

New Technologies in Production

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Annotation: The adoption of the concept of sustainable development implies the commitment by individual states and regional integrations to harmonize the economic, social and environmental aspects of development. One of the areas of such activity is the introduction of "green" technologies in various branches of economic activity. This article discusses the problems and prospects for the development of "green" technologies in production.

1 INTRODUCTION

One of the key areas of sustainable development of modern civilization is the introduction of "green" technologies - environmentally friendly technological processes, production lines and logistics that provide the most optimal parameters of resource saving, energy efficiency and environmental safety in the current conditions. The introduction of "green" technologies in the manufacturing industries is based on the appropriate mechanisms of state policy, which involve stimulating innovations in the field of "green" ecology and tougher penalties for environmental offenses.

Developed countries are implementing "green" technologies in all sectors of the economy and at all stages of the product life cycle - from the design and production of products to its processing and final disposal.

With the introduction of environmental technologies, success is achieved in reducing the expenditure of resources and the increased use of by-products arising from the organization of production processes. For example, in the new millennium, refrigerators consume 75% less electricity compared to refrigerators produced in the 70s of the XX century. At the same time, they have a lot of power. These results were achieved through the use of new


materials that provide increased insulation and the development of more efficient cooling systems.


Compared to the 1970s, cargo ground transport consumes 20% less fuel with an increase in carrying capacity; in civil aviation, fuel savings amounted to 50%. In recent decades, due to the use of the latest technologies, the efficiency of oil and gas production has increased.


The most important direction in the implementation of "green" technologies is the energy industry, which has a direct impact on all existing industries. The key areas in this area are increasing energy efficiency and using renewable energy sources.

Renewable energy sources are inexhaustible resources. The main principle of renewable sources is to obtain them from natural processes that are cyclical in nature: radiation of sunlight, sea tides, wind, geothermal energy of the earth. When using these natural energy sources, it is possible to obtain energy comparable to energy from burning oil, gas, coal and their products. The use of natural resources does not affect the energy balance of the planet and is the basis of the "green economy", which leads to the active development of renewable energy in European

countries, which have high hopes for it in the long term. The role of renewable energy sources in solving

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global civilizational problems is clearly presented in Figure 1.

Types of resources and types	Energetic	Ecology	Food
Wind turbines	+	+	+
Small and micro GES	+	+	+
Solar heating set up	+	+	+
Solar photovoltaic set up	+	+	+
Geothermal electric stations	+	+/-	0
Geothermal heating station	+	+/-	+
Biomass. Burn of hard rubbish mass	+	+/-	0
Biomass. burn of agricultural waste	+	+/-	+
Biomass.bioenergetic recycle of waste	+	+	+
Biomass. Gasification	+	+	0
Biomass. getting liquid fuel	+	+	+
Set ups for low potential heat utilisation	+	+	0

Figure 1: The role of renewable energy sources in solving global problems (*Note. + positive impact, - negative impact, 0 no impact.).

Obviously, renewable energy sources are essential for the energy system that feeds the most significant industries. Renewable sources also have the advantage of being located close to energy supply facilities, unlike traditional fuel and energy systems, in which high costs are required to deliver energy to enterprises. Further development of renewable sources will improve the supply of remote regions, reduce the intensity of traffic flows and ensure the uniform development of production in the country.

Some of the renewable energy sources contain components from which it is possible to obtain not only energy products, but also elements used in the chemical industry, metallurgy, road construction and agriculture. These elements include oil shale, thermal waters and bituminous rocks, which contain nickel, lithium, sulfur, vanadium and other elements in sufficient quantities (Vladimirov, 2020).

Another direction for the introduction of "green" technologies in production activities is the manufacture of non-toxic products that can be used in a closed cycle: "production - disposal - new production" (Kalner, 2018). An example of the implementation of "green" technologies is the use of only recyclable types of plastic in the production, as well as the development and implementation of its biodegradable counterparts.

Waste-free and low-waste production technologies are also widely used. For example, in the metallurgical industry, the problem of the formation of solid, liquid and gaseous wastes is solved by

melting the metal in a liquid bath, which ensures the preservation of solid and liquid emissions. Sulfur-containing gases accumulate in a special tank and are subsequently used to produce sulfur and sulfuric acid.

Powder metallurgy is recognized as a practically waste-free technology, in which the utilization rate of the feedstock reaches 99%. The wood processing technology is actually waste-free, since the waste left after the formation of furniture panels and lumber is used for the industrial production of chips, sawdust, pellets and fuel briquettes.

