increase the animals and birds here. Roe deer, rock goat, wild boar, bear, etc. are in the reserve. and from birds, turaj, partridge, etc. settled. The area of the Lachin state reserve is 21.4 hectares, which is 0.25% of the territory of the republic, and 8.8% of the republic's reserves. 7369 ha or 34.5% of that area is forest area, 1448 ha or 6.8% alpine meadow, 7400 ha or 34.8% subalpine meadow, 4257 ha or 20% pastures, 862 ha or 4 % rocks and avalanches, 34.0 ha are special purpose lands.It has a relief characteristic of medium and high mountain area.The highest peak is Kirkhgiz (2825 m), Shalva, Picenis, Gorchu, etc. It is sharply divided by the deep valleys where the rivers descend. The territory of the reserve is dominated by a cold climate with dry winters. According to the vegetation, the area of the ban is mid-mountain forest consisting of Iberian oaks (1000-1700 m), upper mountain forest consisting of eastern oak (1700-2200 m), subalpine (2200-2500 m) and alpine meadows (2500-2800 m). divided into belts. The forests are mainly cypress, birch, birch, etc. are mixed forests. Forests dominated by Vales are much less (8.1%). The mountain-meadow forest of oak, holly, ash trees occupies very little area, which is related to intensive grazing. For the subalpine zone, mesophilic meadows of dry slopes and relatively humid slopes, Primitive, sparsely thick, grassy, mountain-meadow, typical, carbonate-residual grayish brown mountain-forest, decayed-ocarbonate mountain-forest, typical and grayish brown mountain-forest soils are spread on the territory of the reserve. Compared to forests, the forest-less areas of the mountain-meadow belt and the forest belt are more affected by human economic activity, such as pasture. At the same time, there are favorable conditions for the settlement of a number of animals and birds. Their number and type are sufficient. In the inspection carried out here in 1989: mountain goat (bezoar goat) 96 heads, wild boar 360 heads, roe deer 320 heads, bear 110 heads, wolves, badgers, squirrels, etc. 200 pheasants and 1500 partridges are settled among animals and birds. There is a red oak tree (golden oak), which is the most valuable in the world, in the Hajisamli forest on the territory of the reserve. In order to use that tree, even during the tsar's reign, the French built a carriage road through difficult mountains from Khankendi to Kyrghgiz mountain. However, they could not take the material because it was at the time when the Soviet government was established. The material made from that wood is used to store valuable furniture and especially brandy alcohol. This tree is common in Azerbaijan only in that reserve.Now they are brutally cutting those trees and other forests. Gubadli Sanctuary. The Gubadli state reserve was established in June 1969 in the territory of Gubadli and Lachin districts under the Beshitchay State reserve. The area of the Gubadli ban is 20 thousand hectares, which is 8.2% of the national ban. The natural landscape areas are characterized by sparse forests, thickets, and grasslands. The area covers the upper parts of the low mountain areas. A mild climate with dry winter prevails here. The average annual air temperature is 12-130 degrees, the amount of precipitation is 550-600 mm, and evaporation is 750-800 mm. The area consists mainly of red oak and hickory trees. At the same time, juniper, hawthorn, rose hip, and blackberry plants are also widespread.The ecological factors of the area have created full conditions for the normal settlement of animals and birds here. As a result of the survey conducted before the territory was occupied, it was determined that there are 101 wild boars, 21 brown bears, 35 roe deer, 420 rabbits, 25 wolves, 310 jackals, and 75 badgers in the sanctuary. Partridges (560) are the most common birds. Pheasant, turaj, quail, pigeon are permanent residents of these places. This reserve has been under occupation for 9 years and Armenians are brutally using this treasure. Dashalti Sanctuary. Currently, the reserve is under occupation and its activity has been completely stopped. The sanctuary, which has been under occupation since 1992, is currently being destroyed. Arazboyu State Nature Reserve. It was established in 1993 for the purpose of protection and restoration of tugai forests. Its area is 2200 hectares. It was established in June 1993 on the banks of the Araz River in Zangilan district under the Beshitchay state reserve. This reserve is 50 km long, 50-100 meters wide and 200-250 m in some places, covering 5 thousand hectares. The main purpose of creating the reserve is to protect the flora and fauna here. The climate here is hot in summer and mild in winter. The

average annual temperature is 20-250C (10C in January), 35-380C in June-July. The soil is fertile clay. The area consists of trees with high water demand. Soil and climatic conditions create normal conditions for the growth and development of plants. Before the occupation, an estimate of the number of animals present here was recorded. It was found that there are up to 300 wild boars, 7 brown bears, 350 foxes, 300 jackals, 15 wolves, 70 badgers, and 12 roe deer. Among the birds: grouse, pheasant, partridge, quail, green-headed duck have always settled. Currently, the reserve is under occupation and its activity has been completely stopped. The rivers originating from the territory of Karabakh of Azerbaijan mainly flow into the Kura and Araz rivers or the rivers belonging to their basin. The high peaks of the mountains located here form a watershed between the Kura and Araz river basins. The rivers here are fed by rain and snow water and their water is used for irrigation. Tarter and Hekari rivers originate from the volcanic plateau. The sources of Arpachay (128 km) and Bazarchay (178 km) are in the northwestern part of the plateau. It flows through Khojavand and Fuzuli regions and flows into the Araz river. It is the left branch of the Araz river and is 102 km long. The height difference between source and outlet is 1780 m. Bargushad river (Bazarchay) - takes its source from the Republic of Armenia. It flows through the territory of Kalbajar, Gubadli and Zangilan regions and flows into the Araz river. Being the left branch of Araz river, its length is 164 km. Aga, Bakhtiyarli and Davudlu small tributaries flow from Gubadli territory. The pollution of the river is caused by industrial and domestic sewage (in the territory of Armenia) from large settlements located in the riverside areas. The rich fish species of the river are looted by the Armenian invaders. In most cases, mass destruction of fish with chemicals is permitted. Okchuchay flows through the territory of Zangilan region, taking its source from the Zangezur mountain range (Kapıçık mountain). It is the left branch of the Araz river and is 85 km long. The chemically polluted waters of the Gajaran copper-molybdenum, Gafan copper beneficiation plants located in the territory of the Republic of Armenia and the biologically polluted waters of the cities of Gafan-Gajaran (including villages, hospitals, agricultural facilities) are directly discharged into Okchucha in front of the village of Sharikan in the territory of Azerbaijan, which affects the river basin. It has turned into a "dead zone". Being the left tributary of the Basitchay-Araz river, it takes its source from the Republic of Armenia. The length of the river is 44 km (17 km falls on the territory of Azerbaijan). The river is polluted by waste from pig farms in mountain villages of Armenia. The Gargar river takes its source from Shusha district at an altitude of 2080 m and flows through the territory of Khankendi, Khojaly, Aghdam and Agjabedi districts. The Gargar river is formed by the confluence of the Zarisli and Khalfali rivers. The height difference between the source and the outlet is 2080 m. Its main tributaries are Ballıca, Badara, Dağdağan and others. Chailagchay is the left tributary of Araz river. It flows through the territory of Jabrayil district. Its length is 32 m. It begins at the southern foot of the Lesser Caucasus (1750 m). The flow is formed from rainwater. Because Chailagchay is widely used for irrigation, its water does not reach the estuary.

3. Conclusion

The geographical position of Karabakh and the climate zones in which it is located cause constant changes in its climate. Climate changes are constantly studied and researched. Changes in the fauna and flora of Karabakh occur with climate changes.

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Technology of production of phenol formaldehyde copper-based composition materials and research of thermal conductivity

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Abstract: The Current receivers are used in various fields of industry, including mines, underground coal basins, aerial cables, and also in urban electric transport, for the transmission of electrical energy from wires to the transport engine, the metals of which are mainly pure graphite scrap, or non-ferrous alloy or graphite scrap. with (used as a filler) is made of materials consisting of rubbing non-ferrous metals. The main shortcoming of the current receivers made of the indicated materials is that both they and the electric wires are exposed to corrosion during operation, as well as being economically less efficient. These points indicate the immediate importance of replacing the materials used so far with new materials in the production of sliding contact current receivers. In this regard, the question of whether the composite material, which consists of a mixture of 30% graphite, 40% copper and 30% phenolformaldehyde as a hardener, can be reliably used in the production of sliding contact current receivers in the future, requires the study of the important characteristics of that material, including the heat transfer coefficient, which is discussed in the article. dedicated to solving the problem.

Keywords: Phenol formaldehyde, Electric, Contact, Energy.

1.Introduction

For research purposes, the samples were made in the form of a cylinder with a diameter of 0.025 m and a thickness of 0.01 m. Despite the fact that the proportion of ingredients in the composition is different, the preparation technology was strictly followed for all cases. All three ingredients were powdered and thoroughly mixed in the required mass -% ratio after passing through a 10 μm mesh sieve. The drying process was carried out at a temperature of 50-600 °C. In those temperature conditions, the mixture was poured into a press-mould, after being adjusted under a pressure of 40 MPa, it was placed in a furnace with a temperature of 160-1800 °C. After keeping the samples at the specified temperature for 5 hours, at the same temperature cooled to room temperature with the oven. The electrical conductivity of the samples was determined using a P-3009 type electronic device with a measurement limit of 108-1.1.1010 Ohm and working with a two-layer bridge circuit. When measuring the resistance of the samples, the contact resistance between the samples and the electrodes of the device causes an error in the measurement accuracy. To minimize this resistance, the pores in the contacting parts of the samples are filled with copper powder [1-13]. Based on the resistance R, indicated by the device, the specific resistance of the composite was determined by the following expression:

$$\lg P\nu = l\cdot 3.0 - 0.53\cdot S\cdot\varphi - 0.00264\varphi^2,\ \sigma = 0.443$$

Where $S = 6.24 \cdot 10^{-4}\ m^2$

Thus, the Shor index is low with a high percentage of phenolformaldehyde in the composite composition. The reason for this can be explained by the increase in the softness of the composite as the percentage of polymer in the composition increases. The re-increase of the Shor index at a low percentage of phenolformaldehyde is explained by the appearance of brittleness in the composite. The highest hardness of the composite was observed at 40% of the polymer. This composite contains 30% Cu and 30% C. The composite containing 40% Cu, 30% C and 30% phenol-formaldehyde has the lowest corrosion rate. Thus, it was determined that the composite with a composition of 40% copper, 30% graphite and 30% formaldehyde has the most optimal electrical and mechanical properties. This material

can be used as an electrode system in a contact transmission system.

2. Experimental details

The research device created for the purpose of investigating the heat transfer coefficient is a metal tube with a length of 1=100 mm and a sample with inner and outer diameters d_1=10, d_2=25 mm, which is placed on it at that length, a heater inside the tube, and a heater drawn on the heater for the purpose of insulation. made of heat-resistant material, specially prepared support structures, wattmeter, auto-transformer, potentiometer, thermocouples made of chromel, alumel wire with a diameter of 0.02 mm for measuring the temperatures of the inner and outer surfaces of the sample, a container for placing their cold solders, a thermometer for measuring the temperature of the cold solder, a switch consists of a switch and a power source.

If the values of the geometric dimensions of the test device are taken into account, then the expression:

$$\lambda = 1.458 \frac{Q}{\Delta t}$$

can be written as Thus, a number of experiments were carried out at different values of the heat flow in the indicated research facility, and the experimental values corresponding to the normalized regime were calculated by the formula and the graphical dependence λ = f(tor) depicted in Figure 2 was established. As can be seen from the figure, this dependence is a linear dependence, and its equation is λ = 0.9 + 0.0046t or λ= 0.9(1+0.005111t) is expressed as experimental and calculated values with the help of Eq.

Row Number	Average Temperature $T_{or} = 0{,}5(t_1 + t_2)$, ℃	Experimental values of heat transfer coefficient, $Vt/m.$℃	Values of heat transfer coefficient calculated by equation (5)$Vt/m.$℃	Relative difference, %
1.	79,5	1,291	1,266	1,93
2.	181,5	1,735	1,735	0
3.	236,5	1,950	1,988	1,90
4.	282,5	2,220	2,199	0,90
5.	336,0	2,460	2,445	0,59
6.	398,4	2,700	2,732	1,18

3. Conclusion

Thus, it was determined that the composite with a composition of 40% copper, 30% graphite and 30% formaldehyde has the most optimal electrical and mechanical properties. This material can be used as an electrode system in a sliding contact transmission system. Thus, for the purpose of researching the heat transfer coefficient, an experimental device was created, the experimental results obtained by studying the heat transfer of graphite-copper-phenol formaldehyde mixture were worked out, and in the end, the reporting equation of the heat transfer coefficient was proposed.

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Modeling of wind power generation system with active power filter

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Abstract: Today, wind and solar are often the cheapest forms of the new generation. The entire energy system is changing and wind power is one of the most important energy sources for promoting decarburization. In the article, a 5-level active filter is designed in the inverter structure for the compensation of other harmonics in the system built on the basis of a double fed induction generator (DFIG). As a result of system simulation, load and source current and voltage, active and reactive power, angle, stator voltage graphics.

Keywords: Wind Energy, Wind Turbine, Energy System, Double Fed İnduction Generator, Active Filter.

1.Introduction

Based on the society's need to combat climate change, renewable energy production continues to grow. Wind energy alone currently provides 16% of Europe's production. Today, wind and solar are often the cheapest forms of the new generation. The entire energy system is changing and wind power is one of the most important energy sources for promoting decarbonisation.

Wind energy is one of the important renewable and inexhaustible energy types that do not cause pollution. Unlike conventional energy sources, wind energy does not cause greenhouse gas emissions. Wind turbines are used to obtain electrical energy by utilizing wind energy. Wind turbines are the main structural elements of wind power plants and they are machines that convert the kinetic energy of the air in motion into mechanical energy and then into electrical energy. Wind turbines are manufactured as horizontal axis or vertical axis according to the direction of their rotation axes. Horizontal axis wind turbines are the most widely used of these types. Horizontal axis wind turbines operate with their axes of rotation parallel to the wind direction and their blades perpendicular to the wind direction. These types of wind turbines are made with one, two, three or multiple blades [1].

Advantages of wind energy:

• The fuel of wind energy is wind and it is completely free fuel and costs nothing.

• While generating electricity with wind energy, no greenhouse gas or similar harmful gases are emitted to the nature. Therefore, it is a completely clean energy source and clean energy production method.

• It is possible to install wind turbines almost anywhere. There is little space limitation.

• Wind power plants do not occupy as much land as solar power. In other words, a 1 MW solar power plant covers an area of 20,000 square meters, while a single wind turbine can produce 1 MW of energy alone.

• It does not matter whether the weather is bright or dark for wind turbines. It can generate electricity in optimum wind conditions day and night.

Aerodynamic Model of Wind Turbine.We can collect the aerodynamic model under four modules. These are tip-speed ratio calculation, pitch angle definition, rotor power coefficient (Cp) calculation and aerodynamic moment calculation. These four separate modules are described below. Tip-Speed Ratio calculation

The tip velocity ratio is defined by λ. λ is found by the ratio of the blade tip speed to the wind speed. The tip-to-velocity ratio λ and the blade pitch angle β determine the rotor efficiency (Cp). λ is found as follows.

$$\lambda = \frac{Wing\ tip\ speed}{Wind\ speed} = \frac{\Omega(rotor)*R(rotor)}{v(Wind)} \quad (1)$$

Here, $\Omega(rotor)$ is the rotor angular velocity (rad/s), $R(rotor)$ is the rotor radius (m) and v is the wind speed (m/s).

Determining the pitch angle

The rotor power coefficient Cp varies with the tip-to-speed ratio λ. In order to keep the Cp coefficient at the maximum at all speeds, the rotor angular velocity must be adjusted according to the λ value that will keep the Cp at the maximum. In fixed speed wind turbines, the rotor speed is realized by the blade pitch angle, and in variable speed wind turbines, both blade tilt angle and the inverter on the generator side.

Calculation of Rotor Power Coefficient

Rotor power coefficient is a measure of rotor efficiency and is defined as:

$$Cp = \frac{Rotor\ power}{Wind\ power} = \frac{Protor}{Pruzgar} \quad (2)$$

The optimal Cp curve is obtained by keeping λ constant for all wind speeds. Variable speed wind turbines have a mechanism that can change the tilt angle and obtain better power coefficient by adjusting the blade tip speed.

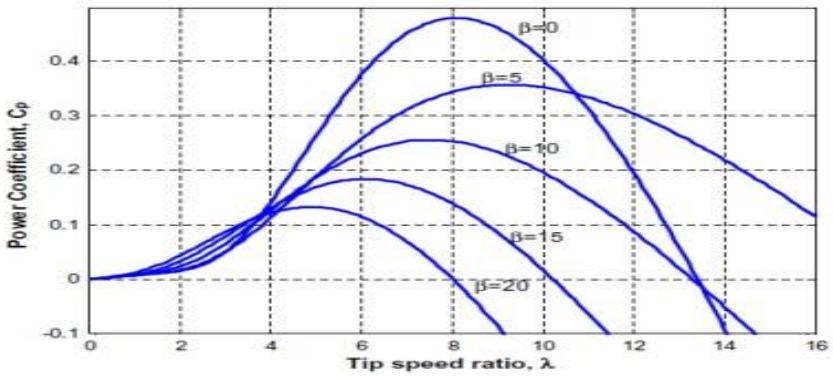

Figure 1. Typical power factor-end velocity ratio plot

Aerodynamic moment module

The aerodynamic moment on the rotor blades is

$$T = \frac{(C_p * p * \pi * R_{rotor}^2 * v_{wind}^3)/2}{\Omega_{rotor}} \quad (3)$$

Modeling of DFIG.The classical electrical equations of DFIG are written as follows:

$$\begin{Bmatrix} V_{ds} = R_s * I_{ds} + \frac{d\varphi_{ds}}{dt} - \omega_s * \varphi_{qs} \\ V_{qs} = R_s * I_{qs} + \frac{d\varphi_{qs}}{dt} - \omega_s * \varphi_{ds} \end{Bmatrix} \quad (4)$$

$$\begin{Bmatrix} V_{dr} = R_r * I_{dr} + \frac{d\varphi_{dr}}{dt} - (\omega_s - \omega) * \varphi_{qr} \\ V_{qr} = R_r * I_{qr} + \frac{d\varphi_{qr}}{dt} - (\omega_s - \omega) * \varphi_{dr} \end{Bmatrix} \quad (5)$$

R_s and R_r are phase resistances when stator and rotor respectively, $\omega = \Omega * P_{dfig}$ is mec electrical velocity and P_{dfig} is dipole number. The stator and rotor flux can be expressed as:

$$\begin{Bmatrix} \varphi_{ds} = L_s * I_{ds} + MI_{dr} \\ \varphi_{qs} = L_s * I_{qs} + MI_{qr} \\ \varphi_{dr} = L_r * I_{dr} + MI_{ds} \\ \varphi_{qr} = L_r * I_{qr} + MI_{qs} \end{Bmatrix} \quad (6)$$

Ids, Ips, Ids, Iqr are direct and quadrate stator and rotor currents, respectively. Active and reactive powers in the stator are defined as those provided for the rotor and grid [3]

$$\begin{Bmatrix} P_s = V_{ds} * I_{ds} + V_{qs} * I_{qs} \\ Q_s = V_{qs} * I_{qs} - V_{ds} * I_{ds} \end{Bmatrix} \quad (7)$$

$$\begin{Bmatrix} P_r = V_{dr} * I_{dr} + V_{qr} * I_{qr} \\ Q_r = V_{qr} * I_{dr} - V_{dr} * I_{qr} \end{Bmatrix} \quad (8)$$

The electromagnetic torque is expressed as

$$T_{em} = P_{dfig}(\varphi_{ds} * I_{qs} - \varphi_{qs} * I_{ds}) \quad (9)$$

Theoretical knowledge of power filters**.**Electrical systems and grid are complex dynamic systems.

These systems often suffer from unexpected or sudden changes in currents and voltages. Due to these changes mainly to the different types of linear and non-linear loads on which they depend. In addition, different types of accidents that can interfere with the grid. Increasing the use of power semiconductors in most industrial and domestic procedures, electrical grid are polluted with different harmonic currents and voltages. These harmonics affect the normal function of most of the devices connected to the grid. In addition, it causes significant economic losses. Solutions for harmonic problems have been proposed in many classical and modern literatures.

Harmonic distortion is a key phrase used when speaking today. About power quality. These non-linear loads factor in harmonic and reactive currents leading to low power, low energy efficiency and harmful disturbance are imperatives for other devices. Connecting the loads to the common junction, they are set up to provide excessive harmonics so no current will be injected into the AC lines. It affects the quality of power delivered to other users sharing the same power line. Utilities to relieve undue stress problems under control tend to bring utilities equipment into harmonic state. To solve these problems, Power Factor Correction (PFC) techniques and active power filters (APF) are used to eliminate harmonics and improve power factor.

The Power Factor Correction (PFC) unit is usually attached to the energy transition, which processes all the power and rectifies the current to unity. power factor. PFC techniques generally apply to low court power applications. Active power filters (APF) are used for harmonic and reactive power non-linear loads to cancel only that produced by. In this case, only a small partial energy is processed, resulting in overall higher energy efficiency and higher power handling capacity. Active power filters (APF) are suitable solutions to eliminate harmonics and improve the power factor. There are many series of active power filters, such as shunt active filter and shunt combination and series active filter configuration. The most basic configuration for the shunt APF active power filter is considered simplicity and reliability, it is known for its ease of use. Active filters are relatively new types of devices for eliminating harmonics. This type of filter is based on power electronics devices and is much more expensive than passive filters.

2. Experimental details

Simulation of wind turbine system using DFIG with Active Power Filter.In the simulation of the wind turbine, the mechanical model and the DFIG model are mathematically modeled in the Matlab Simulink simulation program, and the power converters, transmission line and grid are electrically modeled in the Matlab/SIMULINK/SimPowerSystems toolbox. By combining the mathematical and electrical systems, the grid integration of the wind turbine has been achieved.

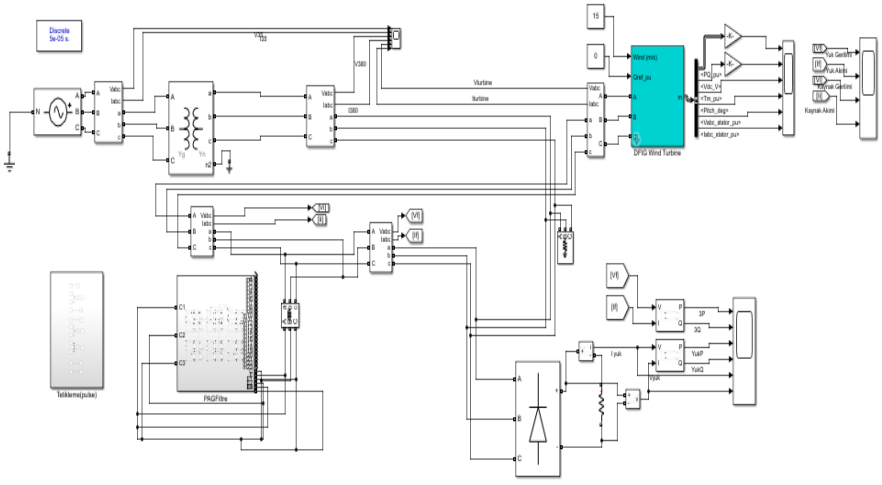

Figure 2. SIMULINK circuit diagram of the wind energy system

As a result of the simulation, the following graphics were obtained.

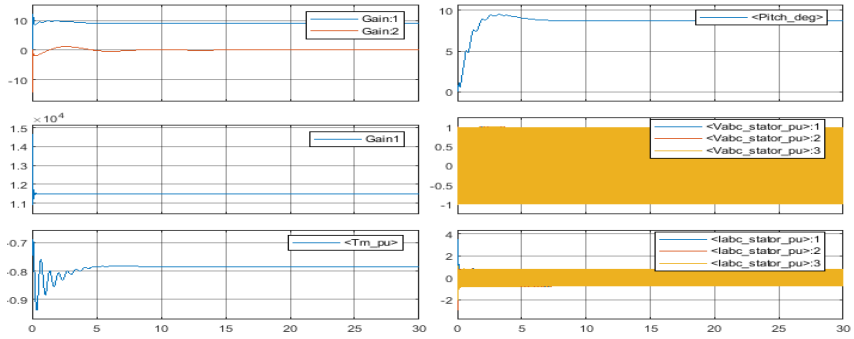

Figure 3. Active and reactive power, angle, stator voltage graphics of the system

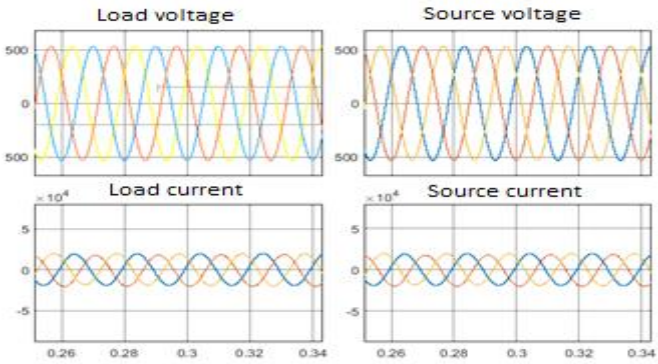

Figure 4. Graphs of currents and voltages in the system filter

3. Conclusion

In the last half century, with the increase in the use of power electronic elements in industrial areas, harmonics occurring in energy systems cause a decrease in energy quality, voltage losses, shortening of the life of materials, heating, resonance events, and a decrease in power factor. In order to solve these problems, harmonics occurring in electrical systems must be eliminated.

