ENERGY SAVING AND EFFICIENCY ISSUES AND A SYNERGETIC APPROACH TO THEIR SOLUTIONS

Qosimov Oybek Abdumannon o‘g‘li
Andijan State Technical Institute
E-mail: oybekqosimov1998icloud.com@gmail.com
Karimov Islombek Lutfillo o‘g‘li
Andijan State Technical Institute
Raxmatullayev Shamsiddin Hakimboy o‘g‘li[3]
Andijan State Technical Institute
ORCID: [0009-0006-5504-6980]

Abstrakt:In Uzbekistan, the scientific renewal of methods and means of energy use in the fields of industry, construction, housing and communal services is an urgent issue today. In our opinion, to solve this issue, it is necessary to start by launching alternative energy sources and creating new efficient mechanisms based on the scientific foundations of energy. Energy saving issues are one of the most complex tasks. We all know that solving this issue is becoming increasingly difficult at the household, neighborhood, city, regional and national levels. Today, energy shortages are becoming a global problem, like ecology. The world community is approaching this issue as a vital necessity. We understand that it is important for all countries to work together to solve these issues with the help of science and technology.

Key words : energy , industry, metallurgy,efficient ,artificial intelligence , renewable energy sources , bioenergy .

Annotatsiya: O'zbekistonda sanoat, qurilish, uy-joy kommunal xo'jaligi sohalarida energiyadan foydalanish usullari va vositalarini ilmiy jihatdan yangilash bugungi kunning dolzarb masalasidir. Bizning fikrimizcha, bu masalani hal qilish uchun muqobil energiya manbalarini ishga tushirish va energiyaning ilmiy asoslariga asoslangan yangi samarali mexanizmlarni yaratishdan boshlash kerak. Energiyani tejash masalalari eng murakkab vazifalardan biridir. Biz hammamiz bilamizki, bu masalani hal qilish uy, mahalla, shahar, viloyat va milliy darajada tobora qiyinlashib bormoqda. Bugungi kunda energiya tanqisligi ekologiya kabi global muammoga aylanmoqda. Jahon hamjamiyati bu masalaga hayotiy zarurat sifatida yondashmoqda. Ushbu muammolarni ilm-fan va texnologiyalar yordamida hal qilish uchun barcha mamlakatlar birgalikda ishlashi muhimligini tushunamiz.

Kalit so'zlar: energetika , sanoat, metallurgiya,samarali ,sun'iy intellekt , qayta tiklanadigan energiya manbalari , bioenergetika .

Аннотация: В Узбекистане сегодня актуальным вопросом является научное обновление методов и средств использования энергии в промышленности,

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строительстве, жилищно-коммунальном хозяйстве. По нашему мнению, для решения этой проблемы необходимо начать с внедрения альтернативных источников энергии и создания новых эффективных механизмов, основанных на научных основах энергетики. Вопросы энергосбережения являются одной из самых сложных задач. Мы все знаем, что решить эту проблему становится все труднее на бытовом, районном, городском, региональном и национальном уровнях. Сегодня нехватка энергии становится такой же глобальной проблемой, как экология. Мировое сообщество относится к этому вопросу как к жизненной необходимости. Мы понимаем, что для всех стран важно работать сообща над решением этих проблем с помощью науки и технологий.

Ключевые слова: энергетика , промышленность, металлургия, эффективность ,искусственный интеллект , возобновляемые источники энергии, биоэнергетика.

Introduction.

Today, many countries of the world pay attention to the problem of energy saving and energy efficiency as an urgent issue. In the 70s of the last century, an energy crisis occurred in European countries and the United States. In Asian countries, increased competition between manufacturers also increased attention to energy saving. At that time, a large-scale state policy was adopted as a rational use of primary fuel and energy resources, and attention was paid to solving the problems of obtaining electricity and heat mainly from oil and natural gas as an important task. We know that each country organizes its work based on its existing conditions. In the 21st century, environmental problems and the depletion of traditional energy resources are creating global problems. Therefore, today, the development of energy saving and the solution of problems of increasing energy efficiency require the joint development of science and technology of the countries of the world. Scientific renewal of methods and means of energy use in Uzbekistan in the fields of industry, construction, housing and utilities is an urgent issue today. In our opinion, to solve this issue, it is necessary to start by introducing alternative energy sources and creating new efficient mechanisms based on the scientific foundations of energy.