The introduction of "green" technologies in the chemical and oil refining industries is based on the active use of membranes for the separation of liquids and gases, the production of biogas from organic residues, the use of plasma, ultraviolet radiation and electric pulse intensity to transform waste into useful substances. In the mechanical engineering industry, environmental developments should be directed to the development of water recycling processes in order to minimize their use and pollution. An example of waste-free production technology is shown in figure 2 (Molchanova, 2019).

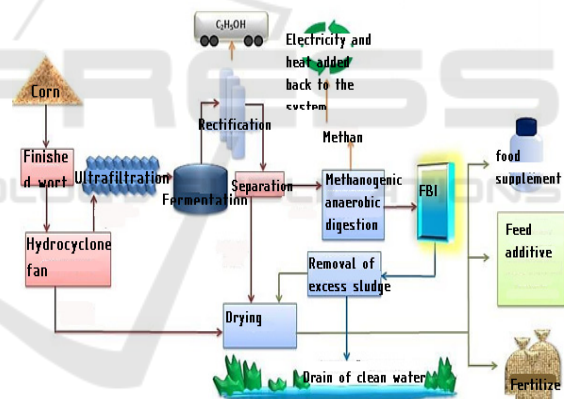


Figure 2: An example of a waste-free technology for the production of ethyl alcohol.

The use of "green" technologies in production not only improves the environment, but also reduces costs, improves the efficiency of technological processes, and ensures high competitiveness of manufactured products. This causes significant interest in such technologies not only from developed countries, but also from rapidly developing economies, such as China.

At present, there are about 2,000 research centers and state-owned business incubators in China, designed to ensure the development of environmentally friendly technologies. At present, China ranks among the top countries in the world in

the number of patents in the field of wind power, biofuel production and the sustainable use of coal. Small businesses are of particular importance in the implementation of scientific research and the development of "green" technologies in production. Small innovative enterprises (SIEs) are companies that meet the national criteria for classifying small businesses and specialize in the development and implementation of science-intensive "green" technologies, high-tech and innovative products.

2 MAIN BODY

In developed countries (EU countries, Japan, New Zealand, Republic of Korea), the share of spending on research and development in the field of "green" technologies reaches 10-15% of the total state budget. The most active developments are carried out in the production of innovative biofuels, as well as in technologies of high-temperature superconductors and smart grids (Egorova, 2020). A significant direction in the development of "green" technologies is the fight against pollution. Thus, in Australia they are actively working on technologies for purifying water resources, in Germany all attention is focused on air pollution, in Brazil, India and China, technologies for the effective management of municipal solid waste are of particular importance. The most significant global environmental problems include climate change, deterioration of fresh water quality and reduction of biodiversity. It can be assumed that the further development of "green" technologies will be aimed at solving these problems. Today, the most promising areas for the development of "green" technologies are increasing the efficiency and environmental friendliness of vehicles, improving building materials, reducing the size of gadgets while increasing their functionality, and developing nanotechnologies and biotechnologies aimed at cleaning the environment from pollution.

In the Russian Federation, "green technologies" have an extremely low development, the total number of Russian patents in this area is less than one percent. The introduction of environmentally friendly technologies could improve the situation with environmental pollution, saving resources, increasing efficiency in certain production areas. All these factors are of great importance for our country.

A serious problem in the implementation of "green technologies" is the development of a strategy for its application and the organization of the application of new processes. The transition to green

technologies requires a significant initial investment, and research shows that this transition later provides an increase in natural capital and, in general, increases the level of GDP.

The approach to the use of "green technologies" primarily depends on the policy of the state and the ratio of costs for traditional and environmentally friendly processes. A constraining factor in the development of this area is the high cost of electric vehicles, whose share in the automotive market in Western Europe is no more than one percent.

Also, the spread of "green technologies" is constrained by weak regulation by the state, a long period of development and organization of the process, the need to reorganize the energy and transport infrastructure, the lack of qualified specialists and management, and the unpreparedness of business for fundamental changes in the approach to technological processes. Despite these difficulties, in many advanced countries the state builds its policy taking into account the widespread use of "green technologies" and takes measures aimed at shaping environmental consciousness among citizens (Shilov, 2020).

So, at present, Russia has adopted and is implementing the national project "Ecology" - one of the 14 national projects operating in Russia for the period from 2019 to 2024. This project was adopted in pursuance of the Decree of the President of the Russian Federation "On the national goals and strategic objectives of the development of the Russian Federation for the period up to 2024". The national project "Ecology" includes 11 federal projects. The structure of the national project "Ecology" is shown in figure 3 (Murtazova, 2021).