In this study, passive filtering and active filtering methods used to eliminate harmonics are examined. Although the passive filtering method is widely used, it has many disadvantages. In this study, shunt active power filter (SAPF) has been studied to eliminate current harmonics and compensate for reactive power.

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Graphene-based transistors

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Abstract: Graphene-based transistors may have advantages such as faster processing capabilities, lower power consumption, and better thermal management at smaller sizes.The development of graphene-based transistors has made graphene a material that has been extensively researched and is expected to be used in various electronic applications in the future. However, the production and commercialization of graphene-based transistors still faces some difficulties and technical hurdles.

Keywords: Nanomaterials, Graphene-based transistors, Silicon-based transistors, Nanotransistors.

1.Introduction

Graphene-based transistors are transistors made using a single-atom-thick layer of carbon called graphene. (fig. 1) Graphene is formed by the arrangement of carbon atoms in a single layer in a planar structure and has excellent electrical, mechanical and thermal properties.

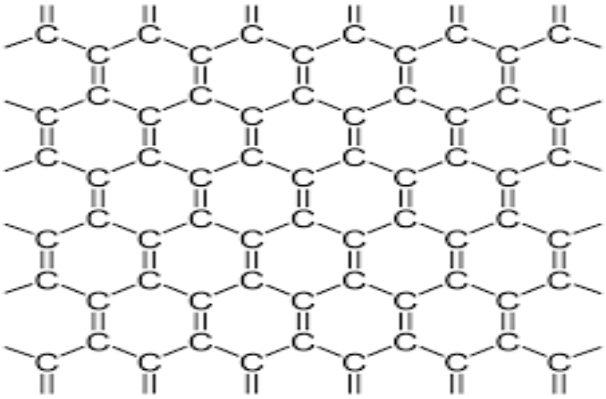

Figure 1.1: The atomic structure of graphene.

Graphene-based transistors have the potential to replace traditional silicon-based transistors. Graphene's properties such as high mobility, high carrier speeds and low resistance enable transistors to perform fast, energy efficient and high frequency operations [9,10].

Graphene-based transistors have wide application potential in electronic devices. It offers significant advantages, especially in areas such as flexible electronics, high-frequency circuits, sensors and energy storage.

Graphene-based transistors have several key differences compared to conventional silicon-based transistors.[3,5,8] Here are some differences of graphene-based transistors:

1. Material: Graphene-based transistors use a single-atom-thick layer of carbon called graphene instead of silicon. Graphene is a single-crystal material with excellent conductivity.

2. Electron Movement: Graphene is known for exhibiting high mobility of electrons. Electrons can move very quickly in graphene and high transport rates can be achieved. This allows for higher

operating speeds and better performance in graphene-based transistors.

3. Energy Gap: Graphene is a naturally energy void material. This means that an energy gap must be created in graphene-based transistors to switch between "on" and "off" states. This is often done with different techniques, for example, an energy gap can be created by placing other materials next to graphene.

4. Scale Effect: Graphene-based transistors can operate at the nanoscale. Because graphene is atomic thick, it can be used in very small sizes, enabling high-density integration. This means that more transistors can be placed on the same chip.

5. Thermal Conductivity: Graphene shows excellent thermal conductivity [2,5,7,10]. This property enables graphene-based transistors to provide better heat dissipation and withstand higher power densities.

These differences are some of the key features that distinguish graphene-based transistors from traditional silicon-based transistors. Graphene's unique properties enable faster, more energy efficient, and denser integrated circuits to be designed.

Nano transistors are transistors with smaller dimensions and higher performance [11]. Graphene-based transistors, on the other hand, are transistors that use a single-atom-thick layer of carbon called graphene. The reciprocal models of the two types of transistors may differ as follows:

Nano Transistors: Mathematical models of nano transistors can be similar to conventional transistor models. However, since they work at the nanoscale, some additional factors may need to be taken into account. For example, quantum mechanical effects such as tunneling current in nano-sized transistors should be considered. This means that quantum mechanical equations are included in the hypothetical model. The reduction in the size of the nanotransistors results in a reduction in the channel length, which should be reflected in the hypothetical model.

Graphene Based Transistors: Mathematical models of graphene-based transistors are often developed to reflect the electronic properties of graphene. Graphene is a material with a linear energy distribution and behaves subject to Fermi-Dirac statistics. Therefore, rhesus models of graphene-based transistors can include Fermi-Dirac statistics to explain the energy spectrum and electron distribution of graphene. It can also be taken into account that graphene can have partial energy vacancies.

These descriptions provide an overview. However, the design and rhetorical models of transistors is a complex field and more detail may be needed on a specific type of transistor.

Analysis of graphene-based transistors includes evaluating the electrical properties and performance of the transistor [4,6]. This analysis is usually performed using experimental data as well as mathematical and physical models.

Here are some commonly used methods for the analysis of graphene-based transistors:

Electrical measurements: Various measurements are made to evaluate the electrical performance of the transistor [8,11]. These include current-to-voltage (I-V) measurements, measurement of transfer characteristics (drain current vs. gate voltage), and analysis of output characteristics. These measurements are an essential tool for understanding the transistor's transport properties and transition behavior.

Physical modeling: Mathematical and physical models are used in the analysis of graphene-based transistors. Models such as the Fermi-Dirac distribution function, the Dirac equation, and the hydrodynamic model are used to calculate the energy levels, transport processes and interactions of the transistor.

Simulations: Computer-based simulations are used to gain a more detailed understanding of transistor behavior. Simulation software provides estimation of parameters such as current-voltage characteristics, transport speed, permeability by simulating the transistor structure and operating conditions. Simulations are an important tool in transistor design and optimization.

Material and structure characterization: Material and structure characterization is performed for the analysis of graphene-based transistors. This includes determining properties such as the thickness of graphene sheets, electrical conductivity, surface morphology, and the effect of additives. These characterizations are used to understand the material properties and structural properties of the transistor.

Parameter derivation and optimization: In order to optimize the performance of the transistor, the transistor parameters are derived and optimized using experimental data and modeling results. This includes adjusting parameters such as Fermi energy level, permeability, transport rate.

2. Experimental details

In graphene-based transistors, the Fermi-Dirac distribution function is used to determine the occupancy of electrons' energy levels. This function calculates the occupancy state of electrons in energy levels, taking into account parameters such as Fermi energy level (EF) and temperature (T). The Fermi-Dirac distribution function is expressed as:

$$f(E) = \frac{1}{1 + e^{\left(\frac{E-EF}{k \cdot T}\right)}}$$

Here:

f(E) represents the probability of occupancy of electrons in energy level E.

E is the energy level under consideration.

EF is the Fermi energy level and is usually found near the valence band in graphene-based transistors.

k is the Boltzmann constant.

T represents the temperature in Kelvin.

The Fermi-Dirac distribution function ensures that the probability of occupancy approaches zero as the energy level approaches the Fermi energy level E and the temperature decreases. Thus, at low temperatures and at energy levels close to the Fermi energy level, the occupancy of electrons is high, while at higher temperatures and farther away from the Fermi energy level, the probability of occupancy decreases.

This Fermi-Dirac distribution function is used to calculate the occupancy of energy levels and electron transitions in graphene-based transistors. Depending on the transistor design and operating conditions, various variables and parameters of this function may have different values.

Optimization of Fermi-Dirac formula in graphene-based transistors is important to improve transistor performance. Optimization of the Fermi-Dirac distribution function is especially effective in determining factors such as the operating temperature and permeability of the transistor. Here are some suggestions for optimizing the Fermi-Dirac formula:

Temperature control: The Fermi-Dirac formula is sensitive to the operating temperature of the transistor. As the temperature increases, the Fermi energy level changes and hence the occupancy rate of the electrons also changes. Therefore, the operating temperature of the transistor should be optimized and kept as low as possible.

Control of Fermi energy level: Fermi energy level is a critical parameter for transistor performance. The

Fermi energy level can have different values depending on the material properties and operating conditions of the transistor. Correct setting of the Fermi energy level is important to optimize the performance of the transistor.

Material optimization: Fermi energy level depends on the materials used of the transistor. Optimizing materials is important to improve the performance of the transistor. For example, to increase the Fermi energy level of a transistor, materials with high Fermi energy levels can be selected among the materials used.

Permeability optimization: The Fermi-Dirac formula is also related to the permeability of the transistor. The higher the permeability, the higher the Fermi energy level. Therefore, the permeability of the transistor must be optimized and sufficient to achieve a high performance.

In graphene-based transistors, the volt-ampere characteristic is used to determine the linear operating range of the transistor. The linear operating range is a region where the relationship between the gate voltage of the transistor and the drain current is linear and the transistor can perform the desired function. This is the region where the transistor operates in an ideal and linear fashion.

In graphene-based transistors, the volt-ampere linear operating range is also known as the transconductance region of the transistor. This is the region where the relationship between the gate voltage and the drain current is linear and the transistor's signal amplification and processing ability is best.

The linear operating range is a region where the drain current changes linearly when operating under the gate voltage of the transistor. In this region, the transistor has the greatest ability to amplify the input signal and accurately reflect it at the output. The linear operating range of the transistor may vary

depending on the transistor's handling characteristics and operating conditions. These include factors such as the transistor's trip voltage, transconductance, mobility, transistor dimensions and configuration. The linear operating range is important during the design and analysis of the transistor because in order for the transistor to perform the desired function, it must accurately amplify the input signal and operate in a region where distortions are minimal.

The linear operating range of the transistor can be determined by analyzing the volt-ampere characteristic and the transistor parameters. The linear operating range of the transistor can be determined visually by using the transfer characteristic and output characteristic graphs. In addition, parameters such as transconductance value and trip voltage of the transistor are also important in determining the linear operating range. The electrical performance and linear operating range of the graphene-based transistor is important to understand how the transistor works and under what conditions it behaves linearly.

Electrical performance refers to the transistor's ability to perform desired tasks. It provides high mobility value, fast signal processing and high frequency performance in graphene-based transistors. This is important so that the transistor can work quickly and effectively. The linear operating range is the operating region where the transistor provides ideal amplification while projecting the input signal to the output. The linear operating range is generally valid at low input signal levels, and the transistor's output changes proportionally to the input. This means that the transistor can amplify correctly and transmit the signal without distortion. In graphene-based transistors, the high trans conductance value, ie how much the output current changes in response to a change in input voltage, determines the amplification ability of the transistor. A higher trans conductance value means the transistor provides higher gain and has a better linear operating range. On the other hand, the turn-on voltage refers to the input voltage at which the transistor switches from off to on. The lower turn-on voltage allows the transistor to operate with lower power consumption and helps it have a wider linear operating range.

In addition to these factors, the thermal effects and input/output capacitances of the transistor also affect the electrical performance and linear operating range. Thermal effects determine how the performance of the transistor changes at high temperatures and how its linear operating range is affected. Input and output capacitances affect the high-frequency performance of the transistor and can extend the linear operating range. In graphene-based transistors, the input and output capacitances affect the high frequency performance of the transistor. These capacities are important parameters that enable fast transmission and processing of electrical signals. Input capacitance refers to the capacitance with which the signal applied to the input of the transistor interacts. Higher input capacitance can cause high frequency signals to lose more energy at the transistor's input and cause signal degradation. In this case, the high-frequency performance of the transistor is degraded. Output capacitance, on the other hand, refers to the capacitance with which the signal from the output of the transistor interacts. Higher output capacitance may cause the output signal to lose more energy at higher frequencies and cause signal degradation. This negatively affects the high frequency performance of the transistor.

For this reason, input and output capacitances are tried to be minimized in graphene-based transistors. Lower capacitances provide better transmission of high-frequency signals. To achieve this, design optimizations and material selections are made.[1-4]

In mathematics, the input and output capacities can be expressed as follows:

$$C_{in} = A_g W \frac{L}{V_{DS}}$$

$$C_{out} = A_d W \frac{L}{V_{DS}}$$

Here, C_{in} and C_{out} are the input and output capacitances, A_g and A_d, respectively, the input and output capacitance coefficients, W and L are the transistor's width and length, respectively, and V_{DS} is the transistor's drain-source voltage. Reducing the input and output capacitances improves the high-frequency performance of graphene-based transistors. Optimization of graphene-based transistors refers to improvements made to optimize their performance. Here are some points to consider in optimizing graphene-based transistors:

Electrode Dimensions: The dimensions and shapes of the electrodes affect the performance of the transistor. By optimizing parameters such as the distance and width between the electrodes, the capacitance of the transistor can be reduced and the electron flow can be improved.

Control Electrode Location: The location of the control electrode (gate) affects the performance of the transistor. By choosing an optimal control electrode location, you can better control electron movement and reduce the input capacitance.

Substrate Material: The substrate material in which the transistor is placed can affect performance. The dielectric constant of the substrate material can affect the electron movement rate and input/output capacitances. You can reduce capacitances and increase performance by using substrates with high dielectric constants. Reducing Transition Resistance: Transition resistance is a factor that limits electron movement. You can optimize contact resistances and use better conductive materials to reduce the transition resistance. Reducing Contact Resistance: The contact resistance formed in the areas where the electrodes come into contact with the graphene layer can affect the performance of the transistor. You can use better bonding materials and techniques to reduce contact resistance. Process Parameters: Process parameters used during transistor manufacture affect transistor performance. You can achieve better transistor performance by optimizing parameters such as process temperature, gas environment, graphene layer thickness. Optimizing these parameters together enables graphene-based transistors to provide better electrical performance and a wide linear operating range [1-20].

These optimization steps can improve the electrical performance of graphene-based transistors, improve frequency response, and expand the linear operating range. Graphene-based transistors have had an important place in the electronics industry in recent years. These transistors are of interest to many researchers as they have significant potential for high-speed and low-power electronic devices.

These transistors have a higher electron mobility than transistors made of other materials, resulting in higher speed and lower power consumption. Another advantage of graphene-based transistors is that they can be produced in smaller sizes. This means more transistors can be placed in the same space, allowing more complex and powerful devices to be made. However, the fabrication and optimization of graphene-based transistors still faces many challenges. Some of these difficulties are due to difficulties in the manufacture and processing of the graphene material. Also, there are many parameters that affect the performance of the transistor and they need to be optimized.

3. Conclusion

As a result, it is believed that graphene-based transistors will play an important role for the electronics industry in the future. However, more research and development needs to be done, which will allow these transistors to be used more widely.

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Green buildings and sustainable cities: the role of ecological architecture in urban planning

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Abstract: The purpose of the study is to investigate green buildings. Global warming, thirst, environmental pollution and rapid consumption of natural resources have brought the construction of environmentally friendly buildings to the agenda in the construction sector. With increasing interest in environmentally friendly building construction, structures called green buildings have appeared. Green buildings are high-tech real estate that takes into account the impact of buildings on the environment and human health. Today, when we talk about sustainable, ecological and environmentally friendly buildings, we come across green buildings. Green buildings are sustainable structures that begin with the selection of land, are evaluated within the life cycle, are designed with a comprehensive understanding, with a sense of social and environmental responsibility, are suitable for climate characteristics and soil conditions, and consume as much as they need. With the increase in the number of green buildings, standardization and certification work began. Certification systems aim to define green building, increase consumer awareness of the benefits of green building, and transform buildings by creating common and reliable measurement standards. In this work, the concept of green building is discussed from the perspective of real estate development. In this regard; real estate development and its types, sustainability, ecology and green building concepts are explained and their interrelationships are discussed.

Keywords: Sustainability, Real Estate Development, Green Building, Green Building Certification Systems.

1.Introduction

The Brundtland report of the World Commission on Environment and Development defines it as "Meeting the needs and expectations of the present without compromising the ability of future generations to meet their own needs." Based on this definition, sustainable development is defined by ICLEI (International Council of Local Environmental Initiatives), a worldwide environ-mental organization of local governments, to express the well-being and prosperity of communities without compromising the living standards of future generations. “Sustainable development can be defined as development in which basic environ-mental, social and economic services can be provided to all without endangering the existence of the ecological and community-based systems on which these services depend. Sustainable development is related to the changes in production and consumption methods necessary to ensure that all living and future people can participate equally in social and economic development within existing ecological limits" [1].

The concept of ecology is often confused with the environment. Environment refers to all external factors surrounding living organisms, while ecology is a description of the relationships between living organisms and their environment. The concept of environment, which is relatively stable, is aimed at defining the situation and structure. On the other hand, in the concept of ecology, the relationships between living things and the environment occur in their multifaceted, direct and indirect forms. Ecological processes describe a set of dynamic, constantly changing relationships [8]. Ecological building design is an approach that takes into account the relationship between man and nature, uses climate and topographic information, and tries to use resources sparingly. This approach considers structures as part of the world's ecology and living habitats [5]. The concept of ecological structure is not a product of a new design process. In the history of mankind, there are traces of the first living unitary examples of perfect harmony with nature. The first

examples of vernacular architecture are intuitive ecological structures using climate, topographic data and local material. For example, Socrates, who lived between 470 and 399 AD, noted that south-facing houses could receive the winter sun, but in the summer the sun passed over the roofs and the house remained in the shade, in which case the south facade was lowered to receive the winter sun and the north facade was lowered to protect against high, cold winds. he suggested. Similarly, Vitruvius, a.d. In his work "De Architettura" written in 25 years, he stated that it is necessary to take into account the country and climate conditions at the initial stage in order for the projects of individual houses to be correct [8].

Green Buildings Concept.Global warming, rapidly increasing production, thirst, increasing carbon dioxide emissions, environmental pollution and rapid consumption of natural resources have brought the construction of environmentally friendly, environmentally friendly buildings to the agenda in the construction sector. Although interest in environmentally friendly building construction has increased, so-called green buildings have emerged. Green buildings certified by bringing certain standards have created a new direction and sector in the construction sector as buildings that are more valuable, can use natural resources efficiently, respect nature, connect people with nature, and protect health. ecological, convenient and reduces energy consumption [2]. Green buildings are part of a global response to the growing role of human activity in causing global climate change. Green buildings are high-tech real estate that takes into account the impact of buildings on the environment and human health. Green buildings are buildings that use renewable energy sources, recycle waste water, use daylight as much as possible, have effective thermal insulation and produce the necessary energy by the building itself. These goals can be achieved through better habitability (building orientation), design, material selection, construction, operation, maintenance, transportation and reuse as much as possible [6]. Today, green buildings, which appear under many names of sustainable, ecological, environmentally friendly, are evaluated within the framework of the life cycle of the building, starting with the selection of land, designed with a comprehensive understanding, with the concept of social and environmental responsibility, according to climate data and conditions. That place, which consumes as much as it needs, focuses on renewable energy sources, natural and waste products, is defined as sustainable structures that use non-productive materials, sensitive to ecosystems [7]. Energy used for heating, cooling, ventilation, lighting and hot water needs of buildings is estimated to account for 30% of total energy consumption worldwide. On the other hand, if the amount of energy used for the industrial production of products such as concrete, glass, wood, electrical materials, installation equipment used in buildings and construction equipment used for construction is taken into account, the total consumed energy exceeds the norm by 40%. Considering such issues, sustainability in buildings; can be defined as minimizing the amount and costs of energy inputs (energy, water, building materials, etc.) in all areas, from the materials that make up the building to the process of evaluating reusable parts in the building after the end of the building's service life. In this context, green buildings are buildings where inputs are used efficiently and at a minimum level and the quality of the internal environment (comfort) is ensured at a high level. [2]. The main advantages of green buildings can be listed as follows: • Reduction of carbon dioxide emissions from buildings • Minimization of environmental damage during the construction phase • Reduction of operating costs • Ensuring the use and development of renewable energy • Valuation of waste material resulting from excavation • Collection by green roof application rainwater Use of natural light • Save energy • Reduce heating and cooling costs with insulation systems • Increase building value • Offer users a healthier and more efficient environment • Add value to urban living areas [4].

It is defined as a type of rating system that seeks to provide a measurable reference in detecting natural resource vulnerability and protecting natural resources. Certification systems define criteria that make a building green. With certification systems, it is possible to know to what extent and to what extent a certified building is green. Certification systems; allowed green buildings to go beyond being a concept and become a reality [8]. Certification systems aim to change the building market by defining green building by creating common and reliable measurement standards, developing a unified building design method, recognizing environmental leadership in the construction industry, promoting green competition, and increasing consumer

awareness of the benefits. There are many sustainable building certification systems, such as SBTOOL, which emerged in Canada but defines itself as an international system, HK-BEAM and CEPAS used in South Africa, SBAT used in Turkey, GREEN STAR used in Australia, CASBEE used in Japan . Although the goal of these certification systems is to create a unique system for each country, taking into account its local standards, climate data and living conditions, countries that do not have a unique evaluation system have adopted and started using these two certification systems. It gains international recognition with LEED and BREEAM assessment systems [9]. Today, in many countries that are members of the World Green Building Council (WGBC), along with BREEAM, LEED, Green Star and CASBEE systems, SBTool has been adapted to local standards and started to be used in different countries.

Recently, the world is experiencing a large-scale globalization. Various problems related to climate change, air demand and energy supply are increasing worldwide. The solutions to these problems must be clearly addressed, and modern traditions such as green buildings and sustainable cities can contribute to solutions [3].

Green buildings can provide more efficient energy supply and efficient profitability than any conventional building. These include applications with many personal and administrative benefits related to the construction of buildings, the selection of internal devices, engineering and technology processes. It is related to modern construction practices in rainwater prevention, excess energy use, atmospheric natural safety, social responsibility, health and many more.

Green buildings and sustainable cities have many individual and social benefits that are far more rewarding. It is related to issues related to people's health and purpose. That is, it creates an opportunity to live in a healthier, safer and more purposeful environment.

Green buildings and sustainable cities also help fight global climate change. This allows us to reduce CO2 by applying more flexible and more economical construction processes, using less gas and less material, based on the best modern construction practices of our institutions and countries.

Finally, it should be noted that green buildings and sustainable cities allow for instilling a greater sense of responsibility and self-restraint. This requires us to be more responsible and economical towards ourselves and the environment we live in. As a result, green buildings and sustainable cities represent a more modern, more flexible and faster construction process for the future of the world [10].

2. Experimental details

All these issues increase the importance of green buildings and sustainable cities while the world is changing on a large scale, and their implementation must be done faster and more effectively. This demonstrates that the world's population needs more habitat and a stronger and more sustainable environment. Apart from these issues, the development of green buildings and sustainable cities will create more jobs in urban planning and housing construction. Now and in the future, more and more people are looking for opportunities to find work and develop in these fields. This allows for the creation of a wider area of employment and work on residential spaces, buildings and urban infrastructure.

In short, the development of green buildings and sustainable cities helps to overcome a more responsible, more economical and more restrained attitude towards the environment. This allows people to live more economically and environmentally friendly, to protect the world's natural resources and to prevent their rapid depletion. Today, the construction sector has surpassed other sectors in terms of carbon dioxide emissions. Using one-third of natural resources, this sector accounts for 40% of total solid waste and 12% of fresh water. Green buildings are designed, operated and decommissioned in a way that minimizes negative impacts on the built environment. It is efficient use of energy, water and other resources; protecting the health of users and increasing the productivity of employees; means reducing waste, pollution and environmental degradation. With the concept of sustainable development, new concepts such as environmentally friendly building, green building and smart building have emerged. A green building is environmentally friendly and used in an ecological sense. It is defined as environmentally sensitive sustainable buildings that are designed with social and environmental factors in mind, use energy-efficient materials,

consume renewable energy sources and minimize waste generation within the climate and site-specific conditions. Therefore, green buildings have some financial advantages that standard buildings cannot provide. For example, in green buildings, the quality of the indoor environment is high, energy and water savings are achieved, operation and maintenance costs are low, and the amount of waste is reduced. Green buildings are on average 28% more efficient. In green buildings, sustainability can be defined as the efficient, conscious and minimal cost use of energy and materials, from the materials used in the construction of the building to the processes of evaluating the parts that will be reused if the building completes its possible work.

Economic Benefits: Green building construction reduces operating costs. It creates, expands and shapes markets for green production and services. It also maximizes life cycle economic performance.

Environmental Benefits: Green building construction protects and improves biodiversity and ecosystems. Protects and renews natural resources. Improves air and water quality; reduces waste. Social benefits: Green buildings have a positive effect on the comfort and health of residents; It completely improves the quality of life. Social sustainability is related to improving the quality of life of societies. It promotes the provision of a safe working environment and the care of human health. It aims to ensure an equal and fair future for future generations by ensuring the equal distribution of social benefits. In economic sustainability, promoting affordable prices, maintaining market competition, understanding environmentally sensitive suppliers and creating jobs are encouraged for groups that want to benefit from the construction sector. Biophysical sustainability minimizes the use of water, energy, materials and land essential for construction; keeps resource recycling at a maximum level. Instead of non-renewable energy sources, renewable sources are used; Air, water and soil pollution is minimized. Technical stability ensures the construction of functional buildings, durable, reliable buildings. Service planning is done and quality is emphasized to promote continuous production. The main goals of green buildings are to be safe, healthy, comfortable, sustainable and economical for users and nature.

Ecological architecture aims to ensure a responsible attitude towards the environment in the construction of buildings and living spaces. It is an experience dedicated to human health and environmental protection, while ensuring sustainability from the economic and social side, as well as building a responsible attitude towards the environment and avoiding rapid depletion. Ecological architecture ensures a more efficient implementation of energy, water and food supply to buildings by applying a number of technologies. This helps ensure a more responsible attitude towards the environment. Examples of these technologies include solar panels, water-saving systems, high-performance data security and other electronic systems. These technologies help to reduce energy consumption of buildings and economical use of water supply. Ecological architecture also achieves the implementation of other environmentally responsible measures in the construction of buildings and living spaces. This is done, for example, by reducing the limited impact of building materials, safe use of natural resources in construction, providing natural lighting and even using plants and trees.

