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RATIONING OF ELECTRICAL POWER CONSUMPTION

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In the modern world, where efficiency and saving resources are becoming increasingly important, the issue of rational use of electricity is becoming especially relevant these days. One of the main ways to achieve this goal is to set consumption limits, that is, rationing electricity consumption.

Let's start with a representation of such a production process, where each of the stages will require a clearly defined amount of energy. We will set the goal of maximizing the efficiency of this process, but it is necessary to set a planned guideline in advance. To do this, we will set a kind of benchmark that will determine how much electricity should be spent on producing a unit of production or processing raw materials.

The adopted standard defining the planned consumption is commonly referred to as the specific consumption rate (or, more succinctly, simply the specific rate), and the actual consumption per unit of production is referred to as the specific consumption.

The specific consumption rate is the required amount of electricity required to produce a unit of product or perform a certain amount of work in specific production conditions, and is determined by the structure and technology of the process, as well as the level of equipment used [1].

There are three types of electricity consumption standards: technological (or aggregate), for workshops and for factories.

Technological standards reflect the energy consumption of a specific stage of the production process, and also take into account losses in equipment. They are important for assessing electricity needs in the manufacture of energy-intensive products, the selection and development of electrical equipment, monitoring of production processes and energy conservation. The effectiveness of personnel in matters of energy con-

servation is assessed on the basis of compliance with technological standards.

Workshop standards cover energy consumption for technological and other needs within the workshop. They are used to determine the workshop's electricity needs, plan its distribution within the enterprise, monitor energy use efficiency, identify losses, and design an electricity supply scheme.

The factory standard includes all workshop costs, as well as other costs that are not accounted for at the workshop level. Factory standards are necessary to determine the overall needs of the enterprise and plan its distribution, as well as to control economical use. Meeting factory standards is an indicator of the efficiency of electricity use in an enterprise, and staff can be rewarded for achieving savings.

In the actual practice of electricity consumption rationing, there are three main approaches to determining specific electricity consumption rates: computational, computational-experimental and statistical. Next, we will describe how they differ and where they are used.

Let’s start with the calculation methods. As the name suggests, they rely on theoretical calculations and engineering knowledge. Let’s give the following example: a machine-building plant where car parts are manufactured. Engineers should have information such as how much energy is needed to operate each machine (turning, milling, grinding). They take into account engine power, operating time, transmission losses, and other factors. Based on these data, the electricity consumption rate for the manufacture of one part is calculated. It's like making a recipe for a dish: if you know exactly how much you need; you’ll get a predictable result [2].

Next on the list, we consider computational and experimental methods. Here, real measurements and experiments conducted directly at the factory are added to the theoretical calculations. For example: steel is smelted at a metallurgical plant. Theoretically, it is possible to calculate how much energy is required to heat the metal to the desired temperature. However, in practice, it is necessary to take into account heat loss, the quality of raw materials, the operating characteristics of furnaces and many other factors. Therefore, experiments are carried out, the actual energy costs are measured, and adjustments are made to the calculated rate. The result is more accurate and realistic.

These two methods are good because they allow us to technically justify how much energy is really needed to produce a unit of product. They take into account the specifics of equipment, technology, and operating modes, and allow for the development of progressive and cost-effective standards.

But what if the production is complicated and it is impossible to accurately calculate the energy consumption? Then the statistical method comes to the rescue. It consists in taking statistics on the actual consumption of electricity for previous periods, and based on it, the norm is set. It's as if we were preparing a dish without knowing the exact recipe, and just focusing on how many ingredients we used last time. This method is less accurate, but sometimes it is the only possible option. For example, a chemical plant produces a complex product with many stages, and it is difficult to accurately account for the contribution of each stage to the total energy consumption [3].

Thus, having studied the methods of rationing electricity consumption, we can single out the following: computational and experimental methods are the most preferable, since they allow us to take into account the technical features of production and develop sound and progressive standards. The statistical method, although easier to use, should only be used in extreme cases where other methods are not applicable, as it does not encourage energy efficiency improvements and may perpetuate suboptimal levels of energy consumption. The introduction of sound electricity consumption standards is an important step towards reducing costs and increasing the competitiveness of any enterprise.

References

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