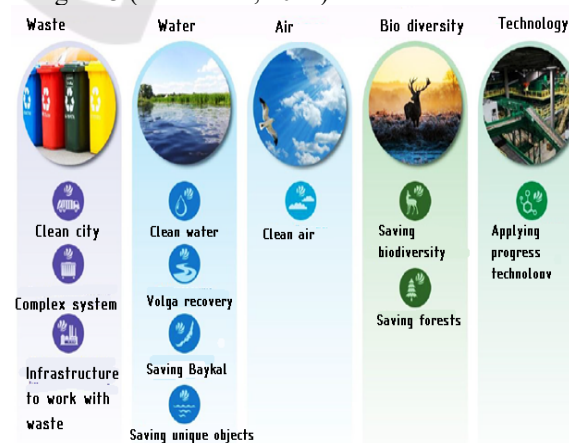


Figure 3: The structure of the national project "Ecology".

Thus, the national environmental development project is being implemented in five areas: "Waste", "Water", "Air", "Biodiversity", "Technologies".

The national project "Ecology" has six main goals:

- efficient management of production and consumption waste, including the elimination of all identified unauthorized dumps within the boundaries of cities;
- reduction of atmospheric air pollution in large industrial centers;
- improving the quality of drinking water for the population;
- environmental rehabilitation of water bodies, including the Volga River, and the preservation of unique water systems, including lakes Baikal and Teletskoye;
- conservation of biological diversity, including through the creation of at least 24 new specially protected natural areas;
- ensuring the balance of disposal and reproduction of forests in the ratio of 100% (Gakaev, 2020).

The total funding is 4,041,000,000,000 rubles. Of these, about 700 billion rubles are expected to be attracted from the federal budget, 133 billion rubles from regional budgets and the rest from extrabudgetary sources. More than half of these funds are expected to be used to finance the federal project "Introduction of the best available technologies" (Souter, 2019).

The second project in terms of funding is the Clean Air project, the third is a project related to improving the municipal waste management system.

3 CONCLUSION

The implementation of the national project "Ecology" is closely connected with the development of "green" technologies in Russia. The development of such technologies has significant prospects: the country is actively developing nuclear power, nano- and biotechnologies, the production of laser equipment, and information technologies. The growth of investments in environmental innovations, the creation of sustainable development institutions, and the support of the innovation infrastructure in general contribute to the introduction of "green" technologies in Russian production.

During the coronavirus pandemic, technologies related to air disinfection and biological safety were noted among the new trends. Green technologies have

been extremely successful in the construction industry. Thus, as part of the implementation of the Skolkovo project, an exclusively "green" building planning and design code is being implemented, the LEED Silver level (that is, a certificate of leadership in energy and environmental design) is mandatory for all industrial and technological facilities being built. Lakhta Center in St. Petersburg is also a modern LEED-certified skyscraper. All the newest and reconstructed MEGA-IKEA facilities comply with the BREEAM environmental standard. Residential quarter "European" in the city of Tyumen was awarded the highest rating "excellent" according to the BREEAM standard (RBC).

Gradually, environmentally friendly technologies are being introduced in all sectors of the Russian industry, however, for a full-fledged "green transition" can only be implemented under conditions of comprehensive interaction between the state and business.

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REFERENCES

- Kalner, V. D., Polozov, V. A., 2019. *Green economy and non-alternative natural resources*. p. 22.
- RBC. The pandemic set new trends in green building: what developers are implementing. <https://realty.rbc.ru/news/5fd3194a9a7947115ccf9d7a>.
- Shilov, I. A., 2020. *Ecology*. Yurayt. p. 78.
- Murtazova, K. M.-S., 2021. *Ecological and economic assessment of sectoral agricultural technologies*. 3(15). pp. 68-71.
- Gakaev, R. A., Bayrakov, I. A., Bagasheva, M. I., 2020. Ecological foundations of the optimal structure of forest landscapes in the Chechen Republic. *Environmental problems. Looking into the future*. pp. 50-52.
- Vladimirov, A. M., Imanov, F. A., 2019. *Principles for assessing the ecological flow of rivers*. pp. 225-229
- Molchanova, Ya. P., 2019. *Hydrochemical indicators of the state of the environment*, p. 192.
- Egorova, N. I., Mityakova, O. I., 2020. *Environmental Innovation and Sustainable Development*. pp. 209-215.
- Souter, MacLean, Okoh and Creech, 2019. *ICTs. Internet and Sustainable Development: Towards a new paradigm*. IISD, Winnipeg, Manitoba Canada.