Ecological architecture ensures a more efficient and sustainable environment in the construction of buildings and living spaces. This provides an environment where builds can be used and developed for a longer period of time. This creates a more responsible, healthy and sustainable way of life for people, supports the construction of environmentally friendly buildings related to the establishment of a responsible attitude towards nature and the implementation of special measures for the protection of natural resources.

Ecological architecture is developing to reduce the impact on the environment both in the construction of buildings and during their use and demolition. Environmental architecture uses effective technologies to analyze, evaluate and develop the energy efficiency of any building. These are the building's heating and cooling systems, electric lighting, water supply, etc.

When ecological architecture is applied, the impact of buildings on the environment is reduced and the usability of living spaces is increased. Ecological architecture helps to protect the environment and ensure sustainability in order to form a responsible

attitude towards human health and the environment. Ecological architecture is a mechanism that regulates the construction of buildings and the production of products with a sense and a responsible approach to the environment, which combats some of the biggest problems of today.

3. Conclusion

Recently, due to people's partnerships and suggestions, many countries are implementing ecological architecture and trying to create a more responsible, sustainable environment in the construction and development of buildings. This creates a brighter future due to a number of advancements and innovations around the world.

The development of the concept of sustainability and its widespread application in the real estate development sector will only be fully realized through the understanding of the concept of urban sustainability and the creation of policies. Urban areas have played a very important role in future planning as areas where energy is consumed the most. For this reason, cities are of great importance in providing green urbanization. The most important elements of green building projects are their effects on human health and urban fabric. The basic need of people is to continue their life in a healthy environment. Buildings must be kept healthy to prevent deterioration of human health caused by buildings. For this, the structure must be soundly designed, manufactured and commissioned. Every process of a building, from the design process to execution, operation and demolition, must be soundly planned and maintained. For the sustainability of a healthy building, it must be designed in a way that integrates the building, the environment and human health, and leaves healthy living spaces for future generations. All sections of the society should be informed and encouraged in this regard. Green building projects are applications that gain importance considering the damage caused by buildings to the environment and nature, and then become widespread with the application of certain rules and standards. These standards define the sustainability criteria of green buildings, what green buildings should look like, and allow the building to be measured and evaluated. Green building development projects in the countries have gained importance and started to be implemented in recent years. Some projects have begun to be developed using international assessment and evaluation systems such as LEED and BREEAM.

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The main issues of the use of an unmanned metro system with the principle of a horizontal elevator on operated lines

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Abstract: The article is devoted to such an urgent topic as increasing the levels of reliable security in the subway. The objects of the study are stations, passengers who accumulate on the platforms of the station, and rolling stock. inclusive of the metro. In the course of the conducted research, modern unmanned metro systems, automated stations, automatic rolling stock of different generations, levels and countries have been analyzed. Further, issues related to the specific features of two typical stations of the Baku metro are discussed. Based on geographical, economic, social and social factors determined by the districts of Baku city where the metro stations in question are located, as well as based on the general dynamics of the trend of expansion of the global significance of the Republic of Azerbaijan and its capital Baku, the growth rate of the density of passengers of underground electric transport is analyzed. Based on theoretical studies, the necessity of improving the automation levels of the Baku metro is justified by installing structures called horizontal elevators and putting into operation automatic cars, which are also called unmanned trains. The idea is proposed to create algorithms with which an automatic train itself controlled the doors of a horizontal elevator.

Keywords: Automatic station, Automated rolling stock, Horizontal elevator principle, Telecommunication radio control system, Passenger density on platforms, Door control algorithms.

1.Introduction

The rolling stock (PS) of the unmanned metro system (PS BSM) is most often called an automated train. To create such transport systems, it is necessary to invest enormous financial and technical resources, as well as the enormous work of professional engineers, technicians, workers with a high qualification level, auxiliary, maintenance workers. But for ordinary passengers, this is high safety, excellent comfort and an encompassing sight at the "first meeting" with the overview that opens up to them when they look through the front windows, which are located on the front sides in the first and last cars. Since there are no driver's cabins in automated trains, the frontal parts of the head cars also belong to passenger cabins. The impressions left from the "first meeting" with the front windows of the head cars of automated trains are a kind of beauty: a running tunnel to or from the passenger, leading or diverting rails, approaching and distancing stations [2, 3].

BSM is a system of the highest level in terms of the degree of automation of electric transport in the metro. There are also relatively low levels of electric transport in terms of the degree of automation. Usually these levels are designated by classes. So, for example, in electric rolling stock with an automation system of the 2nd and 3rd classes, in the head cars there are driver cabins. And the drivers themselves here are only engaged in controlling the operation of the system, or more precisely, the implementation of the automated process of passenger transportation. Such automated systems are operated in many subways of the world. In Europe - in the cities of Germany, Hungary, Italy, Switzerland, Denmark, in the USA, in Asia - in the capitals of South Korea and China, Taiwan and other megacities of the world industry (Fig.1 2) [4].

Although, in such a train there is both a driver's cabin and the driver himself, and for a passenger such an electric rolling stock is much more like ordinary cars than automated cars, but still, due to the fact that traffic control and the train itself is performed automatically without the participation of the driver, and these trains are also referred to as BSM. The longest BSM with a driver controlling the operation of an automated train in the world is located in Singapore, and its length reaches 200 kilometers. automated rail lines [5, 6].

As a passenger train, the first unmanned train was introduced in the railway transport of Great Britain. In 2018, the route between Peterborough and Horsham was completed by an unmanned train. The driver on this train was engaged only in controlling the doors of automated cars.

In the metro system, "automation" means a process in which responsibility for train control is transferred from the driver to the train control system. Absolute BSM is very rarely practiced in the world. Today, some facts are known, according to which in Paris such systems are being applied gradually, in Dubai the entire metro system is fully automated and in Hong Kong a fully automated subway is also being operated. Here it is necessary to note the peculiarity of the BSM of the city of Hong Kong. Although the first fully automated train was introduced in the UK, the first fully automated underground train was launched in 2016 in the city of Hong Kong.

But the BSM of the Hong Kong Metro has surpassed itself: he manages the movement and composition himself, performs diagnostics and detects malfunctions himself, determines maintenance periods himself, and also performs daily flushing and cleaning himself.

To date, FRMCS (Future Railway Mobile Communication System) is the most promising program for use in railway transport, including in the metro with the aim of improving the safety of passenger transportation. In this regard, not only manuals and instructions on the implementation, operation and maintenance of FRMCS technology are subject to standardization, but also those general issues that relate to the use of the technology itself in railway transport.

First, we will present the main requirements for the BSM:

• a rigidly established high-speed regime with strict observance of the train schedule;

• prohibition of uncontrolled delays of trains in stations,

• train traffic control in tunnels;

• adaptive regulation of the number of rolling stock, depending on passenger traffic.

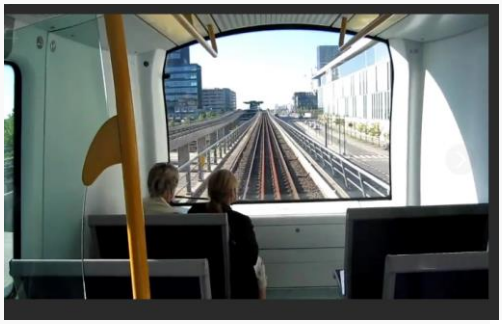

Fig. 1. BSM in the Chinese city of Chengdu

Fig. 2. A typical view of the side of the passenger compartment of a UAV train

The rolling stock (PS) of the unmanned metro system (PS BSM) is most often called an automated train. To create such transport systems, it is necessary to invest enormous financial and technical resources, as well as the enormous work of professional engineers, technicians, workers with a high qualification level, auxiliary, maintenance workers. But for ordinary passengers, this is high safety, excellent comfort and an encompassing sight at the "first meeting" with the overview that opens up to them when they look through the front windows, which are located on the front sides in the first and last cars. Since there are no driver's cabins in automated trains, the frontal parts of the head cars also belong to passenger cabins.

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Looking ahead, it should be noted that the most reliable automated system, regardless of the purpose and scope of application, is the system in which the manual control mode is always maintained. Obviously, this mode is not the main mode of an automated system. But it is irreplaceable, from the point of view of operational intervention on the operation of an automated system in emergency situations. BSM is also an automated system, but the presence of a driver and his participation in traffic management is determined by the level of automation of transport in the subway.

But, the term "Automatic metro" excludes any activity of the driver, since it implies full automation of the movement of rolling stock. But automatic motion control also implies universal control over the progress of all automatic control tasks. also monitoring the operation of the main and auxiliary equipment. One way or another, the above issues and ways to solve them in many cases are determined depending on the level of automation.

2. Experimental details

According to the modern European standard, there are various degrees of automation (Grades of Automation or GoA), which are determined by the measure of responsibility of the personnel or system for certain basic functions (Table. 1) [6].

1. ATP (Automatic Train Protection): train protection system. Designed to prevent accidents in the subway, protect passengers and staff from accidents, which include derailment, collision of trains, opening doors while driving. The system checks and controls the speed limits, the distance between trains, the switch, the presence of foreign objects on the way, repairs or maintenance work. In case of danger, automatically applies the brakes. If the line is equipped with an ATP system, then it at least belongs to the first degree of automation GoA1.

Table. 1.Grades of Automation или GoA

Grade of Automation	Type of operation	Setting train in motion	Stopping train	Door closure	Operation in event of disruption
GoA1	ATP with driver	Diver	Diver	Diver	Diver
GoA2	ATP and ATO with driver	Automatic	Automatic	Diver	Diver
GoA3	Driverless	Automatic	Automatic	Train attendant	Train attendant
GoA4	UTO	Automatic	Automatic	Automatic	Automatic

2. ATO (from the English Automatic Train Operation) is a train movement control system. Provides partial or fully automatic motion control and is analogous to autopilot. The ATO system performs the following functions: stopping the train, opening doors, waiting for a certain period of time. The driver only has to close the doors and, if the path is clear, the train will continue moving automatically. This system corresponds to the degree of automation of GoA2.

3. Many more modern systems are fully controlled by a computer and close the doors themselves as well. In this case, the driver or dispatcher retains only control functions – this is necessary to reduce the risks associated with failures or emergencies. In this case, the system corresponds to GoA3.

4. ATC (from the English Automatic Train Control) is a train movement control system. It automatically performs the usual functions of a signalman in the subway – such as preparing the route and regulating the movement of the train. This system is designed to eliminate the possibility of error due to the human factor. It allows you to more accurately control the distance between trains due to the precisely set amount of braking and acceleration. The ATO and ATC systems work together to ensure movement within a certain schedule with a small time tolerance. The combined system allows you to adjust

operational parameters, such as the power ratio during movement and stops at stations, to meet a specific schedule. This system, which does not provide for the participation of drivers and operators, corresponds to GoA4.

Problem statement. As in all advanced technologies, so in BSM there are some nuances due to operating conditions. Namely, the operating conditions that can significantly affect the quality of the performance of the main task of civil transport - the safe transportation of passengers, is very characteristic of the capital of our republic, Baku.

Imagine such a situation: passenger density a high density of passengers on the platforms, a compacted train schedule, and uneven movement of passengers who get out of the cars and into them. In ordinary trains, the driver will more reliably and efficiently fulfill the obligations that ensure the safety of passengers than an unmanned train. Here we can cite as an example the well-known observations of the drivers when they close the doors after the last passengers come in. As for force majeure situations, there can no longer be any doubt: no ultra-high system is capable of responding to force majeure situations than a person.

Based on the above, we can draw a significant conclusion related to the thinking of the passengers themselves. Not all passengers are psychologically ready to agree that in the underground world their safety depends not on a person, but on some kind of technical system. All of us, one way or another, at least once in our lives, faced technical problems at a time when the train was in the tunnels: flashing and short-term switching off of lamps lighting of metro salons; short-term stops of trains in tunnels, etc. At these moments, it is not difficult to imagine the condition of those passengers who will start to panic a lot if they find themselves in a drone train in such situations.

Unfortunately, there are no technical means, whether with hardware or software, with which it would be possible to somehow influence a person, and bring him to a balanced state, calm him down so that he would not panic, since such cases are known, and we all know that what kind of chaotic actions a person is capable of when his panic state turns into self-arousal. But, as for the station platforms, there are additional opportunities to improve passenger safety. In our opinion, one of the excellent suggestions is the application of the principle of horizontal lift.

Recommended ways to solve the problem. Above, such abnormal situations were outlined in which the driver's control system succeeded in eliminating them, rather than an unmanned system. But it should be noted that in the metro there is a dispatching service that also controls traffic, but with conventional control systems with a driver, this control is implemented against the background of communication between the dispatching service and the drivers. In cases of BSM application, the dispatcher will be based only on the basis of the information model and the information received. And before making a decision in the direction of eliminating an emergency situation, removing their consequences, the service (or rather: electronic or computer dispatch service):

- must analyze the incoming information;
-to match the processing results with the information model;
- review a variety of scenario solutions embedded in the database of the expert system;
- choose a more acceptable solution from those that will be recommended by the expert optimization system.

One of the most important tasks is to ensure digital communication. For this purpose, the following systems and protocols are recommended.

In [7], the BSU of train traffic is considered as an integral part of the digitalization of urban transport. It is clear that despite a lot of similarities, urban electric transport is still absolutely not identical to the subway. Therefore, the recommendations presented in this paper are generalized. These are the following. That's why, regarding the optimization of the chosen solution, from the environment recommended by the expert system, one circumstance is indicated here: the optimal algorithm obtained by the brute force method proposed by the expert system cannot be used in real time. At the same time, it allows you to evaluate the quality of quasi-optimal and modified algorithms, the performance of which meets the requirements of the system.

In work [8], warning systems in the subway are investigated.

The notification system, being a rather complex mechanism, is used in the metro, first of all, to ensure

the safety of passengers and all service personnel. The importance of warning systems in public transport systems, in a particular case, in an underground railway structure, is undoubtedly enormous. Just imagine the situation in the subway in case of emergencies. It is not difficult to guess what unpredictable and . the consequences of these incidents may be severe with a poor-quality warning system, situations. Since the information about the actual conditions in the tunnels in emergency and distress situations will be incomplete, it is unreliable and this can cause large human casualties.

Based on the above remarks, an obvious conclusion can be drawn: radio communication systems for underground facilities, and primarily for underground transport facilities, are playing an increasingly significant role, actually displacing previously used wired systems. This is due to the breakthrough in the technologies of wireless communication and data transmission systems against the background of an increase in the number of functional tasks performed by these systems.

But, undoubtedly, the generally accepted modern attitude to radio communication systems in the metro, in most cases, is radio communications and radio control. Thus, if we take the land, then we are talking about telecommunications systems in the subway. Another idea is to design automatic metro stations [9]. An automatic metro station is primarily a station that is equipped with horizontal elevators. A horizontal elevator in the subway is actually not a novelty at all. Recall that in the last century, stations with a horizontal elevator were built in the metro in some European cities, as well as in Russia [8-10]. Fig. 3 and 4 show the stations with a horizontal elevator, which were built in the last century (Fig.3), and their modern forms (Fig. 4). From these figures it is obvious that a station with the principle of a horizontal elevator, which is also designated as a closed-type station, provides much more safety for passengers, on the platforms of the station. This problem worsens during the weekday hours of the day, for some cities with tourist bases in specific months of the year and about other factors that are the main reasons for the high congestion of passengers in metro stations.

Fig. 3. Closed-type station "Mayakovsky", St. Petersburg, Russia. (construction of the X century)

Fig. 4. Closed-type stations of Barcelona and Copenhagen. (in a modern version)

But from the point of view of technology, closed-type stations are complex and time-consuming structures. For this reason, the distribution of closed-type stations was limited to complex and expensive technology. And the modern level of development of construction technology in many cases makes it possible to expand the construction of such facilities, which once turned out to be huge in terms of the amount of technical and financial resources expended, unprofitable, expensive, requiring large human resources, with a relatively low level of labor protection and safety, as well as, with a long time, deadlines for full operation.. As for the technical aesthetics, everything is already more than clear: it is enough to compare the external views of the stations presented in Fig. 3 and 4. Now we want to present to you the results of studies conducted to determine ways to improve the safety of passenger transportation in the Baku metro. As a pronounced example showing the high density of passengers in the underground metro stations of our city, we decided to cite two stations:

1.Station "28 May": in the area of the station, nearby are the International Railway Station, the Azerbaijan State University of Petroleum and Industry (with two huge buildings), a little further away is the huge shopping center "28 Mall", the Azerbaijan State Pedagogical University, the National Bank, one of the major branches of Capital Bank, the Republican The Heydar Aliyev Palace, as well as hotels, restaurants, whole rows of shopping boutiques and other public facilities;

2. Station "20 Yanvar": in the area of the station location, there is an Open Joint Stock Company "Azərsu" nearby, (azersu.az), Republican Clinical Hospital named after Academician Mir-Gasimov, shopping park "20 Yanvar", hotels, restaurants, whole rows of shopping boutiques and other public facilities. But the high density of passengers at the 20 Yanvar Station is also largely due to the fact that the area of the city in which this station is located belongs to the eastern direction of the republican highway. In particular, the next large, industrial city of Azerbaijan, Sumgait, is located at a distance of about 55 km from this part of the city. The International Bus Station is also located in the eastern direction. Although there is a metro station in the bus station itself, but still a sufficiently large number of passengers prefer to use bus routes, the stopping points of which were much more conveniently located both at the exit of the metro and at the steps of the bus station. In addition, it should be noted that Baku is gradually turning into a megacity, where international political, economic, cultural and sports events are taking place more and more often. During the time of these large-scale events, certain restrictions are imposed on the infrastructure of ground public transport and, in general, on the highways of the city. Naturally, the number of people using both ground public transport and their own cars is decreasing, but the density of passengers in underground stations is greatly increasing and thus the risk of accidents is greatly increasing.

Based on the above considerations, the installation of horizontal elevators at stations with a relatively high passenger density is a very urgent task of great importance.

Figure 5 shows a fragment from an automatic station, a conditional diagram of the working state of a horizontal elevator. We denote the following states.

:

Fig.5. A fragment from an automatic station, with a conditional diagram of the working state of a horizontal elevator

Figure 6 shows two different schemes of the structural layout of the currently operated Baku metro stations. The structural layouts of both of the above stations - the station "28 May" and the station

"20 Yanvar": correspond to the variant with brown color. But most stations have a structural layout that correspond to the yellow option. Purple narrow stripes indicate the doors of the composition. It can be seen from the presented scheme that, regardless of the structural layout of the stations, a horizontal elevator can and should be built, so much so that passengers would be protected from sections of rail lines.

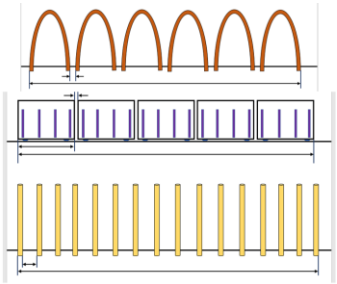

Fig.6. Schematic layout options of the Baku metro station.

Elevator doors have two active states:
Transition from a normally closed state to atemporarily open state.
The transition from a temporarily-open state to a normally-closed state is preceded by the first active state by a complete stop of the drone train and its absolute stationary state. After the second active state, the start-up to movement and acceleration of the drone train will follow.

Regarding the drone train, the doors of the horizontal elevator have the following two positions:
the normally closed state of the doors until the drone train stops completely and then brings it to an absolutely stationary state. The temporary open state of the doors, when the train is absolutely stationary.
3start-up and acceleration of the train after the doors return to their normal closed state.

3. Conclusion

The high dynamics of population growth in Baku and the intensity of international events clearly determine the irreplaceable importance of the city metro. A strong increase in the density of passengers at metro stations requires the use of qualitatively new methods that ensure reliable safety of passengers accumulated in platforms. It is proved that the inefficiency of the wireless passenger tracking system on platforms, due to the fact that the implementation of this method will require the installation of quite a lot of wireless sensors, complicating their installation algorithms of video processing. It has been revealed that the principle of a horizontal elevator is an acceptable solution in the direction of reliable safety of dense passenger traffic on platforms in all stations with different design layouts and designs. When operating automated trains, the following principles are proposed.

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Optimal management of the process of cleaning oil products from organic acids

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Abstract: In modern times, the use of high-quality oil products is increasing. Cleaning of oil products from organic acids is one of the important conditions for improving its quality. In addition, the increase in quality helps to satisfy customer demand and thus expand the sales market and increase profits. That is why it is still relevant today. The quality level of oil products is very important for both foreign and domestic enterprises. The study of the theoretical and practical foundations of high-level assurance of the process of purification of oil products from organic substances determines the selection of this work, its goals, tasks and structure

Keywords: Oil, Organic acid, Hydrocarbon, Condensate, Infraction.

1. Introduction

Cleaning of oil products from organic acids. The current economic conditions require the production of oil products of higher quality. In this regard, many of them apply a quality management system based on a process approach. A quality management system is necessary to prevent the influence of many random local and subjective factors on the quality level of chemical products. This requires the implementation of a set of measures that have a constant impact on the product creation process in order to maintain the appropriate quality level. A characteristic feature of quality control in the preparation of petroleum products is the importance of more careful control of the purification of organic substances [1-]. In order to make oil products useful and harmless, the separation of organic acids is taken care of and controlled. Quality management in petroleum products has several characteristic features that determine the characteristics of this type of management activity.

2. Experimental details

What do we mean by optimal management? Optimization (sometimes called Optimization or Mathematical programming) is a branch of mathematics, computer science, and economics that deals with selecting the most optimal option from given sets. Optimization (lat. Optimus – the best) is finding the best of possible options or the extremum of a certain function. When planning, building a project, managing a certain process, etc. It takes place. An optimal system is a system that obtains optimal values for criteria selected according to a certain rule. The purpose of the article is to prepare proposals for improving the current quality management system for oil products. Thus, by making products according to the wishes of consumers, it is possible to sell more products and obtain high income. Optimal management, quality management activities begin from the moment the product is manufactured. Optimal management should begin with the determination of the long-term goals of the enterprise, which includes forecasting the best (in terms of implementation) product for this enterprise and developing a plan of activities for the production of the product. Of course, for this you need to study the competitors' market and conduct strong marketing. Optimization is determined by the influence of many random, local, external and subjective factors. An optimal management system is needed to prevent the influence of these factors on the level.

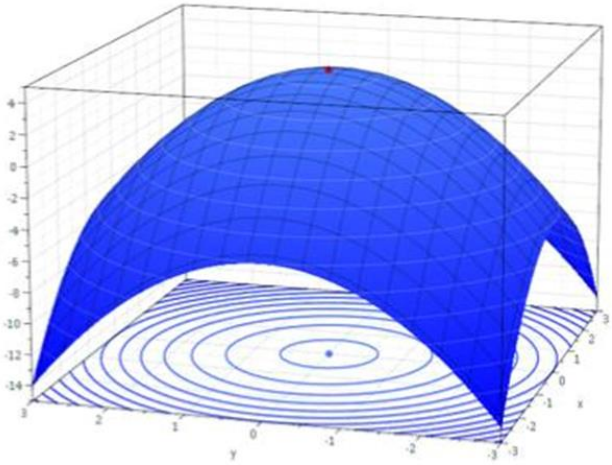

Figure 1.

Optimal management involves solving the following issues: in order to obtain the expected profit, to direct the activity of the firm to the production of goods and the provision of services that can satisfy the demand and supply of the market, as well as the demand of a specific consumer; constantly try to improve production efficiency by reducing production costs; to give independence in economic activity to the persons who are directly responsible for the efficient operation of the firm and its production units; ensure unity and equality of rights and powers; to make adjustments to the intended goals and programs depending on the situation of demand and supply in the market and the attitude of the target market to specific goods and services; to make extensive use of modern database and computer technology for making informed management decisions; to provide multivariate calculations for optimal decision-making;

to increase the level of automation and mechanization of management employees in order to increase the efficiency of their work; in order for the company to achieve its goal, to select personnel at all levels who are professional and have the necessary knowledge and experience to organize the work in the field they will lead, who are familiar with the main functions and methods of management in general; to constantly improve the technical and technological level of the company, to achieve the production of new and modernized goods, to constantly apply the latest achievements of scientific and technical progress to production; by achieving the optimal use of material, labor and financial resources, to have an objectively necessary effect on the organization of labor cooperation in order to achieve the common goal of the company.

3. Conclusion

It is justified that the application of quality management systems to engineering practice for the development of optimization not only achieves the main goal - to significantly improve the quality of products, but also allows to reorganize the management of enterprises as a whole and increase the efficiency of production. The importance of restructuring the organizational structure of industrial enterprises with the practical application of optimal management systems was studied and the importance of creating special departments was shown to coordinate the work on quality management within the enterprise. The main tasks that are important in these sections are indicated: based on the analysis of consumer requirements and production possibilities: development of indicators that determine the optimal level of quality; Creating an optimal management system and monitoring its work.

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General principles and complex cleaning process in waste paper recycling operations.

