Development of forecasted values of specific norms for the issues of produced products in industrial enterprises

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Abstract. This article discusses the issues of determining the predicted values of rationing the power consumption of industrial enterprises. For a certain pattern of change in power consumption and specific power consumption, hourly productivity was studied, which determines the performance of units. On the basis of the predicted values of the output volume, the norms of energy consumption were developed, which are reflected taking into account its specifics, the energy intensity of the products. In developing the norm, the calculation method was adopted based on the analysis of static data for a number of previous years on actual energy consumption, the volume of output of factors affecting their change.

Planning for future electricity supply should begin with rationing energy consumption. Progressive, scientifically based standards also make it possible to assess the level of operation of existing equipment, to open and realize unused reserves. Standards should be based on the energy characteristics of technological equipment and take into account the optimal operating mode. Rationing of electric energy consumption is the establishment of a planned measure of their production consumption [1,2,3].

Rationing of the consumption of electric energy includes the development of standards and their consumption for production, approval and bringing design standards to production shops, as well as the implementation of systematic monitoring of implementation.

The energy consumption rate, taking into account the specifics of the object, can help increase production efficiency [4,5].

We will consider the norms of energy resources consumption in the production of yarn at Fergana Turan Textile LLC.

The spinning production of Fergana Turan Textile LLC in 2014 produced 316352.33 kg of single-strand and 565641.68 kg of double-strand yarn, while the annual actual energy consumption was 16242862 kWh.

Table 1. Shows the consumption of various types of energy.

| Kind of | Unit | Consumption | Fuel | Consumption | Fuel |
|---------|------|-------------|------|-------------|------|

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The installed capacity of the entire fleet of technological and energy equipment for production as a whole is 4935.6 kW, and the maximum power consumption is 3453.54 kW, i.e. utilization factor to 0.7

Table 2. The balance of power consumption for production facilities and the enterprise as a whole is shown.

| Workshop names       | Power consumption | To total power needs |
|----------------------|-------------------|----------------------|
| Spinning section     | 951,5             | 27,5                 |
| Ring spinning section| 1459,2            | 42,2                 |
| Torsion section      | 264,7             | 7,7                  |
| Valve chamber        | 546               | 15,8                 |
| Compressor           | 65                | 1,9                  |
| Boiler room          | 5,7               | 0,2                  |
| XVO                  | 10,6              | 0,3                  |
| Pumping station      | 5,3               | 0,2                  |
| Workshop lighting    | 97,3              | 1,9                  |
| ABK                  | 61,2              | 1,8                  |
| Territory lighting   | 22,8              | 0,7                  |
| **Total**            | **3459,3**        | **100**              |

From the balance of power consumption, it can be seen that the main power consumer is: pneumatic spinning section – 27.5%, ring spinning section – 42.2%, torsion section – 7.7%, ventilation, cameras -15.8. The remaining sections consume from – 0.2% to – 1.9% of the total power consumption.

To determine the patterns of changes in power consumption and specific energy consumption, hourly productivity was studied, while taking into account that each type of yarn requires a spindle speed that determines the performance of the machine [6,7,8].

To calculate and analyze the predicted specific energy consumption and the dependence on the type of yarn produced, as well as taking into account the specified technological requirements for the machine, we determine the values of these indicators, based on the formula below.

\[ d = \frac{P_n \cdot k \cdot 10^9}{n_v \cdot 60 \cdot T \cdot m \cdot k_n} \]

where \( P_n \) is the power consumption of the machine, \( K \) is the value of the twist of the yarn, \( T \) is the thickness of the yarn, \( m \) is the number of spindles on the machine, \( n_v \) is the speed of the spindles, \( k_n \) is the coefficient of useful time.
Accounting for the consumption of energy resources and energy carriers can be carried out by appropriate devices, and in the absence of their calculation, experimental, experimental calculation, average statistical methods [9,10,11].

As the main calculation methods, experimental and settlement-experimental methods have been adopted, covering the costs of electric energy and fuel for basic and auxiliary production needs (ventilation, lighting, etc.) including network losses.

The standards should facilitate the assessment of internal reserves of fuel and electric energy savings, the implementation of planned targets and the achievement of economic production indicators.

On the basis of the predicted values of the volume of output, standards are developed for the consumption of electric energy and fuel for the production of a unit of finished products for each production, taking into account its specificity, and it should reflect the energy intensity of the product [12,13].