International experience. According to the Organization for Economic Cooperation and Development (OECD), 70 percent of energy resources are wasted. Countries around the world are taking scientific and technical measures to solve this problem. According to the International Energy Agency (IEA), 20 countries that are members of this organization have adopted energy saving programs, which indicate the necessary measures for energy saving and indicators for their control.

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Experience of Uzbekistan. Increased attention is being paid to improving energy efficiency in economic sectors and social spheres, in particular in energy, metallurgy and water management, strengthening research into renewable energy sources, developing the integration of science, education and production, as well as strengthening mutual scientific and creative and international relations between scientists. The Republic of Uzbekistan was one of the first among the CIS countries to adopt a law on the efficient use of energy. This law serves as a legal basis for the use of fuel and energy resources and the efficient use of all types of energy in all sectors of production.

Denmark's experience. Denmark initially focused on optimizing the economic structure of energy resources, using state subsidies and financial leverage. This country mainly used oil products for heat supply. Therefore, the import of this product from abroad became a factor hindering the development of the country's national economy. Based on the initially developed plan, measures and measures were developed to reduce this negative factor, which resulted in a halving of heat supply costs over 16 years.

German experience. Germany initially paid attention to the issues of heat preservation in buildings. In 2001, it increased attention to the production of energy-saving devices. It organized work on the practical implementation of methods and tools for optimizing the parameters of hot water supply systems and heating devices. To ensure energy efficiency, work was directed to the use of alternative energy sources and modern technologies.

Japanese cost-effective technologies. **The Fujisawa Sustainable Smart Town** is being built in the southwest of Tokyo . This city consists of houses equipped with modern electronics, and it is called a “Smart City” in reference to humans. The layout of the houses in it attracts attention with its location in such a way that it does not block the sun. This energy-efficient city project is being tested. It was found that the equipment, consisting of an electric generator, water heater and electric batteries, developed in Japan, can reduce electricity consumption by 30% and smoke emissions into the atmosphere by 70%. With the help of this project, it was found that it is possible to save 30% of water by using rainwater for household purposes and introducing water-saving technologies in order to reduce the waste of drinking water .

It is known that due to the oil crisis of 1973, scientific and practical work on energy conservation was also started in Japan. This work initially began with solving energy conservation issues in the construction of new houses. In 1980, new energy conservation standards were developed. According to them, it was specified to reduce the energy consumption for heating in residential buildings and public

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buildings by 40%. New structures were introduced into the structure of the rooms of the house to ventilate the room in hot weather and to preserve heat in cold weather, *and* an electric generator and a water heater that works using the electricity it generates, as well as devices for storing excess electricity - batteries, are being installed outside the house (see Figure 1).



Figure 1. The figure shows, from left to right: an electric generator, a water heater, and a battery.

The capacity of the yard power plant does not exceed 750 kW. It is equipped with electric batteries, which are charged during the day and can be used in the evening . Control is carried out using electronic devices. The ENE-FARM *Panasonic* electric generator extracts carbon monoxide and pure hydrogen gas from natural gas and water vapor. It passes it through a heating element with oxygen from the air and converts it back into water. The heat and electricity generated as a result of these processes are used to heat houses and water in them and to provide household services. Experts are also considering the possibility of storing excess electricity in electric batteries or selling it to electricity companies.

Japanese electronics are known for their high quality. Electronics are equipped with artificial intelligence tools, which are widely used in the following tasks:

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1. The washing machine determines the detergent consumption. To do this, it determines and uses the water temperature and volume depending on the degree of soiling of the item.

2. When there is someone in the house and the temperature is low, the toilet seat temperature increases.

3. It adjusts the brightness of the TV screen based on the level of light in the room and turns off the TV when no one is around.