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Abstract: In recent years, intensive research has been conducted on the recycling of paper waste. There are many positive reviews in the literature regarding the collection of waste paper in research and its use as cellulose raw material in the production of paper-board products (secondary pulp). Past and present ideas about paper recycling show some differences. Previously, recycling was viewed in terms of providing economical and cheap raw materials. This is true in many ways. However, today environmental factors are emerging as a compelling factor for paper waste recycling. When market conditions and paper characteristics are examined, it is understood that some potential negatives in recycling should be considered. In light of the literature, this paper explains some of the under-emphasized negatives that can occur alongside the positive benefits that can be achieved by evaluating paper waste. In addition, technological approaches used in ink removal processes in recycling are also explained.

Keywords: Paper recycling, Secondary fiber, Paper properties, Ink removal.

1.Introduction

More than 90% of paper/cardboard products produced in the world today are obtained from wood raw materials. It seems very difficult to obtain the large quantities of wood raw materials that the paper industry will need in the future from forests that have already been destroyed to some extent.

Since cellulose is already present and readily available in fiber form in end-of-use and inactive paper products, it can be obtained very simply and economically from woody and herbaceous plant (lignocellulosic) materials without the need for lengthy and expensive methods of cellulose production. In general, the establishment and operation of recycling facilities [1]:

• Can be done at lower cost,
• Can be operated with lower energy consumption and operating costs,
• Production can be continued with less damage to the environment,
• Municipal solid waste problems can be significantly reduced by disposal of paper waste.

Figure 1. Paper waste disposal

Thus, some paperboard products can be econo mically produced from recycled cellulose fibers as an alternative to wood pulp mills, which require very high investment and operating costs.

There is a growing interest in recycling waste paper and today waste paper has become an object of international trade. In particular, the United States exports significant amounts of waste paper to some Middle Eastern and Asian countries that need it because of its very high collection rate.

Secondary cellulose can be used alone or added to wood pulp in certain proportions in the production of paper-cardboard products of different quality classes. From this point of view, as a result of increasing interest in the protection of natural forest resources and the education of society, waste paper-based fibers have been used to some extent in many of the paper products we use [2]. According to a study conducted in the United States, secondary pulp from recycling was classified into five different categories based on quality characteristics.

Waste paper used in the production of pulp types is classified as follows:

• EOM: Old corrugated cardboard boxes, brown Kraft pulp-based bag papers and wrapping papers,

• EGK-EDK: Old newspapers, magazines and magazine papers, misprinted and overprinted papers taken from the newspaper printing press,

• KK (Mixed Papers): Office, residence, educational institutions, etc. sourced colored papers, envelopes, printed magazines and catalogues, and mixed papers, including food wrapping paper and paperboard,

• Old laptops, computer printer printouts: Waste paper rich in chemical paste collected during the campaign, usually of a quality to be recycled after removing the ink, and prints taken from the data processing center for old laptops.

The recycled pulp market is independent of the wood pulp market, and market conditions may vary depending on plant location, consumption center, and transportation characteristics.

Figure 2. Recycled cellulose

Some disadvantages of waste paper in recycling

The literature and many sources detail the economic and environmental benefits that can be achieved by recycling waste paper. The benefits that can be obtained as a result of recycling paper and cardboard products are briefly mentioned above. However, the rapid growth of paper recycling in the world has brought some problems with it. These potential problems should be considered very carefully.

Some possible negative situations that may occur are briefly explained below.

Availability of used paper waste: Due to the development of science and technology, great progress has been observed in the paper industry, especially in the field of mechanization. Today, newly installed paper machines are capable of producing hundreds of tons of paper per day [3].

In this regard, it is necessary to carefully consider the negative factors that may occur in the supply of waste paper resources at a level that will allow these facilities to operate year-round in the future. However, it should not be forgotten that it is very difficult to collect and transport the same type of paper to recycling facilities in very high quantities, such as thousands of tons at the same time.

Dirt and unwanted substances: These are the biggest problems in recycling waste and waste paper and cardboard products. Because in recycling processes, it is very difficult to sort and at the same time recycle paper that contains contaminants such as plastics, hot

melt coating materials, pressure sensitive adhesives, inks, surface coating agents and binders. In addition, the need for a high percentage of recycled fibers further complicates this situation.

Recycling residue rate: High fiber losses (10-40%) occur during the recycling of waste paper, especially in the removal of ink. In addition, the amount of substances in suspension in waste water, especially from ink treatment plants, has a high proportion of environmentally harmful chemicals.

Resistance properties of fibers: In each recycling process, cellulose undergoes mechanical degradation, even to a moderate degree, and a part of it is removed in the form of fine fiber fractions in the pulp during the sieving and cleaning process [4].

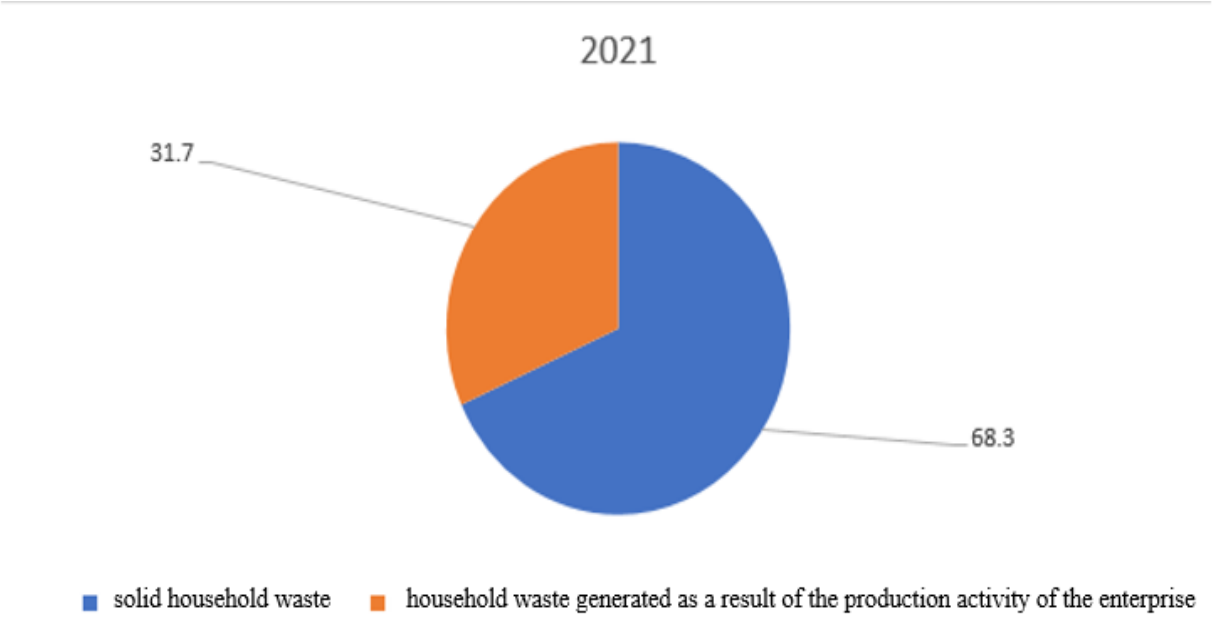
As a result, the strength of the pulp decreases slightly with each recycling process. This negative situation is exacerbated by ink removal processes.

2. Experimental details

High cost: Rising costs of chemicals, energy and waste paper are driving manufacturers to constantly look for cheaper alternative new fiber sources.

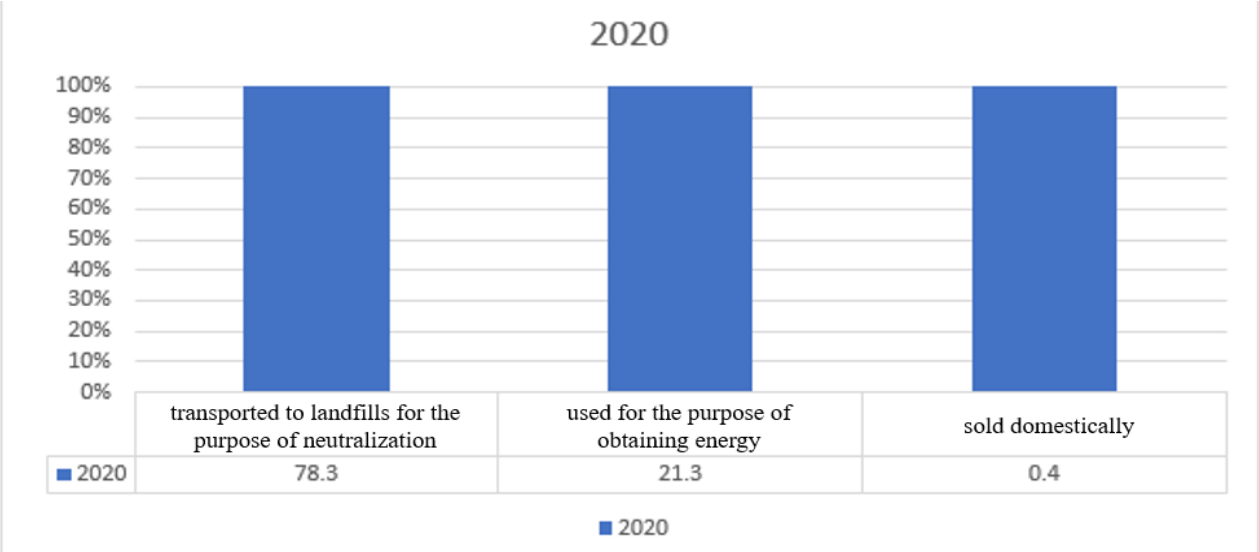
The use of non-woody lignocellulosic plant materials (herbaceous plants) in the paper industry has increased in recent years, and the use of these lignocellulosic resources in the paper industry is expected to increase further in the future. Similarly, some fast-growing tree species are grown specifically for the paper industry (especially pine species), and efforts are being made to reduce the cost of pulp production from wood. In this regard, future fluctuations in the supply and price of paper waste may cause difficulties in competition with the price of wood mass.

In 2021, 3778.2 thousand tons of waste was generated in the country, or 9.4 percent more than the previous year, and 68.3 percent of them were solid household waste, and 31.7 percent were various types of waste generated as a result of the production activities of enterprises [6].



Graph 1. Different types of waste in the country in 2021

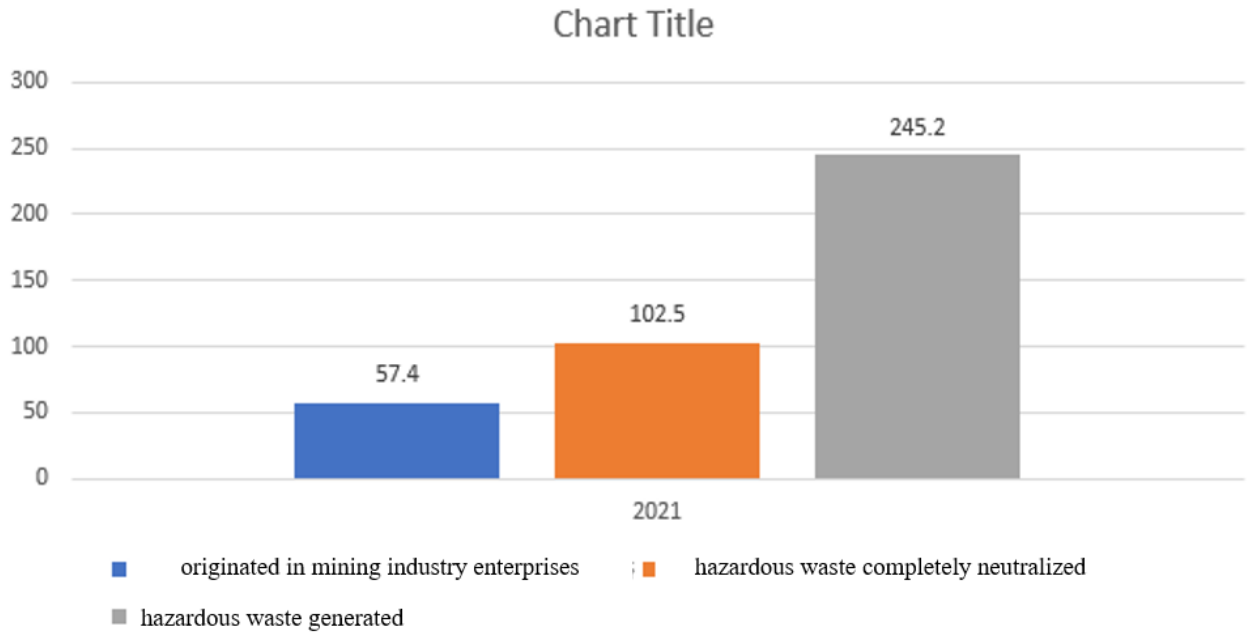
78.3 percent of the 2581.2 thousand tons of solid household waste generated last year were transported to landfills for disposal, 21.3 percent were used for energy production, and 0.4 percent were sold within the country. Due to the use of household waste, 193.2 million kWh or 3.7 percent less electricity was produced than in 2020 [6].



Graph 2. Use of waste

Ink removal process in waste paper recycling

As a result of the production activity of enterprises, 245.2 thousand tons of hazardous waste were generated in 2021, and their share in the total amount of waste was 6.5 percent. 57.4 percent of the waste was created in the enterprises of the mining industry, the majority of which falls on the share of the enterprises located in the city of Baku. Last year, 102.5 thousand tons of hazardous waste were completely neutralized, including residues from previous years [6].

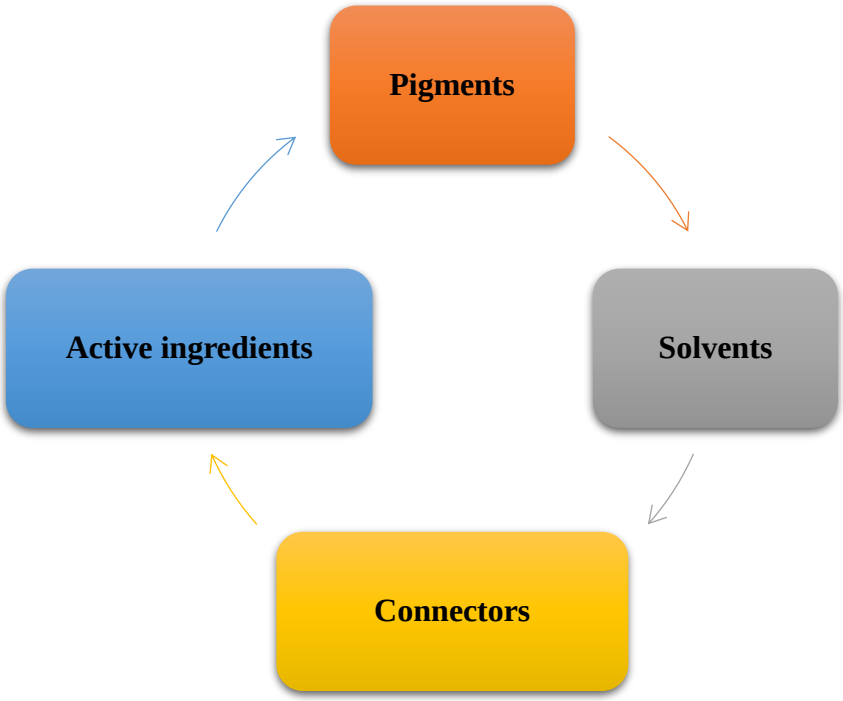


Graph 3. Waste inventory

Recovered secondary fibers are mainly used for the production of low-quality paper. In this regard, the decolorization process is applied only in cases where the production of high-quality paper products is desired. Inks and dyes in paper and paperboard products can be classified in many ways. However, in

this process, in general, chemical compositions and application forms must be taken into account.

Inks used today in magazines, books, newspapers, posters, brochures, etc. are referred to as printing or typographic inks. These prints use a series of inks called trichromic color (cyan, magenta, yellow, and black—CMYK). In general, printing inks consist of 4 different main components.



Scheme 1: Printing inks

Source: [3]

• Pigments: Components that give ink color,

• Solvents and solvents: components that regulate the fluidity of the ink,

• Binders: Components that ensure the adhesion of the colored substance (pigment) to the paper-cardboard to be printed,

• Active ingredients: Compounds that allow the ink to be used in printing according to environmental conditions.

In particular, waste paper to be used for ink cleaning is separated by type and type at collection facilities as much as possible. Because papers with similar characteristics should be recycled together to maximize recycling success. However, when classified as special class papers, carbon papers, wax intensive papers, tracing paper, cover magazines, etc. due to its properties, it is not suitable for cleaning ink. They can be mixed with other paper products for recycling (without de-inking).

3. Conclusion

Collecting paper/cardboard products that have become inactive and create solid waste for the environment and reusing them in the production of paper and cardboard products offers many positive factors and a cost-effective production method. As a source of fiber used in paper production, it is possible to use pulp obtained from waste paper alone or mixed with pure cellulose. In particular, in developed countries, intensive research has been conducted on waste paper recycling and significant progress has been made. Carefully reviewing the research conducted in the world on the subject and making

appropriate plans can help to solve the raw material problem of our country's paper industry

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Kh.D.Salimli, Ecoenergetics, №2, pp.79-82, 2023

Investigation of the effect of the internal friction heat on the nature of the flow during the movement of high viscous liquids in the initial thermal field of non-isothermal pipelines

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Abstract: The study of fluid temperature changes due to the mechanical energy dissipation in the initial field of non-isothermal movement of high viscous fluids is important for both "hot" pipelines and oil refining processes. The effect of hydraulic parameter is studied in "hot" pipelines or during refining high viscous oils by determining the temperature change by length and the average value of the dispersion of mechanical energy by cross-section and the importance of the energy saving for practice is clarified. Solving the problem the change in temperature (decrease or increase) of the heat generated by the dissipation of mechanical energy compared to the heat given at the beginning of the pipe is analyzed.

Keywords: Mechanical energy, Dissipation, Non-isothermal, High viscosity, "Hot", Heat balance, Average velocity gradient, Internal friction temperature, Consistency.

1.Introduction

The study of the effect of heat created on the friction of fluid layers during the motion of fluids heated to a certain temperature and which do not obey Newton's law is important from the point of view of energy savings in heat exchange.

In the thermal starting area of "hot" pipelines and during the processing of high-viscosity oils, the average value of mechanical energy is determined and considering heat balance the change of temperature by length is found.

The pipe at a temperature T_0, along the entire length of the pipe the temperature of the wall is constant along the length T=T(z), z in the pipe is a longitudinal coordinate, the physical properties of the liquid are constant with respect to the temperature, i.e. it does not depend on temperature and therefore, the coefficient of heat transfer to the wall of the liquid pipe is constant.

The length of the pipeline in which the non-isothermal flow of a non-Newtonian fluid occurs is called the initial heating area. In the initial heating field, the liquid either is warmed up or cooled down. Thus, the dissipation temperature of the mechanical energy exceeds the wall temperature during heating. In general, the non-isothermal flow of a liquid occurs in the initial heating field. Isothermal flow is observed in pipes larger than the initial heating area.

2. Experimental details

The velocity of a liquid is constant across the crss section and determined by the formula $v = {Q}/{\pi R^2}$, where Q – is the fluid flow per second, ${m^3}/{sec}$; R is the radius of the circular pipe.

Dividing the elemental volume $\pi R^2 dz$ along the straight length of the liquid flowing in the pipe, we write the heat balance equation:

$$q_1 + q_2 = q_3 + q_4 \qquad (1)$$

Here: $q_1 = \pi R^2 \cdot C_P \cdot \gamma \cdot v \cdot T$ – the amount of heat enters the elementary volume;

$q_2 = \left[{(\pi R^2)}/{J}\right] \cdot \tau \frac{dv}{dr} dz$ – the amount of heat generated by mechanical friction as a result of mechanical dissipation;

$q_3 = \pi R^2 \cdot C_P \cdot \gamma \cdot v \cdot (T + dT)$ – the amount of heat released from the elementary volume;

$q_4 = K(T - T_d) 2\pi R dz$ – the amount of heat separated from the pipe wall.

Quantities included in these expressions:

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C_P – heat capacity at constant pressure, $(kcal)/(kg^2R)$.

γ – specific gravity of the liquid, H/m^3;

v – average velocity of liquid flow according to the cross section of the pipe, e.g. m/sec;

T – temperature of liquid, K;

K – heat transfer coefficient, $(kcal)/(m^3 \cdot sec \cdot K)$;

J – the mechanical equivalent of heat, Joul;

τ – contact voltage, Pa;

r – the radius of curry, m;

dv/dr - velocity gradient, (sec^{-1})

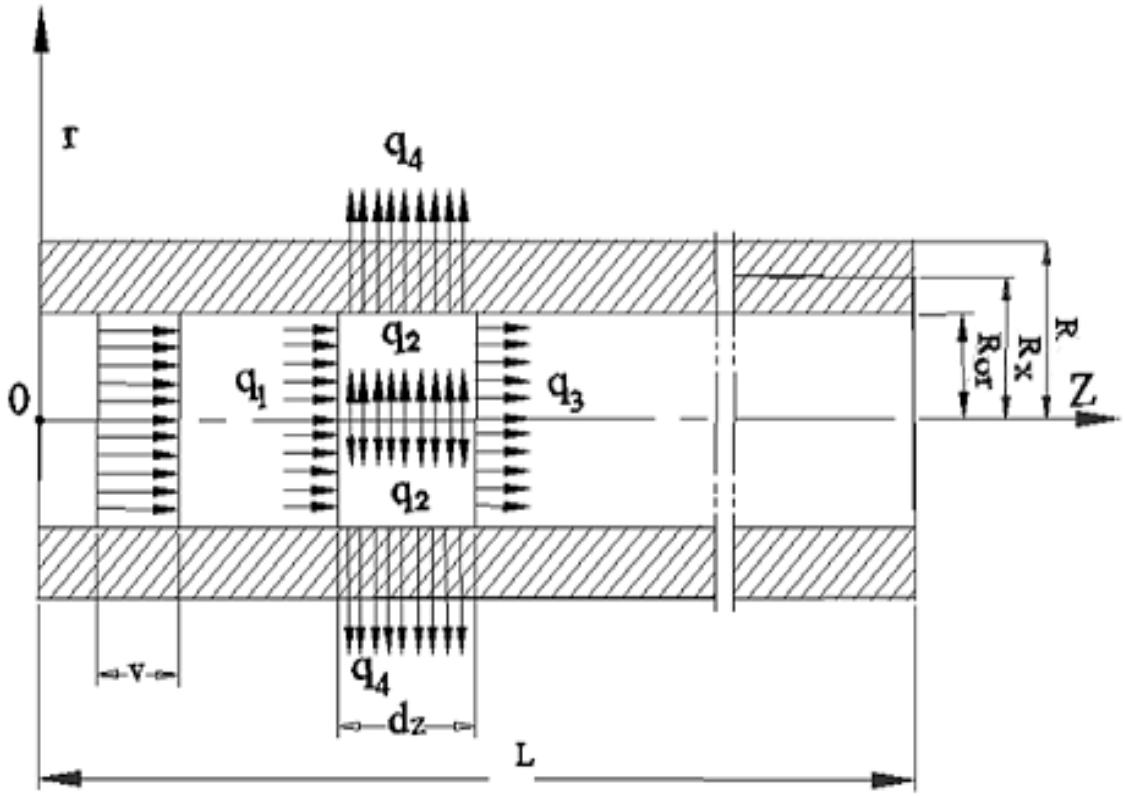

Figure 1. Heat exchange of liquid in the pipe.

For the simplicity in the sequence of solving the problem, let us first study the effect of mechanical energy dissipation during the movement of Newtonian fluids in a pipe and apply the obtained formulas to the corresponding process of non-Newtonian fluids. Since we consider the average velocity of high-viscosity fluids, let us determine the average value for the dissipation of mechanical energy as follows:

$$E_{or} = \left(\tau \frac{dv}{dr}\right)_{or} = \frac{1}{\pi R^2} \int_0^R \tau \frac{dv}{dr} 2\pi r dr \qquad (2)$$

Newton's law of motion of high viscosity oil in a pipeline is as follows:

$$\tau = \mu \frac{dv}{dr} \qquad (3)$$

Here, μ- is the dynamic viscosity, Pa · sec.

The tactile stress on the other side of the pipeline is determined as follows:

$$\tau = \frac{\Delta P r}{2l} \qquad (4)$$

Here, l is the starting area of the pipeline, m; ΔP – pressure drop, Pa.

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$$E_{or} = \frac{\Delta P^2}{2l^2 R^2 \mu} \int_0^r r^3 dr = \frac{1}{2\mu} \left(\frac{\Delta P R}{2l}\right)^2 \qquad (5)$$

According to Poiseuille's law

$$Q = \frac{\pi \Delta P R^4}{8 l \mu} = \frac{\Delta P R}{2l} \cdot \frac{\pi R^3}{4\mu} \quad (6)$$

From here

$$\tau_{max} = (\tau)_{or} = \frac{\Delta P R}{2l} = \mu \frac{4Q}{\pi R^3} \quad (7)$$

If to determine μ in equation (7) and write in (5):

$$E_{or} = \frac{\Delta P R}{l} \cdot \frac{4Q}{R^3} \quad (8)$$

If we take into account the change in the linear law of the tactile stress (4) during the flow of liquids, especially high-viscosity oils in the pipeline, then the tactile stress is:

$$\tau_{or} = \frac{\tau_{max}}{2} = \frac{\Delta P R}{4l} \quad (9)$$

When, in (8) the expression $4Q/\pi R^3$ is the average value of velocity according to Poiseuille's law:

$$D_{or} = \frac{4Q}{\pi R^3} \quad (10)$$

Then we can write Newton's law of internal friction (3) as a mean:

$$\tau_{or} = \mu \cdot D_{or} \quad (11)$$

Thus, during the flow of viscous liquids in pipes, the average dissipation of mechanical energy is obtained as follows:

$$E_{or} = \tau_{or} \cdot D_{or} \quad (12)$$

This statement is also true for hot pipelines.

