

ENERGY MANAGEMENT SYSTEMS IN THE INDUSTRIAL SECTOR

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Introduction. Problems of energy efficiency, along with increasing the environmental safety of production and strengthening social responsibility, are becoming a central object of study of modern theory and practice of industrial enterprise management (Di Franco&Jorizzo, 2020). In this regard, the need for more rational use of energy resources by industrial enterprises comes to the fore. After all, they are the largest consumers of fuel and energy resources. Improving energy efficiency is a priority factor in reducing production costs, which has a positive effect on the profits of manufacturing companies.

The number of people in the world is growing steadily. Every day people require more energy to meet their needs and this process is progressing. The development of the industrial sector using traditional sources of energy (coal, oil, gas) is accompanied by the depletion of natural resources, causing greenhouse gases emissions, because of which the climate on the planet is changing.

The industrial sector accounts for around 38% of global final energy consumption. They are responsible for 24% of the total CO₂ emissions. The environmental consequences of wasteful energy use make us hesitate to consider how efficiently and safely we use energy resources (Dreshpak,&Paliekhova, 2021).

The article presents the problem of efficient electricity consumption in Ukrainian industry. The key reasons for the low efficiency of energy use in industry are explained. The structure of electricity consumption during 2019-2020 is analysed. The main problem for developing mining and metallurgical complex in Ukraine is determined. The ways to increase energy efficiency in industrial enterprises are proposed. The article presents review of energy management systems at Ukrainian industrial enterprises. The model of energy management basing on ISO 50001 is analyzed.

Presentation of the main research. One of the key reasons for the low efficiency of energy use experts calls the still existing stereotype of thinking about the insignificance of the share of energy consumption in the cost of finished products, as well as the idea of affordability and relatively low cost of energy. However, in some industries, they account for 15% to 40% of the cost of the finished product (excluding the cost of purchasing raw materials). The constant increase in the cost of energy and the outdated approach to the use of energy resources harm the competitiveness of manufactured goods.

In turn, this provokes a forced reduction in output and leads to an additional increase in the energy component in the price of the final product, which is associated with falling load and irrational use of production capacity.

As we know, the industry consumes about 40% of all energy resources in the country, so it is very important to pay attention to this topic. Ukraine urgently needs to increase the energy efficiency of its industry. But government measures should be divided into two categories: energy efficiency and energy saving for large enterprises and others. This is done all over the world. Large energy-intensive enterprises such as the fuel and energy complex, metallurgy, chemistry, the pulp and paper industry, and the cement industry, incur very high costs. Small projects such as replacing lamps with energy-efficient ones are quietly implemented by everyone. But for large-scale eco-modernization, large enterprises need state assistance.

The main problems of energy efficiency in industrial enterprises are as follows:

- use of obsolete equipment that does not meet energy efficiency requirements;
- application of out-dated technologies in the production cycle;
- old stock and old utilities, which result in significant heat loss;
- the problem of using modern ventilation systems (with recuperation) in buildings under construction and reconstruction is not solved (old and non-working systems lead to additional heat loss and deterioration of the microclimate in the room);

- the use of cheap building materials in mass construction, despite the well-established production of energy-saving solutions (production of heat-reflecting glass, translucent structures, photovoltaic panels, thermal insulation materials);

- weak use of alternative energy sources (solar collectors and batteries, heat pumps, wind generators); developed legislation in the field of energy saving; etc.

The main problem for the development of the mining and metallurgical complex of Ukraine is the high degree of depreciation of fixed assets, as well as the technical and technological lag of the metallurgical industry compared to the best world achievements. The energy costs of Ukrainian metallurgical enterprises significantly exceed the energy costs of foreign producers (Ukrenergo, 2021).

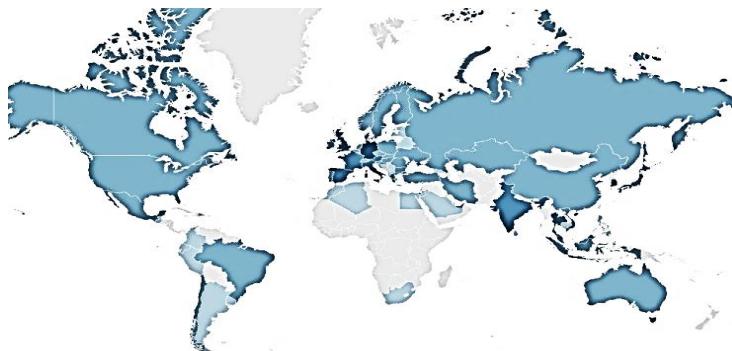
The problem of high energy intensity of gross domestic product of the country is caused not only by energy-intensive equipment and outdated technologies but also to the lack of systemic understanding and management of processes of use and consumption of energy resources. A common way to solve these problems is the implementation of energy management systems (EnMS), which comply with the international standard ISO 50001. According to ISO 50001:2018, the term “energy management system (EnMS)” (is a management system is the way in which an organization manages the interrelated parts of its business in order to achieve its objectives.

The objectives on management systems can relate to several different topics, including product or service quality, operational efficiency, environmental performance, health and safety in the workplace, and etc. EnMS allow to analyze the state of energy security and energy use, to organize efficient monitoring and control over the state of consumption of all types of fuel and energy resources, assess the energy efficiency of industrial technologies, identify the reserves of energy-saving and suggest comprehensive energy-saving measures for efficient use of energy resources. Practical experience shows that enterprises that implement EnMS, with minimum capital investments during the first years, obtain an increase of energy efficiency by 10-20%.

Thousands of companies in Europe are now using energy management systems in their companies. In the industrial sector, the largest number of ISO 50001 certifications in the period 2018-2019 was obtained by enterprises of the metal, food, and chemical industries. According to official ISO reviews, the following number of ISO 50001 EnMS implementation certificates was verified worldwide: in 2016 - 20216; in 2017-22870; in 2018-18059; in 2019 - 18227 (see Fig.1). The leaders in ISO 50001 implementation are Germany (6,243 in 2018), the UK (1,153), and (in recent years) China (2,364). In Ukraine (according to official ISO reviews), the following number of certificates was granted: in 2016 - 21; in 2017-189; in 2018-21; in 2019-12.

Figure 1

Worldwide issued ISO 50001 certificates (OECD/IEA, 2017)



According to ISO 50001:2018, the EnMS cycle of operation is based on the methodology known as the Plan-Do-Check-Act (PDCA) continuous improvement cycle or Deming cycle, which can be represented as follows:

Plan: Planning of its activities for the reporting period by setting goals and objectives, as well as work plans, resources necessary to achieve the results per the requirements of the energy policy of the organization, and identification of risks associated with the activities of EnMS.

Do: Implementation and execution of planned activities (measures) aimed at achieving the policy, goals, and objectives and the implementation of the ISO 50001 requirements that the standard regulates, and which have been specified both for the current period and in the framework of continuous improvement.

Check: Continuous monitoring of EnMS performance and energy use indicators in combination with all non-energy factors affecting them. All this is done in conjunction with a continuous review of the fulfillment of the goals, objectives, and work plans, as well as the requirements of the other EnMS documentation during the operational activities of the organization.

Act: Implementation of actions for continuous improvement of the energy management process and standard requirements with the mandatory participation of the top management.

Conclusions. Thus, energy management is a set of continuous processes and tools that are combined with the business processes of any organization. It encourages it to constantly manage energy consumption and find ways to improve its energy efficiency. These processes and tools cover not only procedures, equipment, and technologies, but also people. Any system (even fully automated) depends on the behavior of the people who created, maintain, and improve it.

References

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