Taking into account the specifications of Fargona Turon Textile LLC, the unit power consumption should be taken as the unit of account: for the production of yarn kW h / kg.

When determining the power consumption of the main technological sections, pneumatic spinning, ring spinning and twisting of yarn added the power of auxiliary objects (compressor, pumping, boiler room, lighting, etc.) in proportion to the power consumption of each section.

\[
P_{\text{nom}} = \sum P_{\text{lex}} + \sum P_{\text{v.k}} + \sum P_{\text{kom}} + \sum P_{\text{kot}} + \sum P_{\text{kr}} + \sum P_{\text{mx}} + \sum P_{\text{lg.k}} + \sum P_{\text{ABK}} \quad \text{kW}
\]

Based on this expression, taking into account the proportional separation of the power consumption of auxiliary equipment, the following values of power consumption are obtained:

- For the spinning section:
  \[P_{\text{nom}} = 1242.3 \text{ kW}\]
- For ring spinning section:
  \[P_{\text{nom}} = 1760.8 \text{ kW}\]
- For the yarn twist section:
  \[P_{\text{nom}} = 465.2 \text{ kW}\]

The specific energy consumption by assortment is calculated for each production redistribution according to the formula:

\[
d = \frac{\sum P_{\text{nom}}}{\sum A}, \quad \text{kW} / \text{kg}
\]

| Spinning selection | Ring spinning section | Torsion section |
|--------------------|-----------------------|----------------|
| Range | URE | Range | URE | Range | URE |
| 27/1 | 2.1 | 28/1 | 3 | 34/2 | 1.4 |
| 34/1 | 2.66 | 31/1 | 3.4 | 36/2 | 1.5 |
| 40/1 | 3.1 | 34/1 | 3.7 | 40/2 | 1.57 |
| 50/1 | 4.3 | 36/1 | 3.94 | 50/2 | 2 |
| 54/1 | 4.9 | 40/1 | 4.6 | 54/2 | 2.3 |
| | | 50/1 | 6.5 | 65/2 | 3.3 |
| | | 54/1 | 6.4 | 65/1 | 8.5 |

The rate of energy consumption per unit of output allows you to comply with the most favorable mode of loading equipment, control over energy use in the shops and the enterprise as a whole [14].
Thus, the specific energy consumption by type of output varies: for a spinning section from 2.1 to 4.9 kW / kg, for a ring spinning section from 3 to 8.5 kW/ kg, for a twist section of yarn from 1.4 to 3.3 kW/kg. It should be noted that the specific energy consumption for each assortment is calculated taking into account the technological regulations for a particular assortment is optimal.

When modernizing or reconstructing production, the value of the specific energy consumption should be adjusted.

Analysis of production work for 2017-2019 shows that part of the equipment works depending on consumer demand. In particular, 8 out of 10 ring spinning machines can work, and 6 out of 8 rotor spinning machines can work. In addition, sawing and twisting machines work on demand. Thus, the inconsistency of the entire fleet of technological equipment during the year leads to energy savings (table 4).

| Years         | Estimated value of energy consumption | Actual power consumption | Difference (+) overspending, (-) saving |
|---------------|---------------------------------------|--------------------------|----------------------------------------|
| 2017          | 22789140,85                           | 15962583                 | 6826577,85                             |
| 2018          | 16462628,7                            | 16242862                 | -219766,7                              |
| 2019          | 18710403,96                           | 15576015                 | 3134388,96                             |
| (9 months)    |                                       |                          |                                        |

So, the following conclusions can be drawn:
1. Rationing the energy consumption in the production of yarn, taking into account the probability of the nature of the process of electric consumption of spinning machines, allows you to determine for specific production conditions the necessary energy consumption per unit of output (yarn), establish an initial value to determine the need for electricity for the planned period and ensure its rational consumption.
2. The main method for developing norms of electric energy consumption for the enterprise as a whole and for technological processes is the calculation-statistical method, which is based on the analysis of statistical data for a number of previous years on the actual expenditures of electric energy, the volume of output of factors influencing their change.
3. The developed standards are not once and for all data. It is very important to timely monitor compliance with the standards and make the necessary adjustments so that they correspond to the level of modern scientific achievements and best practices in the field of improving the technological process and equipment operation.

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