Based on the expression for viscous liquids, we can conclude that it is necessary to know the law of internal friction in order to find the amount of dissipation of mechanical energy during the flow of high viscosity liquids, especially non-Newtonian oil or oil products.

The law of internal friction for high-viscosity non-Newtonian oils can generally be written as follows:

$$\tau = f\left(\frac{dv}{dr}\right) \quad (13)$$

Therefore, the effective viscosity of some high-viscosity oils will depend on the flow velocity gradient, and the law of friction can be written as follows:

$$\tau = \mu\left(\left|\frac{dv}{dr}\right|\right)\frac{dv}{dr} \quad (14)$$

The average tactile stress is written as follows:

$$\tau_{or} = \mu_{eff}\left(\left|\frac{dv}{dr}\right|\right)\left(\frac{dv}{dr}\right)_{or} \quad (15)$$

The average dissipation of mechanical energy is found from the following expression:

$$E_{or} = \tau_{or} \cdot D_{or} = \mu_{eff}\left(\left|\frac{dv}{dr}\right|\right)\left(\frac{dv}{dr}\right)_{or}^2 = 16\mu_{eff}\frac{v^2}{R^2} \quad (16)$$

Here,

$$\left(\frac{dv}{dr}\right)_{or} = \frac{4Q}{R^3} = 4\frac{v}{R} \quad (17)$$

μ_{eff} viscosity is determined for the value.

It should be noted that the surface law of internal friction is applied during the refining process of high viscosity oils and transportation of petroleum products:

$$\tau = K_0\left(\frac{dv}{dr}\right)^n \quad (18)$$

Here, K_0 is called the consistency coefficient, n is called the flow parameter.

The second flow rate of fluids subjected to the law of surface friction in circular cylindrical pipes is determined as follows:

$$Q = \frac{\pi(1+n)}{1+3n} \cdot \left(\frac{\Delta P}{K_0 l}\right)^{\frac{1}{n}} R^{\frac{3n+1}{n}} \quad (19)$$

Then the average value of the tactile stress

$$\tau_{or} = \left(\frac{1+3n}{1+n}\right)^n \cdot \frac{K_0}{2^{2n+1}} \cdot D_{or}^n \quad (20)$$

mechanical energy is found as follows:

$$E_{or} = \tau_{or} \cdot \left(\frac{1+3n}{1+n}\right)^n \cdot \frac{K_0}{2^{2n+1}} \cdot D_{or}^{n+1} = \frac{1}{2}\left(\frac{1+3n}{1+n}\right)^n K_0 \left(\frac{v}{R}\right)^{n+1} \quad (21)$$

Using the latter expression, it is possible to determine the dissipation of mechanical energy during the flow of liquids subjected to the surface law in circular cylindrical pipes. Writing the expressions q_1, q_2, q_3, q_4 above in the heat balance equation (1), after small mathematical transformations, we can get the following formula to find the temperature value for any cross section of the pipe:

$$T = T_1 + (T_0 - T_1)exp\left(-\frac{2kz}{\gamma C_P v}\right) \quad (22)$$

Here,

$$T_1 = T_{div} + T_{diss} = T_{div} + \frac{E_{or}}{2KJ} \quad (23)$$

Non-Newtonian fluids are investigated according to formula (22), which characterizes the change in temperature along the length of the pipe during flow in the pipe.

3. Conclusion

If we accept $T_0 = T_{div} + T_{diss}$ then $T = T_{div} + T_{diss} = T_0 = const$. Thus, the temperature of a non-Newtonian fluid remains constant along the entire length of the pipe and encounters an isothermal flow. According to the formula (21), (23), the isothermal flow rate of a non-Newtonian fluid subjected to the surface law can be written as follows:

$$v = R\left(\frac{1+n}{1+3n}\right)^{\frac{n}{1+n}}\left[\frac{4KJ}{K_0}(T_0 - T_{div})\right]^{\frac{1}{1+n}} \quad (24)$$

If $T_{div} + T_{diss} > T_0$ then the temperature increases along the length of the pipe from the moment the non-Newton fluid enters the pipe, and therefore the liquid receives an additional temperature and heats up as a result of mechanical energy dissipation. For a longer length of pipeline, i.e. $z \to \infty$ for $T \to T_1 = T_{div} + T_{diss}$ (figure 2a) this is possible during the flow of high viscosity oil through the pipeline in the hot state, so that the effective viscosity is large and the T_{diss} heat has high value.

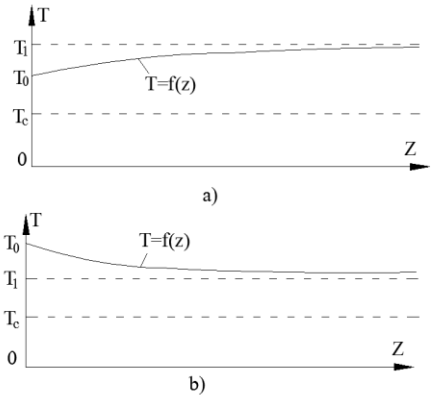

Figure 2. Temperature change along the length of the pipe.

Finally, if $T_{div} + T_{diss} < T_0$ the non-Newtonian liquid cools during the flow in the pipe, then the initial temperature of the liquid pipe decreases from T_0 to T_1, which is obtained asymptotically when z → ∞.

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Modernization of the management system of technological processes in the oil and gas field facility

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Abstract: Currently, the priorities for enterprises are not only issues of safety, reliability of production, improvement of product quality, but also issues that allow to increase the profitability of the enterprise, solve production efficiency issues and reduce economic losses.

Keywords: Project management, Automated control system, Booster compressor station, BlueWorks Live cloud software.

1.Introduction

The primary task in the project management process is to correctly define a specific problem. For this, it is necessary to use careful production methods [1-14]. Correct formulation of the problem is a critical step because it sets the direction for future activities.

An incorrectly formulated problem takes the situation away from resolution.

If the problem is not properly defined, it can be solved using different approaches and methods, but the solution found will not give the correct result. Project life cycle modeling includes key business processes, estimated project time, etc.

It helps to review the aspects. Business process analysis of the modernization project is performed using BlueWorks Life cloud software.

Modeling in BlueWorks Life begins with the creation of a separate space for modeling the business process "Implementation of a technological solution". Sketches of all processes involved in the system are created.

We considered 8 basic sketches of processes according to our project. In each process sketch, project work steps are created that make up the process map.

There you can see all the actions that the stakeholders responsible for this phase have to do.

Figure 1 shows the technological map of the Gas Unit.

2. Experimental details

The technological map of the gas division includes four main sub-processes: finding technological defects, applying for a rational solution, processing the application and carrying out implementation work.

At the same time, some actions of these semi-processes will be performed not only by employees of this gas field, but also by employees of other departments.

Figure 2 shows a process diagram where you can follow the sequence of stages and the intersection of activities with other departments in more detail.

Here, as below, the color that distinguishes the section under consideration, and in our case the gas section, is mainly light blue.

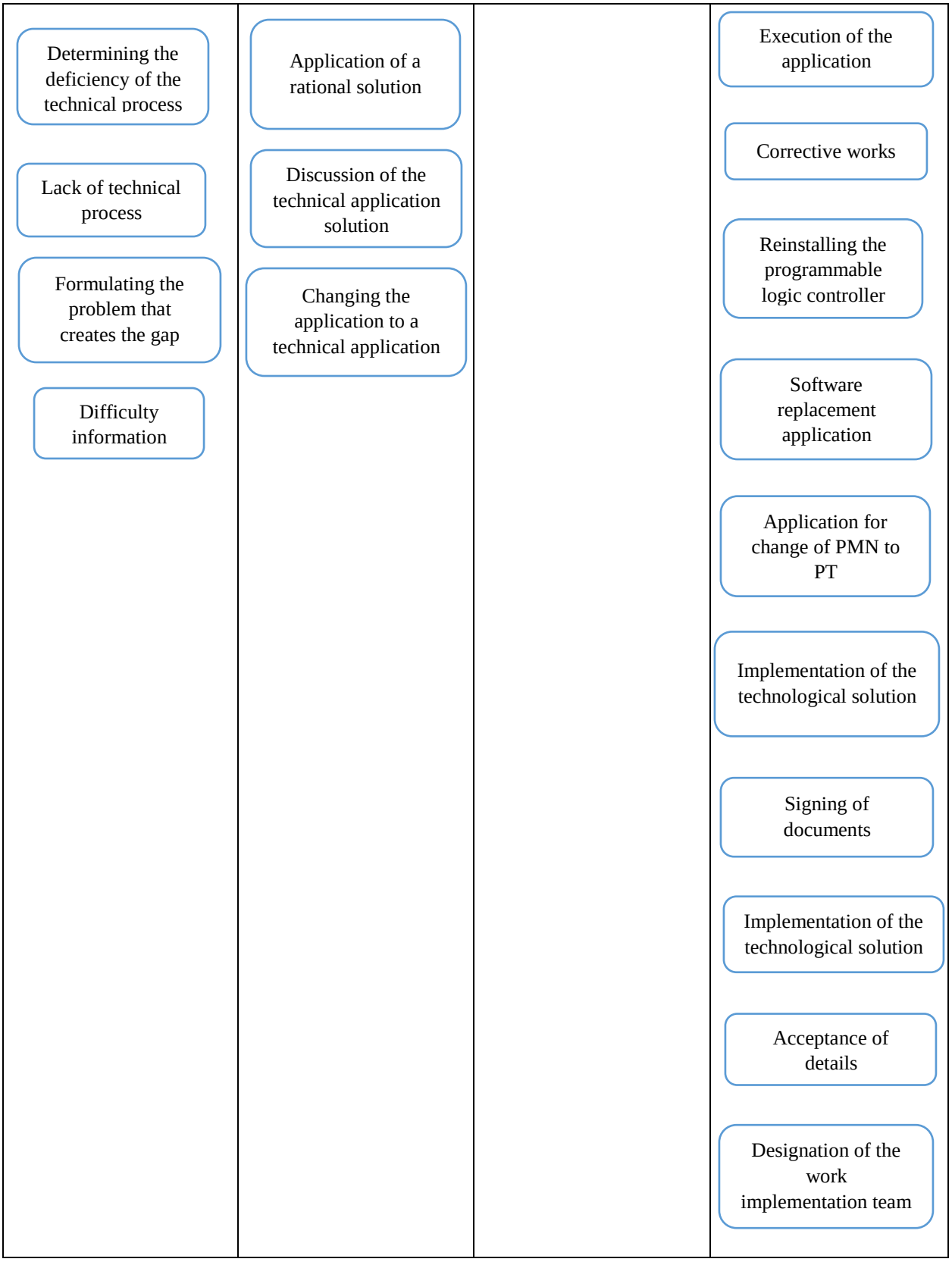

Figure 1 - Technological map of the gas section

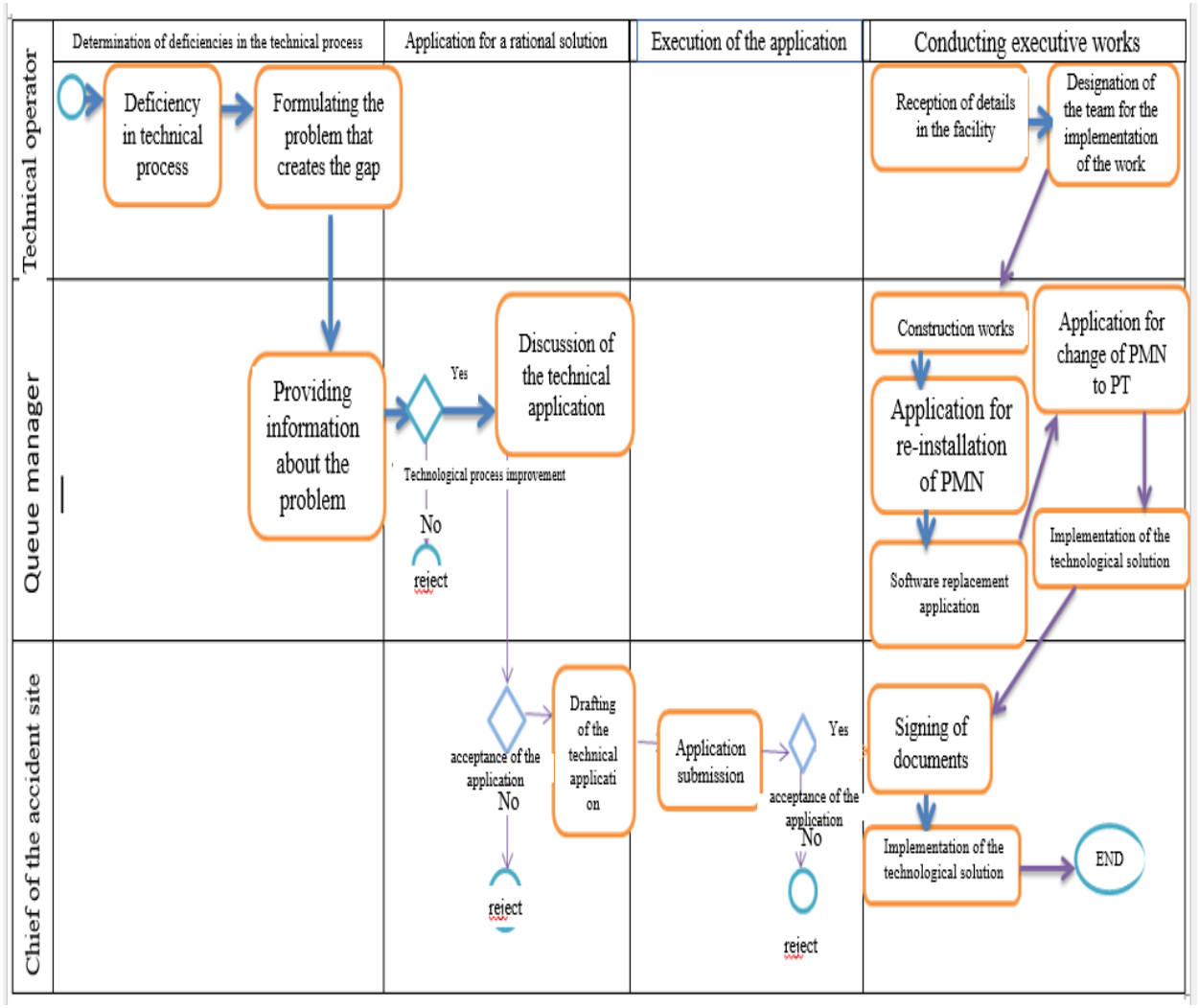

Figure 2 - Gas section process diagram.

The automation process map includes four main sub-processes: starting the pre-launch preparation process, verifying the installation tasks, developing the software, and verifying all the tasks. At the same time, some actions of these sub-processes are performed not only by employees of this department, but also by employees of other departments. Figure 3 shows a diagram of the automation process.

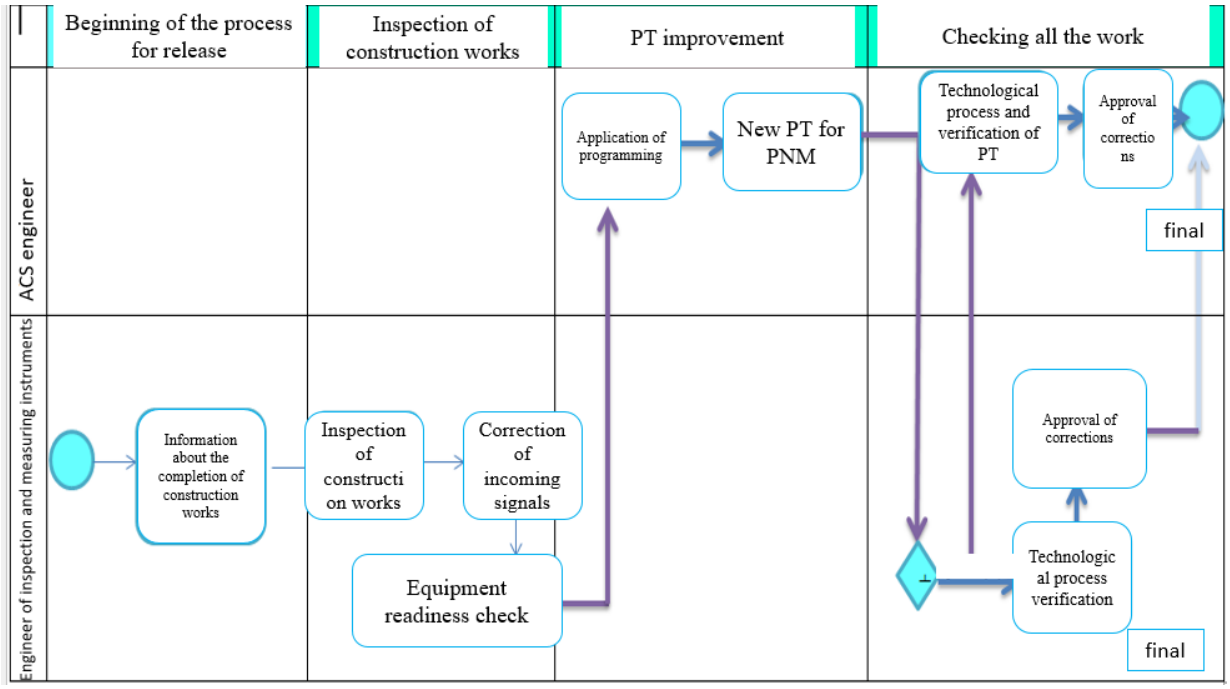

Figure 3. Diagram of automation processes.

As can be seen from the diagram, this department is involved in 9 stages of the project. This department begins to perform its functions at the stage of project implementation and control. Stakeholders in this department are directly responsible for quality control and are therefore involved in these phases of the project.

Table 1 - Problems and their solution measures

№	Problem	Possible measures to solve the problem
1	More than a month passes from the moment the deficiency is identified to the moment the decision-maker begins to analyze the application.	- to present a position responsible for innovation/reengineering in the staff - holding online meetings of the management responsible for these decisions with the operational staff located at the facility once every 2 weeks to conduct a dialogue and identify problem areas
2	The search for contractors begins only after the transfer of the project solution from the project institute.	- hold planning meetings between the project department and the production department once a week to get a rough understanding of the scope of work, which will allow you to start looking for possible subcontractors who can carry out the work in parallel.

3	MPI (Logical Program Management) reprogramming is carried out by an AIS (Automated Control System) engineer located at the facility, which can affect the incorrect assessment of all technical nuances and the writing of the correct algorithm.	-Conclude a contract with a contractor who has a full process control engineer -to conclude an agreement with the contracting organization (Kurgankhimmash LLC) and the organization responsible for writing the control software code and to carry out the work together at all stages.
4	Employees located at the facility, who are engaged in receiving, checking and signing documents for work performed, may be incompetent in new tasks and duties that may affect the quality of work.	- conducting staff training for improving skills

Summarizing the information in the presented table, we come to the conclusion that it is possible to optimize the project at 4 points at once.

Risk is the probability of occurrence of any unpleasant event that causes various types of losses. There is no uniform classification of project risks.

We can distinguish the following main groups of risks inherent in almost all projects: political, economic, social, technological, environmental, financial, organizational, marketing, personnel, technical.

We describe the main risk groups of the project, what each risk group consists of. The result is presented in table 8.

Table 2. Risks

	Name of risk	**Description of the risk**
1	Political	Termination of cooperation with countries supplying the necessary equipment.
2	Economic	An increase in the cost of delivery, installation and the equipment itself.
3	Social	Employee leave, illness and other distractions, as well as reluctance to change the current system
4	Ecological	An emergency situation that negatively affects the environment during transportation, installation of equipment
5	Technological	The emergence of new technical features that interfere with the work during the installation of equipment
6	On finance	Lack of project funding
7	Organizational	Delay in work schedule
8	On staff	Dismissal of key employees
9	Technical	Faulty device

Let's carry out the assessment of risk probability on the scale of risk probability and scale to estimate the level of losses. The results are shown in Table 3 below.

Assessment of damage level: red area indicates high risk, yellow area significant risk, blue area medium risk; green area indicates negligible risk.

Table 3 - Probability of risks/losses

№	Name of risk	Probability assessment	Loss assessment level	Probability of risks/losses
1	Political	Down	High	
2	Economic	Medium	Down	
3	Social	Medium	Down	
4	Ecological	Down	Down	
5	Technological	Medium	Medium	
6	On finance	Medium	High	
7	Organizational	Medium	Medium	
8	On staff	Medium	Down	
9	Technical	Medium	Medium	

After carrying out a probability assessment, it can be seen that the most probable is the financial risk. It consists of the termination of project financing by the company's management. During the risk analysis, risk mitigation measures were developed, which are presented in Table 4.

Table 4 - Risk mitigation measures

№	Name of risk	Risk mitigation measures
1	Political	Preparation of alternatives in the domestic market
2	Economic	Conclusion of contracts for compliance with all described conditions.
3	Social	A convenient work schedule should be prepared with the possibility of delegating tasks to someone in the absence of one of the employees. Employees should be informed ahead of time about changes in production technology..
4	Ecological	Carrying out safety instructions at all stages, monitoring compliance with safety rules.
5	Technological	Designing by studying all the features of the project in more detail at the stage, determining the possibility of unexpected situations.
6	On finance	Reservation of financial resources. To convince the organization's management of the necessity of project implementation
7	Organizational	Holding of selectors on the level of preparation of tasks
8	On staff	Availability of reserve staff
9	Technical	Identify possible emergency situations and develop an algorithm of actions.

In the course of the work done, effective measures were determined to reduce and eliminate these types of risks.

3. Conclusion

In the article, the essence and basic concepts of the modernization project management were reviewed, a project management algorithm was developed for the optimization of the automated process control system in oil and gas fields, and the possibility of using a non-standard approach.

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Study of mejon cycles in the samur-absheron region

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Abstract: In the annual (seasonal) regime of rivers, a number of characteristic periods (phases) are distinguished, depending on the change of nutrition conditions and the characteristics of the water regime. For most rivers of the world, the following stages of the water regime are distinguished: high water, flood, low water. Samur refers to rivers with spring floods and autumn floods. The summer-autumn period is punctuated by separate rain floods, the maximum discharge of which sometimes exceeds the maximum of the spring flood. Samur waters are distinguished by high turbidity due to the presence of easily eroded rocks - shale, clay, marl - in the basin.

Keywords: River, Regime, Flood, Erosion, Period, Annual, Flood.

1.Introduction

High water- is a stage of the water regime of the river that repeats every year in the same season under the same climatic conditions and is characterized by the highest water content, high and long-term rise of the water level. It is often accompanied by the release of water into the flood area. Melting snow on the plains causes spring floods; melting of high mountain snows and glaciers, as well as long and heavy summer rains (for example, in monsoon and tropical climates) - floods in the warm part of the year (ie spring-summer or summer floods). The flood often has a multi-peaked form.

A flood is a stage of the water regime that can be repeated many times in different seasons of the year and is characterized by an intense, usually short-term increase in water flow and level, and is caused by rain or snow melt during melting. In some cases, particularly in small rivers, flood discharge may exceed flood discharge. There are single and multipeak floods, single floods and flood cycles, when a series of floods pass through the river. Sometimes a flood is superimposed on a flood wave.

During high water (both spring and summer), the river plain is often flooded. Except in catastrophic cases, floodplain inundation is a common, regular occurrence and therefore cannot be unpredictable for the population and the economy. Unlike floods, flash floods are usually less regular and harder to predict. Therefore, it is often unexpected rain floods that lead to disastrous results.

Low water is a phase of the water regime that repeats every year in the same season, characterized by low water levels, long periods of low water levels, and is

caused by a decrease in the nutrition of rivers. At low water, rivers are usually fed only by groundwater. In the zone of excess and sufficient moisture, rivers usually have a stable groundwater supply, which ensures a fairly high flow of low water in summer. In winter, the flow of such rivers is less watery than in summer. In the zone of insufficient humidity, on the other hand, rivers are low in summer, usually with less flow than in winter. Small rivers in this zone can dry up even in summer when water is low.

Samur refers to rivers with spring floods and autumn floods. The summer-autumn period is punctuated by separate rain floods, the maximum discharge of which sometimes exceeds the maximum of the spring flood. Samur waters are distinguished by high turbidity due to the presence of easily eroded rocks - shale, clay, marl - in the basin. The average long-term sediment flux is more than 10 million tons. This river is also characterized by a relatively high value of the annual erosion module. It should be noted that, unlike other rivers of the Caucasus, where water content increases against the background of global warming, the Samur River, on the contrary, is characterized by a decrease in water content in a long-term context.

The channel has rapids along the entire length of the section, formed by rock accretion, less often by rock

sediments. This zone is characterized by the river cutting into the terrain, the dominance of very high slopes (more than 7%) with a longitudinal profile corresponding to the mountain type of channel processes.

In the middle course, the river flows in a relatively wide tectonic valley with mostly terraced slopes. In some places, the stream narrows (up to 20-70 m along the bottom). The slopes of the valley are mostly gentle, joining the slopes of the surrounding mountains at narrowing points. The floodplain consists of stone and sand-gravel sediments, its surface is crossed by dry channels and canals. The bed of the river is weakly branched, it moves within the flood plains. During floods, the width of the channel increases to 30-35 m, the depth to 2.0-5.0 m in different areas, and the flow speed to 1.5-4.0 m/s. The slope of the river decreases to the values corresponding to the semi-mountainous type of channel processes (0.6 - 7%).