Solar cells, which convert light into electricity, were originally used only in space, but their efficiency has now been increased, allowing them to be used on Earth as well. However, problems caused by weather, wind, and dust remain to be solved.

Electrical energy efficiency and savings

energy saving activities on a scientific basis, we will focus on the relevant part of the terms and concepts approved by the World Energy Council.

1. An energy chain is the path of energy from its origin to its use (Figure 2).

2. Energy efficiency is a set of measures taken to **ensure the efficient use** of energy resources , and in economic terms, it is understood as measures aimed **at saving electricity** in production .

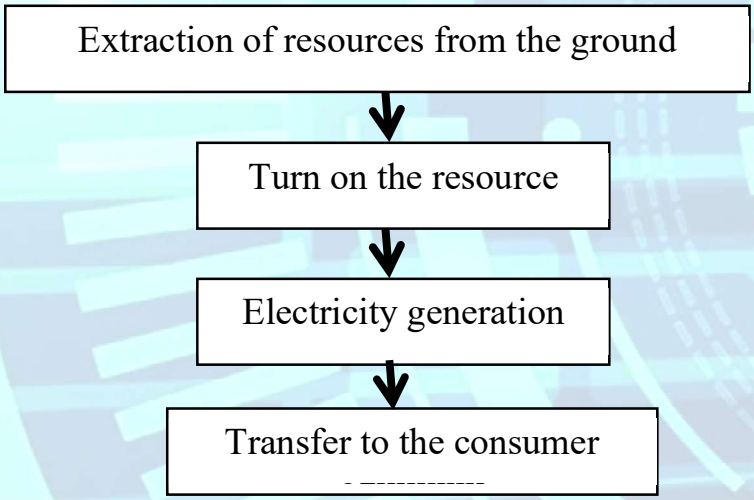


Figure 2. Stages of energy transmission to the consumer.

1. Efficient energy use is understood as achieving economic benefits through the most optimal distribution of energy to consumers and its use in production, taking into account social, political, financial constraints, environmental, ecological, and similar factors.

2. Energy conservation refers to measures aimed at reducing the energy consumed in production. In particular, in mechanical engineering, measures aimed at reducing the energy waste used during the operation of electric motors (Figure 3).

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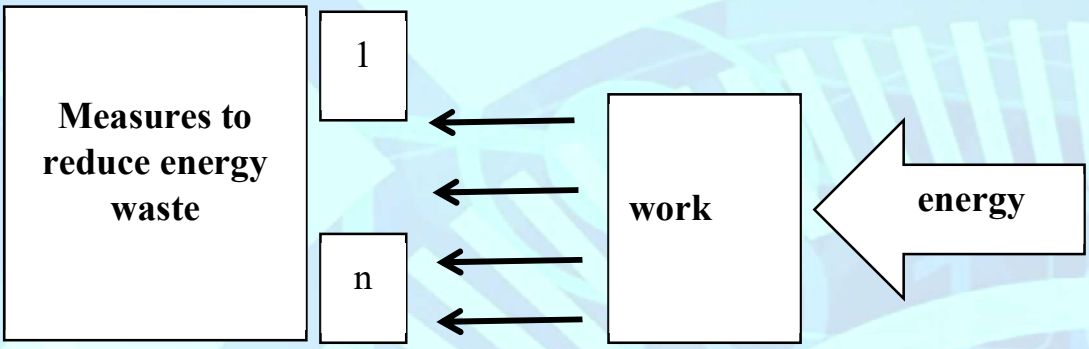


Figure 3. Energy saving methods and measures

Thermal energy and electrical energy are converted into each other using technical means. To store thermal energy, it must be insulated from the external environment, that is, blocked. Such an ideal barrier is a vacuum, through which heat begins to pass through any object. The transfer of heat through gaseous and porous substances slows down. The simplest technical device that stores heat is a "thermos". Heat moves from a high temperature to a low temperature. In Figure 4 below, the movement of heat through a barrier is shown by a double-sided spear symbol. Since the external temperature is lower than the heat source, the side of this symbol facing the external environment is shown relatively long. This shows that heat is escaping to the external environment through insulation. The resistance of the wire that transmits electric current also causes the waste of electric energy. For this reason, it is necessary to pay more attention to the means that maintain the integrity of electrical insulation, otherwise the waste of electric energy will increase.