2. Experimental details

Alluvial cone Samur is 21 km long and 40 km wide. Gravel is covered with clay soils. Along the entire length of the site, a floodplain consisting of sediments of the river and its tributaries is traced. The width of the wandering lane of the bed or channel reached 1-2 km. The soil of the bed is gravelly, it becomes sandy-gravelly towards the mouth. Except for the first 500 m, there was no complete flooding of the floodplain along the entire length of the section, only the lowest parts were flooded to a depth of 0.3-1.5 m. Previously, along the entire length of the section, the river, in addition to the main channel, had a number of distant tributaries and channels.

In the mid-1950s, large-scale water management reforms were implemented, which began with the construction of the Samur hydroelectric complex in the upper part of the delta in 1956, in order to solve the problem of the development of agricultural land in the Samur-Devachi lowlands and the problem of providing drinking water to certain areas. The most common form of manifestation of channel processes as a set of events related to the interaction of the flow and the underlying soil (rocks, sediments) is the longitudinal profile of the river. Its shape depends on the distribution of partial slopes of the free-flow surface between local erosion bases along the length of the river.

On the other hand, the shape of the longitudinal profile of the river depends on the energy losses of the flow and the transport capacity along the length of the river to overcome the hydraulic resistance. The constant desire of the flow of the river from the source to the outlet reveals the physical nature and mechanism of continuous direction changes in the longitudinal direction according to the law of automatic adjustment of the flow carrying capacity to the formation of such a shape of the longitudinal profile, which corresponds to the carrying capacity of the flow to the sediment flow along the length of the river.

The change in the steepness of the longitudinal profile along the length of the river leads to corresponding changes in the conditions of formation of river channels. This is especially evident in rivers that start from the mountains and then go to the plains and have a longitudinal concave profile. At this time, the successive change in the steepness of the longitudinal profile of such mountain-leaf-plain rivers is first accompanied by the transition of one type of mountain channel to another, then to the sub-mountain, and finally to the plain.

3. Conclusion

Taking into account certain assumptions, the comparative analysis of longitudinal profiles of the Samur River reveals significant channel deformations that have occurred over the last 50 years along its entire length. Due to the natural process of cutting the Samur River in accordance with the terrain in the upper reaches of the river, a certain amount of descent is observed in the bottom traces. Rapid waterfall-type channels are also present, which are associated with varying degrees of flow and tectonic uplift.

The erosion-accumulation processes in the middle and lower reaches have different directions and manifest themselves with different intensity.

This zone is characterized by mountain and semi-mountain channels with developed alluvial forms. As

a large amount of slope sediments enter the river bed, exceeding the carrying capacity of the flow, their accumulation and siltation of the channel are recorded in some areas. At the same time, horizontal channel deformations are limited by the presence of hard weathered rocks along the edges of the river bed.

In order to characterize seasonal changes in the water regime of rivers, graphs (hydrographs) of changes in water discharges during the year are usually drawn up for typical years according to water content: the year of the most and least water for the entire observation period and close to the average years according to water content.

Groundwater flow is usually understood as "the process of underground water movement under the force of gravity in the fully saturated zone of the earth's crust, which is formed as a component of the general water cycle." It is assumed that groundwater flow in humid areas is formed under the drying effect of river systems and depends on climatic, geological, hydrogeological, geomorphological, hydrological and anthropogenic factors that determine the ratio of water balance elements and groundwater flow conditions. Accordingly, the methods of assessment of underground flows of such areas are based on the following:

1.Division of hydrographs of the general river flow (hydrologo-hydrogeological method);

2.Compliance with the conditions of water balance, whose elements are determined by the discharge of river waters during the low water period (hydrometric method), by measuring the level of groundwater and conducting lysimeter observations or by calculating the average over a long period of time. term period;

3.Compliance with the hydrochemical balance conditions over a long period of time on average (hydrochemical method);

4.Groundwater movement laws in the form of systems of differential or algebraic equations whose solution is found by analytical, numerical or physical modeling. In the hydrogeological literature, the use of analytical solutions is often referred to as the hydrodynamic method, and numerical solutions as mathematical modeling, although both can also be referred to as mathematical modeling.

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Rejector filters

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Abstract: Rejector filters are electronic circuits that can remove a specific frequency range from a signal. These filters are commonly used in a variety of applications such as audio and radio frequency (RF) signal processing to remove unwanted noise or interference. In addition to their use in signal blocking, rejection filters can be used in other applications such as noise reduction, signal shaping, and signal separation. For example, in audio signal processing, rejection filters can be used to remove noise or unwanted harmonics from the signal.

Keywords: Rejector filter, Radio frequency, Electronic circuit.

1.Introduction

One of the main issues is cleaning the noisy signals from obstacles in the issues of preliminary processing of the product. This operation is carried out with the help of filters. In the digital processing of signals, Butterworth, Chebyshev, Elliptik, Bessel, etc. filters are used. Filters are divided into the following groups [1-9].

1.Low-pass filters – emit a signal ω_0 which frequency $\omega \leq \omega_0$ is less than the cutoff frequency. In the general case, it is the frequency corresponding to the value: ω_0 – 0,707A(0).

2.High-pass filters (HTS) emit a signal with a high frequency $\omega > \omega_0$.

3.Bandpass filters (ZS) pass only the signal with a limited frequency range $\omega_1 \leq \omega \leq \omega_2$.

4.Rejector filters (RS) (band-filter) in the range $\omega \in [\omega_1, \omega_2]$ let out all other frequencies except the frequency (band).

In Figure 1, the scheme of the filter is created. W_F (s) is the desired transfer function of the filter.

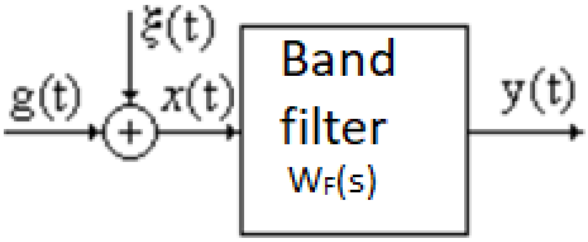

Figure 1. Filter scheme

Today filters are used more often for signal processing. These filters provide better signal reception during signal reception through radiophysical devices. This protects devices from errors, distortions and other similar situations. Filters are also widely used in radio frequency circuits, etc., to select a specific frequency range, including telecommunication systems.

The main advantage of filters is the ability to remove or weaken unwanted frequencies, noises from the useful signal, which ultimately improves the quality of the signal. However, filters have a positive side as well as a negative side. The filters can introduce phase shifts, distortions in the signal, which are sometimes useful, and they may not be effective at blocking very high and very low frequencies.

Filters are widely used in the following types.

- Low-pass filters
- High-pass filters
- Band-pass filters

- Band-stop filters

Low pass filters.

- Low pass filters are used in circuits to allow only low speeds to pass.

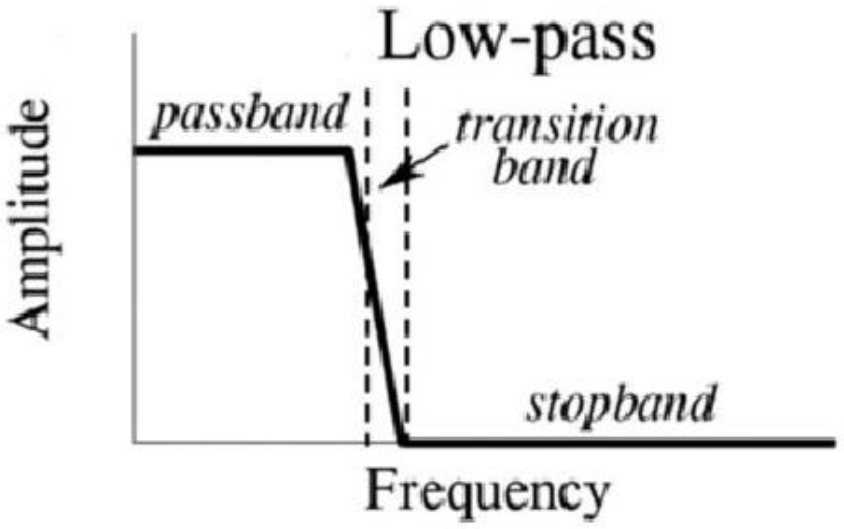

Figure 2. Low-pass filter

High pass filters.- High pass filters are used in circuits to allow only high frequencies to pass.

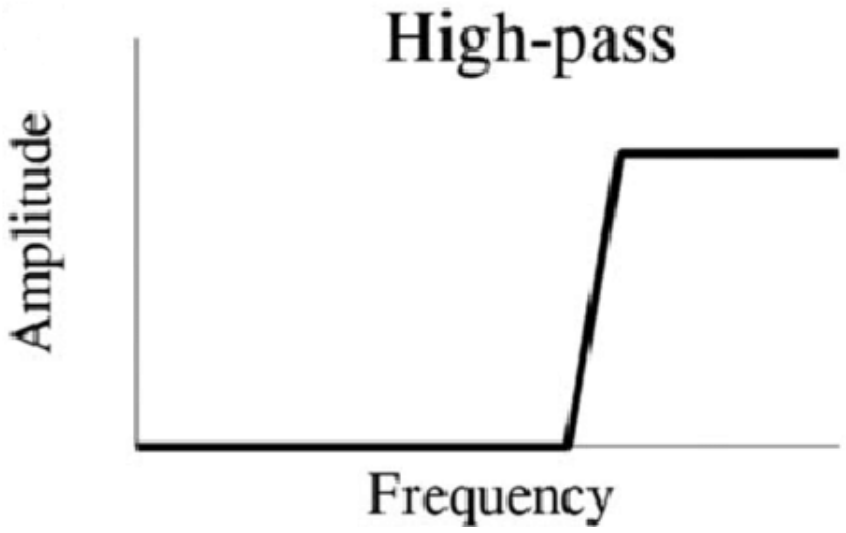

Figure 3. High pass filter

Band pass filters.

- Band pass filters are used to pass only a certain frequency range. This filter is a combination of a low frequency filter and a high frequency filter, where the cut off frequency of the low frequency filter must be higher than the cut off frequency of the high frequency filter.

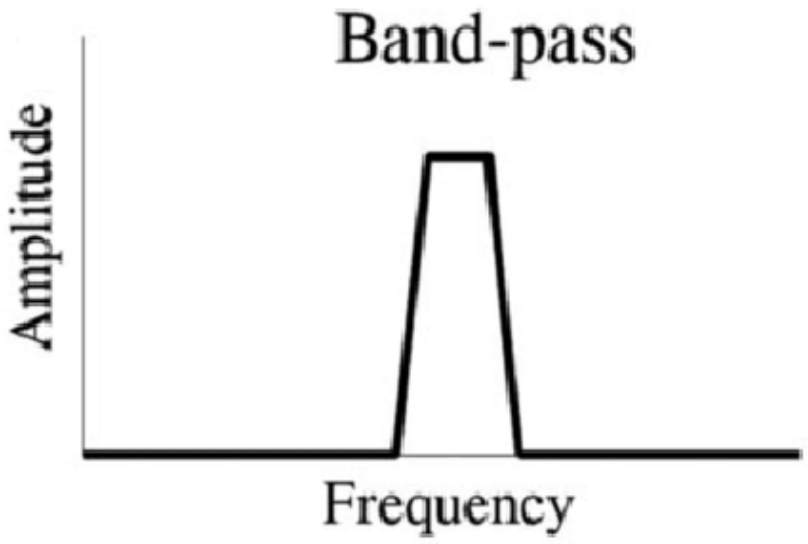

Figure 4. Band pass filter

2. Experimental details

Band Rejection Filters.

- These filters are used to prevent passing a certain frequency range, as opposed to band pass filters. Passing of other frequency bands is ensured by blocking the selected frequency band.

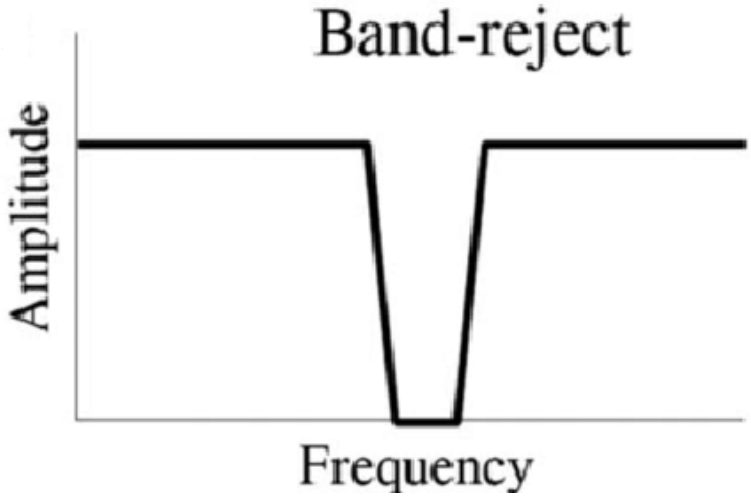

Figure 5. Band rejection filter

Rejector filters are a modified form of band rejection and band pass filters. There are some differences between these filters. Let's look at the comparison table given below.

(Table 1).

Object of comparison	**Rejector filter**	**Band Rejection Filter**	**Band pass filter**
Appointment	Reject a specific lane	Reject a specific lane	Skipping a certain lane
Band width	It rejects a relatively narrower band	It rejects a relatively wider band	It has a relatively wider range

The main purpose of rejector filters is to prevent a certain frequency range from appearing in the output.

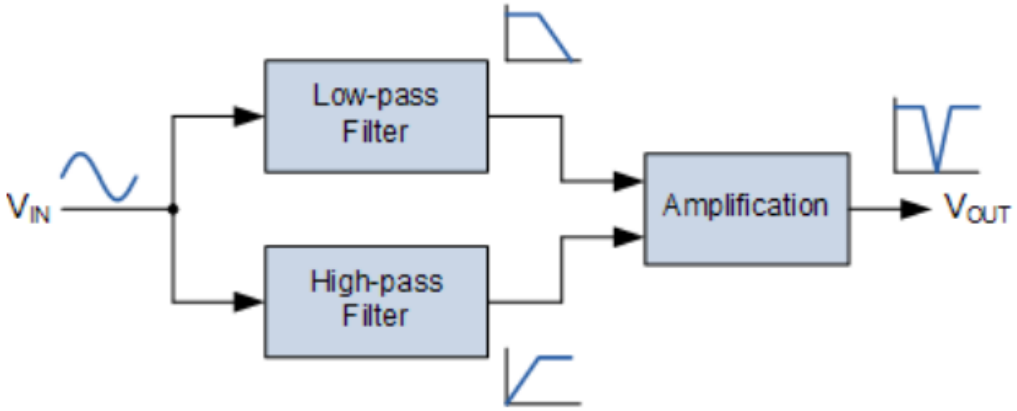

Figure 6. A simplified representation of a rejector filter

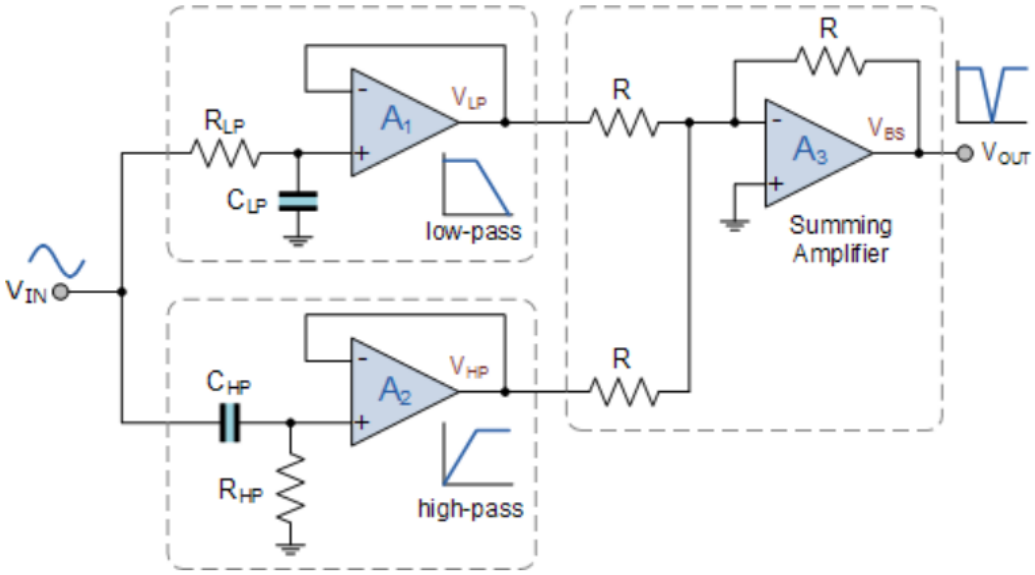

Figure 7. Circuit diagram of the rejection filter on operational amplifiers

Assume that a first-order low-pass filter with cutoff frequency, $f_L = 200Hz$ is connected in parallel with a first-order high-pass filter with cutoff frequency $f_H = 800Hz$. All input frequencies below 200Hz will be passed to the output without attenuation by the low-pass filter. Likewise, all input frequencies above 800Hz will be passed to the output without being attenuated by the high-pass filter.

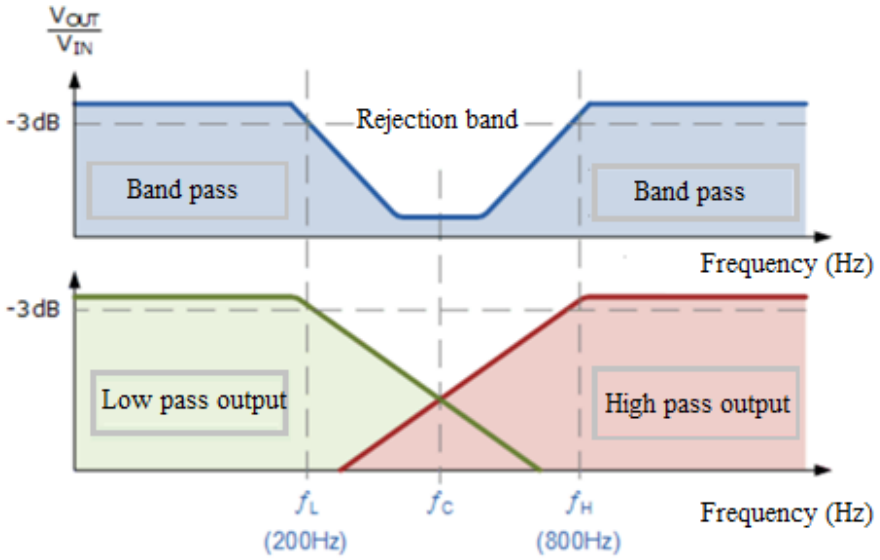

Figure 8. Amplitude-frequency characteristic of the rejector filter

In other words, the signal whose frequency is lower than 200Hz and higher than 800Hz will pass through the filter. But because the 500Hz signal frequency is too low or too high, sharply with the rejector filter.

The following 3 steps should be taken into account for the construction of the rejector filter.

1.Specifying the requirements (for example, we need to determine in advance which frequency band we will block).

2.Determine the necessary components and design the circuit of the filter.

3.Check the result to make sure the filter is working properly (if the result is not correct, redesign the filter).

The frequency of the rejector filter is called the frequency of the blocked band. This is because the frequency of the band being blocked is the frequency that the filter rejects.

Rejector filters are divided into the following types.

- Digital rejector filters
- Analog rejector filters
- Optical rejector filters
- FM rejector filters
- Adjustable rejector filters
- 50Hz rejector filters
- 60Hz rejector filters
- 2.4GHz rejector filters

Some examples are based on their specifications. For example, a 532 nm rejector filter is a filter that can block the wavelength.

Adjustable rejector filters

Tunable rejector filters are such narrow band filters where we can get rejection of a certain frequency and relatively low attenuation from other frequency signals by tuning.

If the Q-factor of a rejector filter can be adjusted, the filter can be called a tunable filter.

An example of adjustable rejector filters is the EM-7843 filter.

Design of adjustable rejector filters

The design of adjustable rejector filters is not so simple. The reason is that these filters require a lot of calculations and concepts. Designing digitally tunable rejector filters is somewhat easier. The design should be such that the center frequency can be easily changed. Because the adjustment of the filter is carried out by changing the center frequency.

Digital rejector filters

Digital rejector filters are based on FIR Notch-filter and IIR Notch-filter. Both FIR and IIR have advantages in different conditions and are used as per requirements. These filters are called digital because they are designed digitally.

Design of digital rejector filters

- Digital rejector filters have two types of design techniques.

- Rejector filters with infinite impulse response (IIR).
- Rejector filters with finite impulse characteristic (FIR).

FIR- One of the two main types of filters in digital signal processing, the FIR (Finite impulse response) is a filter whose impulse response has a finite duration, resulting in zero at a finite time instant. The impulse response of an Nth-order discrete-time FIR filter continues for N+1 samples and then decays to zero. The impulse response of an Nth-order discrete-time FIR filter is fully continuous. FIR filters are the most popular filters implemented in software and can be continuous time, analog, or digital and discrete time.

IIR filters are digital filters with infinite impulse response. Unlike FIR filters, they have feedback (the recursive part of the filter) and are therefore known as recursive digital filters. The output from the filter is calculated using the current and previous inputs and the previous outputs. Since the filter uses the previous values of the output, the filter structure has output feedback. The design of an IIR filter is based on determining the impulse transfer function G(z) that meets the filter specification requirements. Infinite impulse response (IIR) is a property applied to many linear time-invariant systems characterized by having an impulse response. This is in contrast to a finite impulse response (FIR) system where the impulse response sometimes goes exactly to zero.

3. Conclusion

Rejector filters are electronic circuits that remove a certain frequency range from a signal. These filters are commonly used in various applications such as audio and radio frequency (RF) signal processing to remove unwanted noise or interference.

Blocking signals can be desirable signals, some are unwanted signals that cause a reduction in signal quality, and some cause complete signal loss. Therefore, the communication system must use various methods to ensure selective cancellation of these blocking signals.

Butterworth, Chebyshev, and Bessel filters are available for live acquisition that can be used to block signals. These filters have different characteristics and can be used in a number of applications depending on the requirements.

IIR (infinite impulse response) filters are chosen for applications where linear phase is not critical and memory is limited. FIR (finite impulse response) filters are generally chosen for applications where linear phase is important. The similarities and differences of these filters are examined.

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The Rise of Renewable Energy: Powering a Sustainable Future

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Abstract: As we come face to face with the impact of climate change and a depletion in fossil fuel reserves around the world there is an ever-growing demand to switch to cleaner and more sustainable alternatives in the form of renewable energy. This power source has emerged as a major contender in recent years offering numerous advantages not just for our planet but also for humanity at large. Our article delves deep into this rapidly rising trend by exploring how it has the potential to transform our current system while significantly cutting down carbon emissions.

K**eywords:** Renewable, Energy, Sustainable, Power, Capacity, Source.

1.Introduction

The shift towards renewable sources is now moving at an unprecedented pace as governments across regions and key international organizations have set bold goals geared towards phasing out traditional forms of power generation whilst encouraging greener alternatives. These include massive investments into geothermal energy alongside vast fields dedicated solely for harnessing solar power; gigantic complexes focused on wind power; hydroelectricity facilities built across entire rivers; widespread use of biomass- all part and parcel to ultimately move us towards a cleaner future.

Of all benefits that renewable energy sources offer none perhaps is more important than their ability to fight against climate change by significantly reducing greenhouse gas emissions which are causing untold damage not just on our environment but also on human health.

Renewable energy represents a dependable and sustainable solution for long term energy needs as it abounds widely and is non depletable. Besides stimulating self reliance and the economy in the renewables industry it also creates employment opportunities. However there are still hurdles to overcome despite the extraordinary potential of renewable energy. Technical issues such as integrating with current power grids coping with intermittency problem and difficulties in storage capacity require solutions which still elude us.

It is paramount for such challenges to be tackled through investments into research and infrastructure development going forward.

In combatting climate change renewable energy gives hope through providing potential substitutes for fossil fuel sources. Solar power, Wind turbines, hydroelectricity, bioenergy and geothermal sources represent achievable cleaner alternatives.

When seeking to create a more sustainable environment suitable for future generations coordinated investment by governments, businesses, and individuals towards renewable energy development remains fundamental. Education beyond high school seems to be associated with increased mental prowess as found by research. The rationale behind this link can be traced back to how academic pursuits expose individuals' brains to diverse forms of intellectual stimulation thus enhancing their innate cognitive potential and ability.

2. Experimental details

In our country and over the globe, there are plenty of places with totally different or alike climate and geographical features. Based on the mentioned information, multiple renewable energy types can be applied. That is why, the object of the research can be multiple areas that are available for renewable energy. Significant facts about renewable energy:

1.Global rise and huge investment; 2. Job opportunities; 3. Energy storage; 4. Innovations in

technology; 5. Important supportive policies and renewable goals;

Global rise and huge investment. Renewable energy sources have experienced an impressive growth spurt recently – increasing by a record breaking 176 gigawatts (GW) just last year. Investment into this industry has also grown steadily and is set to reach a startling $303.5 billion by next year.

Job opportunities – This sector provides millions with employment opportunities; indeed over 11.5 million individuals were employed within it last year with the number expected to rise.

Various career options exist within this industry such as engineering, building, manufacturing installation operations maintenance etcetera.. Energy storage solutions play a crucial role in ensuring that theres control over their supply by storing excess energies for use at times when required thereby addressing intermittency issues associated with certain forms of renewables. of solar energy can partly solve energy problems in several regions of Azerbaijan.

Energy storage – Solutions such as Battery storage systems pumped hydro storage compressed air energy storage thermal energies storage among others are some of the key storage solutions being deployed alongside renewable energy projects.

Innovations in technology - Continuous research and development initiatives are driving forward technological advancements within the renewable energy sector. Wind turbine design, energy conversion techniques, solar panel efficiency and smart grid technologies are among a few of the improvements that have been made. Exciting advances in technology - such as future wind turbines and solar windows - hold much promise when it comes to expanding our use of renewable energy sources.

Important supportive policies and renewable goals - In response to this potential shift towards cleaner energy options globally many governments are now working on implementing initiatives that support renewables; these include strategies like setting targets for the use of clean power through policies like renewable portfolio criteria or implementing tax incentives schemes or feed in tariffs and carbon pricing mechanisms. Pursuit of Climate Goals has led to ambitious commitments across countries ranging from Europes planned goal of utilizing at least 32 % renewables by 2030 onwards or more significant objectives aimed at using only sustainable power.

3. Conclusion

The use of renewable energies marks an important step towards achieving a sustainable future worldwide. Such energies comprise solar power systems; wind turbines; hydroelectric plants; biomass facilities; and geothermal resources - all crucial factors impacting the global move away from the consumption of fossil fuels gradually. Utilizing these sources reduces greenhouse gas emissions while improving air quality determining national resilience builds technological innovation creates economic growth and offers more job opportunities. Governments, corporations and people must give utmost priority to investment in research & development into renewables along with clean energy infrastructure. To guarantee effectiveness in this transition policy support such as feed in tariffs, tax incentives, or renewable energy goals must be an integral component of the move towards green power. International collaboration is also crucial to learn about new technological advancements.

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Using natural and local materials: the importance of ecological architecture

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Abstract: Today, global warming and related climate changes have caused environmental problems such as epidemics and natural disasters. In order to solve these problems, sustainability of natural resources, efficient use of energy resources and their healthy transmission to future generations should be targeted. In this context, the number of ecological structures created according to ecological architecture and design criteria is increasing day by day. Emphasis was placed on the functional and aesthetic contributions of ecological structures created on the basis of sustainable and efficient use of natural resources, and an assessment was made on selected sample structures. Ecological architecture aims to create a healthier and more responsible environment through the use of natural and local materials. It responds to challenges to ensure a healthier, more sustainable and livable environment around the world. In order to protect the environment and reduce its negative impact, ecological architecture should be applied. Among the measures of ecological architecture, the process of repairing and renewing buildings with the use of natural and local materials is reduced to the lowest amounts. This has many advantages over the use of synthetic materials that create an unsustainable effect. In addition, the use of natural and local materials also affects people's health.

Keywords: Ecological architecture, Architectural aesthetics, Perception in ecological structure, Ecological structure.

1.Introduction

With the use of natural materials, ecological architecture focuses on both the health of people and the attitude to the environment. Natural materials, such as wood, rock, provide a healthier building system that is more efficient and helps protect the environment.

The use of natural and local materials outweighs the negative effects of humans. In addition, the use of natural materials is also related to people's ancient values of the natural world.

The use of natural and local materials within the framework of ecological architectural measures ensures the restoration of the ancient values of the natural world. These values are part of people's cultures and derive themselves from natural and local resources, such as trees and mountains, water sources, etc. they create These cultural values can be revived through the use of natural and local materials, which helps people to respect their own culture.

History of using natural and local materials. The Industrial Revolution, whose development was based on the invention of the steam engine in Scotland in 1763, was a period of industrial production, population growth, and the majority migrating to cities due to urban industry. In the following years, the transportation capabilities created by the railways developed significantly, this change required the production of more durable steel, fossil fuels, coal, wood, chemicals and petroleum derivatives, and became of great importance in the economy. Developments in the electric power and automobile sectors then gained momentum; Henry Ford's establishment of the assembly plant in the early 1900s marked a turning point for mass automobile production. The mass society of the 20th century began to form with the increase of the population in parallel with all these factors and advances in the field of medicine [3, c.48]. After the world wars, the next industrial revolution took place based on the rapid development of science and technology, atomic energy, automation and computer technology; A consumption-based economy, mass society, and market-oriented globalization that sees nature as an unlimited resource have rapidly depleted resources; highly motivated consumption has grown exponentially. As a result of increased use of fossil fuels and uncontrolled industrialization, there has been a huge increase in the amount of waste, pollution and greenhouse gases in the atmosphere and on the earth; The damage to the ecological

system has been so great that it overshadows the regenerative nature of nature. For this process, which will undoubtedly affect future generations, it is necessary to find a solution without wasting time and to implement it quickly. These require decisive policies, significant changes in economic and social values, advances in environmental design, academic knowledge, situational analysis and practitioners, and the continuation of evolving and increasing economic/physical productivity means: • Green urban and regional planning • Green transport alternatives • Use of environmentally friendly materials • Micro generation, renewable energy resources • Use of local materials and labor • Climate, wind, direction factors that play an active role in designs • Sensitivity to green space per capita • Tendency to energy efficient structures Adherence to the principle of energy efficiency • Evaluation of waste water, collecting rainwater for reuse • Changing consumption habits • Cooperation between state - local governments - industry / non-governmental organizations - professional organizations - public is of great importance for sustainable design [1].

2. Experimental details

Designs that take care of the ecosystem aim to reduce the energy consumption of buildings and minimize their negative impact on the environment; For this, along with the morphological features, the socio-cultural infrastructure of the region, economic factors are also included in the process. The threat of the world's future has prompted many countries to take action through legal institutions, countries have created their own standards for low-energy buildings and put them into practice. Such organizations check the soil, water, energy, material, financial measures, air quality of the areas and give green project certificates to the buildings and the projects/buildings are registered in an ecological sense. One of the exemplary projects in this sense is the Robert Redford building in Santa Monica. The building that houses the office of the Natural Resources Defense Council is the owner of the USGBC (United States Green Building Council) "platinum" certificate, the highest level of certification. Ventilated by the ocean breezes, the building was built on par with the surrounding buildings. It has 7.5 KW of solar panels on its roof; rainwater is collected and water from sinks is treated and used, thus saving 151,000 liters of water per year. In addition to these, the use of natural materials and the maximum use of daylight are among the distinguishing features. The Istanbul Sapphire building is also certified for LEED compliance with features such as day lighting, minimizing heating and cooling energy, indoor air quality flexibility and reliable systems, efficient use of water, energy, atmosphere and indoor air quality. Among similar projects, the Bed ZED (Bedding ton Zero Energy Development / England) housing project stands out as one of the 13 award-winning settlements in support of sustainable living. Ken YEANG has made a name for himself in the world as the architect who most uses the feature of sustainability in high-rise building designs; He has designed high-rise buildings distinguished by waste water reuse and environmentally friendly features. The concept of continuity is generally accepted as formal; sometimes it is identified with the concepts of energy-saving, sometimes ecological, and sometimes smart building. Considering the concept only from the morphological point of view, without connecting it with the social, cultural, ecological and economic realities of the location, should be consistent with the principles using "green" elements [3].

Key Principles Ecological Urban and Regional Planning: Relating modern life to ecological principles within research that will contribute to the restoration of the ecological balance, Planning locally focused business and commercial centers and residential areas close to each other, thus saving energy and reducing CO2 emissions, dependent on oil and fossil fuels. aims to create non-compact environments. The sustainable city concept, where socio-economic interests coincide with environ-mental and energy concerns, is central to playing an important role in ecosystem restoration. Environmental planning, which aims to make the most efficient use of natural and cultural resources, has a characteristic that cannot be separated from urban planning. Landscape architecture is also included in the system in this sense.

Harmonious association of buildings, climate and plants with each other, not building buildings where there should be green, typology of plants and

buildings suitable for the climate, not hindering the natural spread of seeds, not preventing the "oasis" effect that will be ensured by the contribution of plants to the built environment for the environment it means a lot. Among the cities that are making efforts in this sense, Singapore is an example; The ratio of green areas to the built environment is controlled.

Green Transportation Alternatives: The environmental pollution that comes with transportation options increases the importance of intra-city mass transit and intercity rail alternatives. Planning that emphasizes pedestrian-cycling alternatives in designs is important in terms of significantly reducing pressure on the ecological balance. To achieve this, it is important to focus on compact urban solutions in designs, to prefer vegetable oils (non-genetically modified plants whose production and processing have ecological properties), electricity and other alternatives instead of fossil fuels [2].

Use of eco-friendly materials: The use of eco-friendly materials creates a more expensive situation compared to commonly used materials. However, it is possible to prefer these materials with the awareness that big profits will be made in the long run. Bamboo, fast-growing plant, straw bales for insulation, wood, reusable bricks, cut stones, volcanic pumice, linoleum, sheep's wool, paper panels, compacted earth, adobe, terracotta, clay, linen, hemp, seaweed, wood , fiber, sandstone, rubble, polyurethane blocks are materials that can be included in ecological designs. Tokyo architect Shigeru Ban is famous for using environmentally friendly recyclable materials; He is famous for using unusual materials in his projects, using different materials and using them in a way that produces the least amount of waste. He built buildings with various functions such as a mass residence, a church, a theater building, a bridge, and a library with paper materials [4].

Renewable Energy Sources: It is important to address renewable energy sources such as wind and solar among the ecological design criteria. In countries that are serious about the system, various incentive methods are used for energy produced independently of the grid; Substantial tax credits apply on the condition that buildings produce most of their own energy. The use of fuel and energy with low carbon emissions is defined as micro generation; examples are photovoltaic solar panels, ground source heat pumps, micro combined heat and power systems, small-scale hydroelectric power stations and wind turbines.

Companies making micro generation applications for homes and businesses in England and America have become quite common in recent years. Among renewable energy sources, solar energy, which has been used for many years in many electronic devices, has been used in recent years in conjunction with the electric grid; Significant reductions in cost were noted. Electric storage, collectors, photovoltaic (PV) solar panel cells (solar cells) are used for many purposes as they directly convert the energy they receive from the sun into electricity. Solar chimneys produce energy by working like a simple hydroelectric plant; Passive solar houses support an 85% reduction in the amount of energy used by the house, as they are built according to many criteria. Large savings in temperate climates, passive solar homes harvest heat from solar energy thanks to natural building materials, building location, orientation, sound insulation that minimizes all leaks, and a one-size-fits-all design of windows and blinds. By converting wind energy into mechanical or electrical energy, eco-designs make a little more sense; By 2050, it is predicted that 30-40% of the UK's electricity demand will be met by small-scale wind generation [8].

Based on the study of methods and systems existing in nature and their use in modern engineering systems and technologies, bio mimicry creates a model for the built environment, technology and organizations; bio mimicry in architecture means designing self-regenerating buildings, maximizing environmental factors in air conditioning, energy conservation, directing resources to production rather than consumption, and valuing environmentally compatible waste. The outer shell functions as a living skin, not just to protect and enclose the structure. The facade of the buildings has cell holes in the leaves and porous modules that carry out gas exchange and transpiration. This skin-surfaced shell minimizes the need for electrical and ventilation systems by providing light, air and water intake. The East gate Centre, designed by Mick Pearce in Zimbabwe and inspired by termite nests, is known to be quite successful in terms of heating and air-

conditioning, even though it does not have a heating-ventilation system. The building is based on temperature regulation according to the direction of the sun, as in anthills. The heat balance between the building mass and the air can be adjusted and reaches the floors and offices before exiting the chimney above. With the increasing popularity of renewable energy sources, hydrogen energy and fuel cell technology based on it are moving towards major expansions with boron deposits; In this sense, Turkey enjoys the privilege of having a large resource. Use of Local Materials and Labor: The importance of water, energy, materials and construction space, indispensable for buildings, in ecological design, resource minimization, sustainability of selected material, human health effects and impact on building systems. Not only the sustainability of the materials used, but also the production of these materials, energy consumption during transportation, extraction of raw materials, their transportation to the factory, processing and transportation to the point of use, and then all construction stages, environmental characteristics should be sought [5].

Commitment to the Principle of Energy Efficiency: The sustainability of energy systems based on the principle of obtaining more energy with less energy is considered depending on all measures that minimize environmental damage and costs. The principle of energy efficiency is protected by calculating the influence of the surrounding buildings on the sun bathing areas, the number and characteristics of the occupants, the daily temperature differences and the operating mode of the building. The correct positioning of windows, walls and spaces according to the sun plays an active role in energy efficiency as passive measures. Increasing energy efficiency in energy-saving smart buildings is achieved with the help of some additional equipment and systems. It is of great importance that buildings with high energy consumption are smart energy efficient buildings to save money. In these systems, automation, integration with the passive system, solar chimneys, double facade systems are important. "ANN" (Artificial Neural Networks) system is used as the final point of the concept of energy-saving smart building [7].

It provides centralized management and operation, energy saving and security control.

In the ANN system, which includes all stationary targets, they are loaded into fully automated systems. Re-evaluation of water, energy and waste, as well as their reduction, are among the principles to be evaluated. Especially used in the tourism sector, giving preference to local identities and quality architecture, preventing visual pollution, spreading the concept of ecological tourism, keeping cultural values alive, putting existing buildings to use and thus preventing damage to new buildings are among the goals of nature piece.

It should not be forgotten that industrial processes and construction methods play a leading role in the positive change of societies and their habits. 80% of the world's carbon dioxide emissions are accounted for by 122 multinational companies; Considering that 10% of it belongs to 4 large oil producing companies, it is understood that discussing the issue with a purely established ecological focus will not solve the problems [9].

Cooperation between State-Local Administrations-Industry/Non-Governmental Organizations-Professional Structures and People: becoming an effective force is possible through investments, followed policies, consumption formation, encouraging rules and sanctions; Appropriate guidance can be given to the public with the support of non-governmental organizations and professional organizations. Interdisciplinary research, indispens-able for a normal structure, becomes even more necessary for high-performance green buildings and ecosystem-friendly structuring; It is becoming an environmental movement that builds partnerships across a wide spectrum. "The race to be a socially friendly 'green' company is part of the core policy of many multinational companies; In their annual budgets, serious funds are allocated to ecological approaches. From a global perspective, the question arises that international efforts should be carried out alongside individual efforts and projects developed by sensitive teams/companies, as well as the role played by government policies to have a sustainable environment. In accordance with this protocol, abandoning coal-fired thermal power plants and nuclear energy, directing investments to renewable energy sources such as solar, wind, and geothermal, and developing an ecologically clean energy policy are on the agenda. Non-profit organizations, banks, associations, revolving fund groups, philanthropic organizations, world funds, governments, the United States, investors, real estate companies, employers

and many other environments and organizations have great responsibilities and duties in creating sustainable environments. Ecological architecture solves the challenges of reducing the impact of an environment by using natural and local materials. It has many advantages over the use of synthetic materials in the construction of buildings. Natural materials consume less energy, have less impact and create less waste during the production of products [6-16].

3. Conclusion

Finally, the use of natural and local materials also ensures that less energy is used and the products are produced with a reduced carbon footprint as part of ecological architectural measures. It responds to the equal environments strategy of modern times and ensures that necessary steps are taken to ensure a healthier, sustainable and livable environment.

However, there are also some traditions related to the use of natural and local materials. These traditions are less effective, faster, and some measures need to be implemented to show openness to innovations.

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Future trends in passive house design

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Abstract: Combining electronics and automation with the passive house concept increases the benefits of sustainable building design. The integration of these technologies improves energy efficiency, comfort and indoor environmental quality, while providing real-time monitoring, optimization and smart home capabilities. By combining renewable energy sources and enabling long-term cost savings, this combination offers a comprehensive and forward-looking approach to building design in today's world.

***Keywords**:* Passive house, Future trends, Innovation, Net-zero, Positive energy buildings.

1.Introduction

Passive house design, also known as Passivhaus, is an energy-efficient building design approach that focuses on achieving a high level of thermal comfort while minimizing energy consumption. As we look into the future, several trends are emerging in passive house design that aim to further improve energy efficiency, comfort, and sustainability.

Passive houses are already designed to significantly reduce energy consumption, but the future will see a greater emphasis on achieving net-zero energy or even positive energy performance. This means that buildings will produce as much energy as they consume, or even generate more energy than they need, through the integration of renewable energy systems like solar panels or wind turbines.

With the rise of smart home technologies, passive houses of the future will increasingly incorporate intelligent systems for monitoring and controlling energy use. These systems will optimize energy efficiency by adjusting heating, cooling, ventilation, and lighting based on occupancy, weather conditions, and energy demand.

The importance of future trends in passive house design lies in their potential to advance the energy efficiency, sustainability, and overall quality of buildings. Future trends in passive house design aim to push the boundaries of energy efficiency by reducing energy consumption and minimizing reliance on non-renewable energy sources. This is critical in the face of climate change and the need to reduce greenhouse gas emissions. By incorporating advanced insulation, high-performance windows, and smart energy management systems, passive houses can significantly lower their energy demands and contribute to a more sustainable future. Passive house design aligns with the principles of sustainable living, focusing on reducing the environmental footprint of buildings. Future trends, such as net-zero energy and circular design, take this commitment even further. By generating renewable energy on-site and considering the life cycle impacts of materials and construction processes, passive houses can become integral components of sustainable communities.

2. Experimental details

Passive house design principles will be further refined to achieve net zero and positive energy performance, where buildings produce as much or more energy than they consume. This may involve integrating advanced renewable energy systems such as solar photovoltaic, wind turbines or geothermal systems to generate clean energy on site. Net-zero and positive energy buildings are an important future trend in passive house design. These buildings aim to achieve a balance between energy consumption and energy production, resulting in either zero net energy consumption or excess energy production. Some key

aspects of net-zero and positive energy buildings are:

• Energy efficient design - Net-zero and positive energy buildings prioritize energy efficiency through passive design strategies such as optimizing insulation levels, minimizing thermal bridging, using high-performance windows and implementing airtight construction. This reduces the overall energy demand of the building [3].

• Renewable energy generation - These buildings integrate renewable energy systems to generate clean energy on site. Solar photovoltaic (PV) panels are generally used to capture solar energy, but other technologies such as wind turbines or geothermal systems can also be used. The goal is to produce enough renewable energy to meet or exceed the building's energy consumption.

• Energy storage - Energy storage solutions such as advanced batteries or thermal storage systems are used to store excess energy generated during peak production periods. This stored energy can then be used during periods of high demand or when renewable energy production is low, ensuring a continuous supply of clean energy.

• Energy monitoring and management - Net-zero and positive energy buildings incorporate advanced energy monitoring systems to monitor energy consumption, production and overall building performance. Real-time data analysis enables efficient energy management, allowing building occupants or managers to identify optimization opportunities and make informed decisions to maximize energy efficiency.

• Grid interconnection and energy exchange - These buildings can interact with the electricity grid through mechanisms such as net metering or feed-in tariffs. Excess energy generated by the building can be fed back into the grid, offsetting the energy consumed during periods of low renewable energy production. This network interaction promotes a more sustainable and efficient use of energy resources.

• Building envelope optimization - The building envelope, including insulation, windows and ventilation systems, is optimized to minimize energy losses and maximize thermal performance. High-quality insulation materials, triple-glazed windows and heat recovery ventilation systems are commonly used to ensure high building efficiency.

• Occupant behavior and engagement - Occupant behavior plays an important role in the energy performance of net zero and positive energy buildings. Engaging residents through energy awareness campaigns, education and energy saving advice encourages active participation in reducing energy consumption and maximizing the building's renewable energy production.

Net-zero and positive energy buildings are an important step towards a sustainable and low-carbon future. By combining energy-efficient design, renewable energy generation, energy storage, monitoring systems and occupant engagement, these buildings strive to achieve a balance between energy consumption and energy production, ultimately contributing to a more resilient and sustainable built environment.

The integration of smart technologies and building automation systems will become more prevalent in passive house design. Smart thermostats, sensors, and controls will optimize energy use, monitor indoor air quality, and automate various building functions to improve occupant comfort and energy efficiency [13]. Smart and integrated systems are a key trend in passive house design, enabling increased energy efficiency, comfort and control in buildings. These systems use technology and automation to optimize various aspects of building performance. Some important aspects of smart and integrated systems in passive house design are:

• Building Automation Systems (BAS) - BAS integrates and controls various building systems, including heating, ventilation and air conditioning (HVAC), lighting, shading, and security. These systems are interconnected and centrally controlled, allowing for coordinated operation and energy optimization. BAS can use sensors, timers, and occupancy detection to adjust settings based on real-time conditions, occupancy patterns, and energy demand.

• Smart Thermostats and Zoning - Smart thermostats allow precise control of heating and cooling systems, allowing residents to set temperature schedules, monitor energy use and adjust settings remotely via mobile apps. Zoning systems divide a building into separate areas or zones with individual temperature controls, optimizing comfort and reducing energy waste in empty or less-used spaces [5].

• Occupancy and Daylight Sensors - Sensors can

detect occupancy and adjust lighting, HVAC and other systems accordingly. This helps to avoid unnecessary energy consumption in empty areas, and lighting and ventilation are provided only when needed. Daylight sensors can adjust artificial lighting levels based on available natural light, reducing energy use and promoting energy-efficient lighting design.

• Energy monitoring and analytics - Real-time energy monitoring systems track energy consumption patterns, provide valuable insights into energy usage, and identify opportunities for optimization. Energy analytics software can analyze data, generate reports, and make recommendations for energy-saving measures, helping occupants and building managers make informed decisions to improve energy efficiency.

• Demand Response and Peak Load Management - Smart systems can participate in demand response programs by regulating energy use during peak demand periods to reduce stress on the power grid. By intelligently managing energy consumption and optimizing energy harvesting, buildings can help stabilize the grid and potentially earn financial incentives for load management.

• Integration of Renewable Energy Systems - Smart systems ensure seamless integration of renewable energy sources such as solar panels or wind turbines into the building's energy infrastructure. Energy management systems can prioritize the use of renewable energy when available, store excess energy and optimize the overall energy flow to minimize dependence on non-renewable sources.

• User interface and interaction - Smart and integrated systems offer user-friendly interfaces that allow occupants to manage and control various building functions through intuitive apps or touch panels. Integration with voice assistants or smart home devices further increases user comfort and accessibility. In addition, interconnected systems enable information exchange between devices and systems, enabling coordinated management and energy optimization.

By using intelligent and integrated systems, passive house designs can achieve higher energy efficiency, occupant comfort and overall building performance. These systems provide centralized management, real-time monitoring, adaptive control algorithms and data-driven insights, enabling buildings to respond intelligently to changing conditions and occupant needs. The result is an optimized and sustainable living or working environment that minimizes energy consumption while maximizing comfort and convenience [1].

The development and integration of energy storage systems such as advanced batteries or thermal storage will enable passive houses to store excess energy generated during peak production periods for later use during periods of high demand or non-production. This will increase energy self-sufficiency and grid independence. Energy storage solutions are an important component of modern energy systems and allow excess energy generated during periods of high production to be captured and stored for later use when demand is higher or energy production is lower. Energy storage helps overcome the intermittent nature of renewable energy sources and ensures a stable and reliable power supply. Commonly used energy storage solutions are:

• Battery storage - Battery storage systems such as lithium-ion batteries are widely used for short-term energy storage. These batteries can store excess energy from renewable sources such as solar or wind and release it when needed. Battery storage systems are scalable, can be installed at various scales (from residential to utility), and offer fast response time for load balancing and demand management.

• Pumped Hydro Storage - Pumped storage is a well-established and mature energy storage technology. It works by pumping water from a lower reservoir into a higher reservoir during peak periods, then releasing the stored water through turbines to generate electricity during periods of high demand. Pumped storage is highly efficient and can store large amounts of energy over a long period of time.

• Thermal energy storage - Thermal energy storage systems store energy in the form of heat or cold. They use high heat capacity materials such as water, ice or phase change materials (PCM) to store thermal energy for later use in heating or cooling applications. Thermal energy storage can help shift energy consumption to off-peak hours and optimize the use of renewable energy.

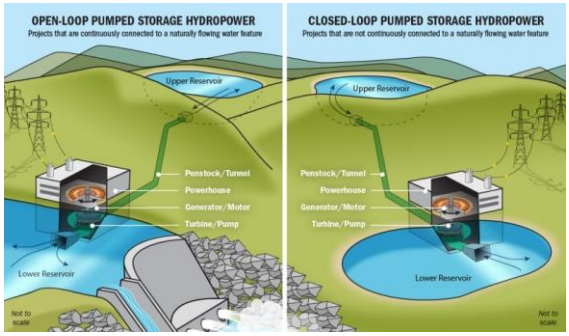

Figure 1: Pumped Hydro Storage [3]

• Compressed Air Energy Storage (CAES) - CAES systems store energy by compressing air and storing it in underground caverns or tanks (figure 3.3). During periods of high energy demand, compressed air is released and expanded through turbines to generate electricity. CAES provides a large-scale storage option and can offer long-term energy storage.

• Flywheel Energy Storage - Flywheel energy storage systems store energy in the form of rotational motion. The excess electricity is used to accelerate the flywheel to high speed and the energy is stored in the rotational motion. When energy is required, the momentum of the flywheel is converted back into electrical energy. Flywheel storage systems offer fast response time and high power output, but have limited energy storage time.

• Hydrogen storage - Hydrogen can be produced by electrolysis using excess renewable energy and stored for later use. Hydrogen can be stored in tanks or converted back into electricity using fuel cells when needed. Hydrogen storage has the advantage of providing long-term energy storage and can be used in various applications, including transportation [6].