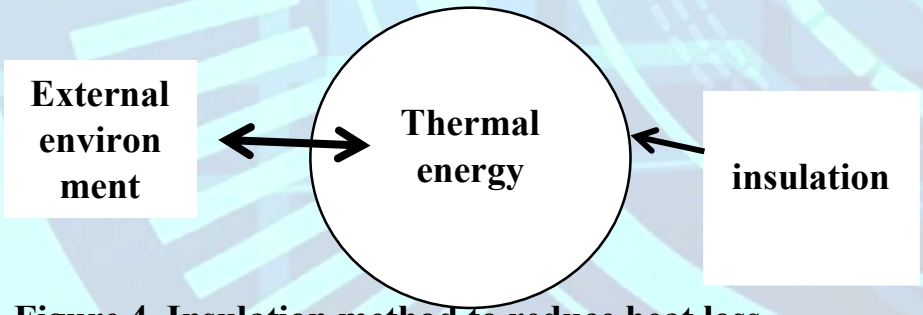


Figure 4. Insulation method to reduce heat loss

3. Energy-efficient devices are electrical devices that operate at the highest efficiency and power factor, regardless of the load level during operation.

4. Bioenergy is the use of organic waste from domestic animals and poultry, as well as household waste collected in cities and villages, to produce combustible gas and use it for needs.

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5. A combined heat and power plant is a thermal power plant that simultaneously generates and distributes both heat and electricity to consumers.

6. A heat pump is a device that transfers heat from a body at a lower temperature to a body at a higher temperature by using mechanical energy.

Energy **saving methods:**

1. A method of returning steam used to generate electricity in thermal power plants to a steam boiler to re-generate steam through a special device or process.

2. A method of energy saving based on the use of new control systems.

3. A method of using energy devices and systems to heat buildings and moderate the climate using water and electricity.

4. A method of replacing an existing device or process with a device or process that uses relatively less energy and replaces them;

5. A method of replacing conventional energy with another type of energy that provides economic efficiency in a production device or process.

energy **conservation.** Energy conservation is a measure aimed at reducing the energy consumed in production, and this measure is evaluated on the basis of determining the relative cost of energy conservation. To do this, it is necessary to know the amount of energy consumed per unit of time for a product produced. Energy is wasted during transmission and use. During the use of electrical energy, part of it is converted into heat and is wasted. To reduce waste, the electrical resistance of electrical transmission equipment should be low. Since the power of electrical energy is directly proportional to the current and voltage, it can be transmitted without changing the power by increasing the current and decreasing the voltage. For this reason, high voltage is used to transmit electrical energy from an electrical source over long distances. Increasing the current leads to its conversion into more heat and waste. Metal wires with good conductivity are mainly used to transmit electrical energy. Their resistance depends on the cross-sectional area of the wire. The larger the area, the lower the resistance. The larger the cross-sectional area of the wire, the more material is used. In order to save material and electricity, the wire should have an optimal surface area. Energy-saving devices are equipped with electronic devices that optimize heat and electricity consumption. When energy-saving devices are used, they operate in an operating mode with the highest possible efficiency and power, regardless of the load level. Air conditioning in buildings is also controlled by electronic devices controlled by certain programs. Optimal control and adjustment of loads is carried out using mechanical mechanisms in conjunction with electronic devices, and a new technical field is developing, known as mechatronics.

Conclusion

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Energy conservation issues are one of the most complex tasks. We all know that solving this issue is becoming increasingly difficult at the household, neighborhood, city, region and country levels. Today, energy shortages are becoming a global problem, like ecology. The world community is addressing this issue out of vital necessity. We understand that it is important for all countries to work together to solve these problems with the help of science and technology. The need to learn from the experience of advanced countries in the field of science and technology is becoming an urgent issue today. It is necessary to implement measures aimed at energy conservation, from each household to the national level, using existing advanced practices.

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