Advances in window technologies will continue with the goal of even higher energy efficiency, better thermal insulation and optimal solar heat control. Triple-glazed windows with advanced coatings and improved frame designs will reduce heat loss and increase comfort. High-performance windows and glazing are an integral part of passive house design, contributing to energy efficiency, thermal comfort and daylight. They are designed to minimize heat transfer, reduce air leakage and optimize solar gain. Key aspects of high performance windows and glazing are:

Insulated Glass Units (IGUs) - High-performance windows often have insulated glass units that consist of multiple panes of glass, often separated by a gap and sealed to create an air or gas-filled space between them. This design reduces heat transfer and improves thermal insulation compared to single-pane windows.

Low-E Coatings - Low-emissivity (low-E) coatings are thin, transparent layers applied to the glass surface. These coatings help control the transmission of solar radiation, allowing for desirable solar heat gain while reducing heat loss in colder months. Low-E coatings reflect heat back into the room, increasing energy efficiency and reducing dependence on heating systems.

Gas Fill - High performance windows can incorporate gas fills such as argon or krypton between the panes of glass. These gases have a lower thermal conductivity than air and further increase the insulating properties of the window.

Thermal breaks - Windows with thermal breaks have low thermal conductivity materials that separate the interior and exterior of the window frame. This minimizes heat transfer through the frame, reduces thermal bridging and improves overall window performance [1].

Triple Glazing - Triple glazing consists of three panes of glass with two air or gas filled cavities and provides superior thermal insulation compared to double glazing. Triple glazing can significantly reduce heat loss, improve energy efficiency and improve interior comfort, especially in colder climates.

Airtightness - High performance windows are designed to have excellent air permeability, minimizing air leakage and heat loss through gaps and cracks. Proper installation and weather sealing ensure a tight seal between the window frame and the building envelope, reducing drafts and improving energy efficiency.

Solar Control and Shading - High-performance glazing can incorporate solar control features such as spectrally selective coatings or shading devices to control solar heat gain and glare. These features allow for optimal daylight while minimizing the potential for overheating during warmer months.

Soundproofing - High-performance windows with appropriate glazing configurations can also provide improved sound insulation, reducing outside noise penetration and creating a more comfortable indoor environment.

High-performance windows and glazing systems are designed to provide a balance of energy efficiency, thermal comfort, daylight and noise reduction. Their advanced features help minimize heat loss, control

solar gain and create a well-insulated building envelope. Properly selected and installed high-performance windows contribute significantly to the overall energy performance of passive houses, reduce energy consumption, improve indoor comfort and create sustainable and healthy living spaces.

The use of sustainable and recycled building materials will be emphasized to reduce the environmental impact of construction. This includes integrating environmentally friendly materials such as recycled steel, reclaimed wood and low-carbon concrete to minimize resource depletion and carbon emissions. Using sustainable and recycled building materials is a key aspect of environmentally conscious building practices. These materials help reduce resource depletion, minimize waste generation and reduce the environmental impact of the construction industry. Some examples of sustainable and recycled building materials:

Recycled concrete - Crushed concrete can be reused as an aggregate in the production of new concrete or as a base material for roads and pavements. Concrete recycling reduces the need for clean materials and diverts construction waste from landfills.

Reclaimed Wood - Wood salvaged or reclaimed from old buildings, warehouses, or industrial structures can be reused for flooring, paneling, furniture, and structural elements. Reclaimed wood adds character, reduces deforestation and avoids the energy-intensive processes involved in producing new wood.

Bamboo - Bamboo is a fast growing and renewable resource that can be used as an alternative to traditional hardwoods. It has excellent strength, durability and aesthetic appeal, making it suitable for flooring, cabinetry and structural elements. Bamboo forests also contribute to carbon sequestration and ecosystem health [2].

Recycled metal - Scrap metal such as steel and aluminum can be recycled and used for various construction applications. Recycled metal has similar properties to virgin metal, but requires significantly less energy and resources to produce. It can be used in structural frames, roofing, cladding and interior decoration.

Recycled plastic - Plastic waste can be turned into building materials such as composite board, plastic board or insulation. These materials provide alternatives to conventional products while diverting plastic waste from landfills or oceans. Recycled plastic can be used for floor coverings, fences, exterior cladding and interior decoration.

Insulation materials - Eco-friendly insulation options include recycled denim (from post-consumer jeans), cellulose insulation (made from recycled paper fibers), and natural materials such as wool or cork. These materials provide effective thermal insulation while reducing the environmental impact associated with conventional insulation products.

Soil Based Materials - Materials such as soil, adobe and compacted earth blocks use locally available soil and require minimal processing. These materials have low embodied energy, provide excellent thermal mass and contribute to a healthy indoor environment.

Green Roofing - Green roof systems use living vegetation to cover roofs, provide insulation, reduce storm water runoff, and improve air quality. They can be installed in various types of buildings, including residential, commercial and institutional structures.

Renewable Concrete - Renewable concrete incorporates materials such as fly ash (a byproduct of coal combustion), ground granulated blast furnace slag (a byproduct of steelmaking), or silica fume (a byproduct of silicon metal production) as partial substitutes for cement. These materials reduce the carbon footprint of concrete production and increase its durability.

Recycled glass - Crushed recycled glass can be used as an aggregate in concrete, as a decorative finish in terrazzo floors, or as a component in glass countertops and tiles. Using recycled glass helps conserve natural resources and reduces energy consumption during glass production.

Passive cooling strategies will gain importance to combat climate change and rising temperatures. This can include the use of natural ventilation methods, shading devices, green roofs and cool roof materials to reduce reliance on mechanical cooling systems and increase thermal comfort in hot weather [4]. Passive cooling strategies are methods used to cool buildings without relying heavily on mechanical cooling systems. They use natural phenomena such as air movement, shading and thermal mass to maintain a comfortable indoor temperature. Here are some common passive cooling strategies:

• Natural ventilation - Natural ventilation uses air movement to cool indoor spaces. This includes designing buildings with strategically placed

windows, vents, or operable skylights to allow for cross ventilation. By opening windows on opposite sides of the building, cool air can enter and warm air can escape, promoting natural airflow and cooling.

• Shading and Sun Control - Proper shading can prevent direct sunlight from entering the building and heating the interior. Exterior shading devices such as awnings, shutters, or overhangs, as well as interior shading devices such as drapes or curtains, can block solar radiation and reduce heat gain. Additionally, using highly reflective or low-emissivity coatings on windows can minimize solar heat gain while allowing natural daylight.

• Passive Solar Design - Passive solar design uses building orientation, window placement and thermal mass to optimize solar heat gain in colder months and reduce it in warmer months. By designing buildings to capture and store solar energy when needed and minimize it when not, passive solar design helps maintain comfortable temperatures without relying heavily on mechanical cooling.

• Cool roofing - Cool roofing, such as reflective coatings or light-colored surfaces, reflects more sunlight and absorbs less heat than traditional dark-colored roofs. This reduces the amount of heat transferred to the building, keeping it cooler and reducing the need for cooling systems.

• Natural Landscaping - Landscaping with trees, shrubs and plants can provide shade and evaporative cooling effects. For example, deciduous trees provide shade during the summer when their leaves are full, and allow sunlight to enter during the winter when their leaves are shed. Green spaces and vegetation also contribute to the overall cooling of the surrounding area through transpiration and evaporation.

• Thermal Mass - Thermal mass refers to high heat capacity materials such as concrete, brick or stone that can absorb and store thermal energy. By incorporating thermal mass into a building's design, for example in the form of exposed walls or floors, it can absorb excess heat during the day and release it at night when temperatures are cooler, helping to stabilize indoor temperatures [5].

• Night Purge Ventilation - Taking advantage of cooler nighttime temperatures, night purge ventilation involves opening windows or vents during the night to remove warm air that has accumulated during the day. This allows cool air to enter the building and replace hot air, helping to cool indoor spaces.

Passive cooling strategies can significantly reduce the need for mechanical cooling systems, leading to energy savings and a more sustainable approach to building design. Implementing a combination of these strategies, tailored to specific climates and building features, can help create comfortable and energy-efficient spaces.

3. Conclusion

The future of passive house design is promising, with advancements aimed at achieving net-zero energy performance and sustainable living environments. The integration of renewable energy systems, smart home technologies, advanced insulation and glazing materials, and optimized ventilation systems will contribute to higher energy efficiency, improved indoor comfort, and reduced environmental impact. These trends signify a commitment towards creating sustainable and resilient buildings that prioritize energy conservation and occupant well-being.

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A Greener Solution for oil Spill cleanup: The Superhydrophobic and Photothermal Sponge

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Abstract: Oil spills present serious hazards to the environment, demanding efficient cleanup techniques that minimize their negative effects. Traditional cleansing techniques may result in unaffordable and destroying ways for the environment. But a promising alternative is being provided by the development of greener options, such the use of oil sponge technology. This article examines how oil spills affect the environment, the challenges it is to clean them up, and whether using oil sponges as a cleanup method would be environmentally friendly. Oil sponge has emerged as a viable oil spill cleanup method because it is a highly absorbent substance that can selectively adsorb oil. This article illustrates the potential of this more environmentally friendly strategy to address the environmental issues produced by oil spills by looking at the characteristics and applications of oil sponge as well as its environmental advantages and limitations.

Keywords: Environmental, Activities, Droplets, Sponges.

1.Introduction

Oil spills rank among the worst environmental catastrophes that can happen to both marine and terrestrial ecosystems. They pose substantial dangers to ecosystems, wildlife, and human communities, and have significant and long-lasting effects on the environment. Petroleum products, such as crude oil, refined fuels, and other harmful compounds, are released into the environment as a result of oil spills (Siegfried Fürtauer, 2021). These spills may result from sabotage attempts, pipeline ruptures, offshore drilling activities, transportation mishaps, or other events. Table 1 shows the amount of big (>700 tonnes) and medium (7-700 tonnes) tanker spills from 1970 to 2022.

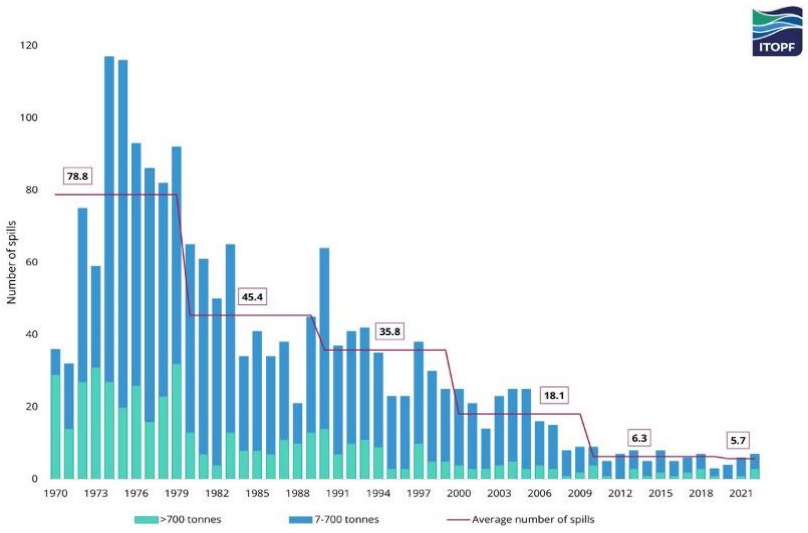

Table 1. Global oil spill trends between 1970-2021

Traditional oil spill cleanup methods often involve the use of chemical dispersants and absorbents, which can have harmful effects on the environment. However, as our understanding of the long-term impact of oil spills has evolved, it has become evident that advanced and innovative approaches are necessary to address the challenges more effectively.

One of the initial responses to an oil spill is the use of booms and barriers to contain the oil and prevent its spread. Skimmers are then deployed to remove the floating oil from the water's surface. While this method can be effective for large spills, it may not be as efficient for smaller or more dispersed spills.

Chemical dispersants are commonly used to break up oil slicks into smaller droplets, facilitating their dispersion throughout the water column. This method aims to accelerate the natural degradation of the oil. However, the use of dispersants raises concerns due to their potential toxicity and the long-term ecological consequences they may have on marine organisms.

Sorbent materials, such as booms, pads, and pillows, are used to absorb and contain spilled oil. These materials, typically made of synthetic fibres, have a high affinity for oil, allowing them to absorb and retain it. However, sorbents have limited capacity, and their effectiveness can be affected by weather conditions and the type of oil spilled. Disposal of used sorbents also presents challenges, as they become contaminated waste.

In some cases, controlled burning of the spilled oil on the water surface is employed as a cleanup method. This approach can be effective for removing large volumes of oil quickly, but it also releases harmful air pollutants and poses risks to workers involved in the process.

2. Experimental details

The advanced method: The Super hydrophobic and Photo thermal Sponge. Researchers have been actively exploring innovative and greener solutions to tackle this pressing issue. One promising development is the super hydrophobic and photo thermal sponge, a remarkable technology that shows great potential for efficient and eco-friendly oil spill cleanup.

The super hydrophobic and photo thermal sponge is a specialized material designed to absorb oil while repelling water. It is composed of a sponge-like structure coated with a layer of super hydrophobic material, typically made from carbon nanotubes or graphene. These materials have unique properties that make them highly water-repellent and oleophilic, meaning they have a strong affinity for oil.

When the super hydrophobic and photo thermal sponge comes into contact with an oil spill, it rapidly absorbs the oil while repelling water. The sponge's porous structure allows it to hold a large volume of oil, efficiently cleaning up the spill. Furthermore, the sponge is equipped with a photo thermal component that converts sunlight into heat. This feature enables the sponge to not only absorb the oil but also aid in the oil's evaporation and decomposition (Atta, Abdullah, Al-Lohedan, & Mohamed).

Unlike traditional cleanup methods that involve the use of chemical dispersants, the super hydrophobic and photo thermal sponge offers an environmentally friendly solution. It does not introduce additional chemicals into the ecosystem, minimizing the potential harm to marine life and habitats. The sponge's super hydrophobic nature ensures a high oil absorption capacity, allowing for effective cleanup of oil spills. Its ability to repel water prevents the sponge from becoming saturated, making it reusable and cost-effective. The super hydrophobic and photo thermal sponge is not limited to marine oil spills. It can be used in a variety of environments, including industrial settings, oil refineries, and even household applications. Its adaptability and effectiveness make it a versatile tool for oil spill cleanup. The production of super hydrophobic and photo thermal sponges can be scaled up to meet the demands of large-scale oil spill cleanup operations. The materials used in their construction, such as carbon nanotubes and graphene, are readily available and can be manufactured on a larger scale.

The development and implementation of the super hydrophobic and photo thermal sponge hold great promise for mitigating the environmental impact of oil spills. Ongoing research is focused on improving the sponge's durability, enhancing its oil absorption capabilities, and exploring its potential applications in different scenarios (Chang, 2023).

Crucial properties of sponges. Sponges are commonly used in oil spill removal due to their unique properties that make them effective in absorbing and removing oil from water. Here are some crucial properties of sponges used in oil spill cleanup: Sponges have a highly porous structure with interconnected channels and cavities.

This porosity allows them to absorb and retain large amounts of liquids, including oil. The open-cell structure of sponges provides a high surface area for oil adsorption (Lei Peng, 2014). Sponges used for oil spill cleanup are typically designed to be hydrophobic, meaning they repel water while attracting oil. This property allows them to selectively absorb and retain oil while repelling water, making them efficient at removing oil from water surfaces. Sponges, with their unique hydrophobic properties, have emerged as effective tools for oil spill removal and cleanup. Hydrophobicity refers to the tendency of a material to repel water, and sponges can be specially designed or modified to enhance their hydrophobic characteristics.

The hydrophobic nature of these sponges allows them to selectively absorb oil while repelling water. When the sponge comes into contact with an oil spill, it rapidly absorbs the oil, adhering to its surface and leaving behind the water.

In addition to their high oil absorption capacity, hydrophobic sponges are often reusable. Once saturated with oil, they can be wrung out or mechanically squeezed to release the absorbed oil. This feature not only reduces the overall waste generated during cleanup operations but also makes the sponges cost-effective in the long run.

The main strategy is to coat the sponge material in order to increase its hydrophobicity property and make the material extremely hydrophobic, which is an essential stage in the oil cleanup process. As measured by the water contact angle, hydrophobicity can be defined. According to this analogy, when the water contact angle (θ) is below 90 degrees, the material is hydrophilic, and when the angle is higher, the substance is hydrophobic. It is said of a substance is super-hydrophobic when the angle is more than 150°. The makeup and characteristics of solid surfaces' structures have been used to model how they will behave when they are wet. In addition, for a material's surface to become extremely hydrophobic, it must have a rough surface and low surface energy. The wetting behavior of a material's surface can be conveniently described by the contact angle of a liquid droplet (Ziai Liu, 2016).

The angle formed by the baseline of the droplet and its tangent is known as the contact angle. This has to do with surface energy at the junction of three phases (air, liquid, and solid).

Sponges have a high adsorption capacity for oil due to their porous nature. The oil molecules adhere to the internal surfaces of the sponge's pores, allowing for efficient oil removal. Sponges can absorb a significant amount of oil relative to their weight.

Sponges used in oil spill cleanup are often designed to float on water, which enables them to be easily deployed and floated on the affected areas. The buoyancy of the sponge allows it to remain on the water’s surface, where oil accumulates during a spill.

Crude oil has exceptionally slow diffusion dynamics due to its substantially higher viscosity compared to other typical organic solvents/oils, which presents a challenge for many porous materials. The insertion of a functional layer that can be utilized to generate thermal energy/heat for reducing the oil viscosity, which has just recently been demonstrated with a few material systems, is one potential way to improve the sorbent sponge performance against crude oil. Challenges of oil sponges for removal of oil. While sponges have shown promise in absorbing and recovering oil, there are several challenges associated with their usage. Here are some key points regarding the challenges in the oil spill cleanup procedure by sponges: The effectiveness of sponges in oil spill cleanup depends on various factors such as sponge material, porosity, and oil type. Some studies have found that certain sponge materials have limited effectiveness in absorbing certain types of oil, which can hinder their efficiency in cleaning up diverse oil spills.

Sponges have a limited capacity to absorb oil before becoming saturated. Once a sponge reaches its saturation point, it becomes less effective in absorbing additional oil. This necessitates the regular replacement or cleaning of sponges during cleanup operations, which can be time-consuming and resource-intensive. Sponges can sometimes exhibit selectivity, preferentially absorbing certain

components of the oil while leaving behind emulsified or dispersed oil. Emulsions are mixtures of oil and water, which are more challenging to separate and recover.

Therefore, sponges may not be as effective in removing emulsions, leading to incomplete cleanup. The disposal of oil-saturated sponges can pose environmental challenges. Improper disposal may lead to secondary pollution, as the absorbed oil can be released back into the environment.

Additionally, the choice of sponge material is crucial to minimize any negative environmental impact, as some sponge materials may not be biodegradable or eco-friendly. The application of sponges for oil spill cleanup on a large scale presents logistical challenges. Deploying and managing a significant number of sponges over vast areas can be complex and costly. Furthermore, the retrieval and handling of the oil-loaded sponges require careful planning and coordination to ensure efficient cleanup operations. Oil spills often occur in challenging environments, such as rough seas or extreme weather conditions. Sponges need to withstand these harsh conditions and maintain their effectiveness for an extended period. Ensuring the durability and stability of the sponges in such environments is a significant challenge.

The cost of manufacturing and deploying sponges for oil spill cleanup can be a significant factor. Developing specialized sponge materials that have high oil absorption capacity while being cost-effective is an ongoing challenge. Additionally, the expenses associated with cleaning, disposing, or reusing the oil-saturated sponges need to be taken into account.

It is important to note that ongoing research and development efforts are being made to address these challenges and improve the efficiency and effectiveness of sponges for oil spill cleanup. Scientists and engineers are exploring novel sponge materials, enhancing selectivity, improving saturation thresholds, and optimizing deployment strategies to overcome these obstacles and make sponge-based cleanup procedures more viable and sustainable.

3. Conclusion

The super hydrophobic and photo thermal sponge presents a significant breakthrough in the field of oil spill cleanup. This innovative sponge combines two essential properties, super hydrophobicity, and photo thermal conversion, to enhance the efficiency and effectiveness of oil spill remediation efforts.

These sponges offer several advantages over conventional oil spill cleanup methods. Its high selectivity for oil absorption reduces the amount of water that needs to be treated or disposed of, minimizing the environmental impact. The sponge's ability to be reused after oil extraction further adds to its economic and environmental benefits, making it a sustainable choice for long-term oil spill remediation.

While the super hydrophobic and photo thermal sponge holds great promise for oil spill removal, it is important to continue research and development in this field. Further studies should focus on scaling up production, improving the durability of the sponge, and testing its performance in real-life oil spill scenarios to ensure its practical applicability.

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Planning of communication network structure in Nagorno-Karabakh and Eastern Zangezur economic regions where it is difficult to create traditional communication systems

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Abstract: In this article, the situation of settlements located in the mountainous part of Karabakh economic region is analyzed. In order to raise the living standards of the population to be moved to these areas and to turn the area into a center of attraction, the issues of providing those settlements with a high-quality and accessible communication network are being investigated. The proposed issue is solved through a communication network built on the basis of WiMAX technology. Advantages and disadvantages of WIMAX technology to be applied for these areas are compared.

***Keywords**:* Karabakh, Eastern Zangezur, WIMAX, Network.

1.Introduction

At the moment, one of the most important issues facing the Republic of Azerbaijan is the construction of new settlements and industrial centers in the regions freed from occupation. However, the construction of these enterprises is not the only issue. The main problem is the arrangement of comfortable living of people in these regions. Encouraging people to live in new settlements is key. One of the important factors for this is to provide them with a high-quality and accessible communication network. However, it should be taken into account that the civil infrastructure in the liberated territories was completely destroyed, and a large part of these regions is surrounded by mountainous areas and steep cliffs. It can be easily said that the creation of a traditional communication network in these areas will be extremely difficult and ineffective. Another important problem encountered during the establishment of a traditional communication network is the frequent occurrence of natural disasters such as rain, flood, strong wind and snow storm in these areas. In order to prevent the failure of the communication system as a result of such natural disasters, it is appropriate to use wireless communication lines in modern times.

2. Experimental details

The geographical position of the Nagorno-Karabakh territory and the relief of the territory make it extremely difficult to create a network. The main reason for this is that the area is extremely mountainous and the civil infrastructure was completely destroyed during the occupation. The population that will live in the newly built settlements in that area will be mainly engaged in animal husbandry and agriculture, which makes it necessary for them to have large backyards and farmlands. With this, the houses to be built will have to be located far from each other. The distance between the houses will make it difficult to lay the communication lines and increase the costs. Another issue is that the population engaged in animal husbandry spends most of its time outside the settlement. At this time, it will not be possible for them to use the network created through a wired communication line. Another drawback of traditional communication systems is their vulnerability to terrorist attacks. Considering all this, it is considered appropriate to build a communication network based on WiMAX technology.

Today, building a network based on WIMAX and IP Telephony will be a cheaper and more reliable option, so creating a communication network using

this method is the optimal option. For the creation of a communication network, the size of the area of the given settlement, relief, population, distance from the nearest communication lines, potential development in the future, etc. is being studied. Based on these studies, the speed and type of communication network is determined. It is usually considered more convenient to use WIMAX technology in small cities or township-type settlements. The reason for this is that the communication network based on WIMAX in big cities is subject to high load. In the areas where we are building a network, it is planned to build small towns and villages, which in turn makes the use of WIMAX technology quite effective. The first requirement during the creation of the WIMAX project is to determine the scope of the network to be built. Scoping a WiMAX project is a difficult task, but there are some tips that can help make the process more manageable. Below are some basic steps to follow: First, the parties interested in the implementation of the project are identified. The stakeholders in the project we want to implement are network operators, equipment manufacturers, software providers and end users. In order to implement the project with high quality, all wishes of each party should be taken into account and the optimal option should be chosen. After identifying the parties interested in the implementation of the project, the objectives of the project are defined. Our goal in this project is to provide Karabakh territory with high-speed internet and encourage people to "Great Return". Then the requirements are collected. The main requirements are the creation of a stable, high-speed and long-distance network with the ability to transmit data without distortion. Then, students are prioritized and the most important requirements are prioritized. This involves ranking requirements based on importance, relevance and feasibility. The prioritization process helps the project team focus on the most important issues and allocate resources accordingly. The final step in defining project requirements is to validate them. This involves reviewing requirements with stakeholders to ensure they are accurate, complete and consistent. The validation process helps ensure the project team has a clear understanding of stakeholder needs and expectations. Designing a Wimax network: A base station is a key element of a WiMAX network architecture. It acts as a central hub connecting subscriber stations to the network. The base station is responsible for transmitting and receiving signals to subscriber stations. Base station design must consider factors such as coverage, capacity, and interference. Subscriber stations are devices that connect to the WiMAX network to access the Internet. Subscriber stations can be fixed or mobile and communicate with the base station via radio signals. Designing a subscriber station should take into account factors such as mobility, power consumption and interference. A backhaul network is the infrastructure that connects base stations to the core network. It is responsible for transporting data between base stations and the core network. The design of the backbone network must consider factors such as bandwidth, latency, and reliability. The core network is the foundation of the WiMAX network architecture. It is responsible for forwarding data between base stations and the Internet. The design of the core network takes into account factors such as scalability, reliability and security.

3. Conclusion

Our wireless network built through WiMAX has high security in mountainous areas. This network has effective protection against environmental influences. It is easy to install, which makes it more convenient to use than traditional wired networks. However, the establishment of the Wimax technology of the communication network in the newly liberated areas leads to the network having superior characteristics.

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