DEVELOPMENT OF SPECIFIC STANDARDS OF ENERGY CONSUMPTION BY TYPES OF PRODUCED PRODUCTS OF THE SPINNING PRODUCT

F A Hoshimov[1], *I I* Bakhadirov[1], M S Kurbanbayeva[2], Aytbayev N.A.[3]

[1] Tashkent State Technical University named after Islam Karimov, 100095, Uzbekistan, Tashkent, University St. 2A
[3] Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Tashkent, Uzbekistan
[2] Karakalpak State University, 230100, Uzbekistan, Nukus, Ch. Abdirov St.1

Abstract. The article deals with the regulation of the energy consumption of a spinning enterprise. For a certain pattern of changes in power consumption and specific power consumption, we studied the hourly performance, which determines the performance of the machine. On the basis of the predicted values of the volume of production, the norms of electricity consumption were developed, which are reflected, taking into account its specificity, the energy intensity of products. When developing the norm, a calculated static method was adopted, based on the analysis of static data for a number of previous years, on the actual consumption of electricity, the volume of output of factors influencing their change.

Introduction

Planning for a long-term power supply should begin with the regulation of energy consumption. Progressive, scientifically grounded standards also make it possible to assess the level of operation of existing equipment, to open and sell unused reserves. The norms should be based on the energy characteristics of the technological equipment and take into account the optimal operating mode. Rationing the consumption of electrical energy is the establishment of a planned measure of their production consumption [1-4].

Main part

Rationing of electricity consumption includes the development of standards and their consumption for the production of products, the approval and delivery of design standards to production shops, as well as the implementation of systematic monitoring of implementation [5-8].

The rate of consumption of energy resources, taking into account the specifics of the facility, can contribute to an increase in production efficiency.

Let's consider the norms of consumption of energy resources in the production of yarn at LLC "VERIGOROW IPAGI".

In 2019, the spinning production of FE VERIGOROW IPAGI LLC produced 3,163,352.33 kg of single-strand and 565,641.68 kg of double-strand yarn, while the annual actual power consumption amounted to 1,6242862 kW*h.

Below. Table 1 shows the consumption of various types of energy.

Table 1.

№	Type of energy	Unit	consumption	Equivalent fuel		Consumption	Equivalent fuel	
			2019	t.e.f	%	2020 (9 month)	t.e.f	%
1	Electrical energy	kW/h	16242862	1997,8	90,7	15576015	1915,8	93
2	Natural gas	m^3	176757	205	9,3	131993	151,1	7
3	Household drinking water	m^3	23985	-	-	20131	-	-
Total				2202,8	100		2066,9	100

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

The balance of power consumption by production shops and the enterprise as a whole is shown in Table 2.

Table 2.

№	Name of workshops	Power consumption, kW	% to total power requirements
1	Rotor spinning section	951,5	27,5
2	Ring spinning section	1459,2	42,2
3	Twisting section	264,7	7,7
4	ventilation. cameras	546	15,8
5	Compressor room	65	1,9
6	Boiler room	5,7	0,2
7	XBO	10,6	0,3
8	Pumping station	5,3	0,2
9	Workshop lighting	97,3	1,9
10	АБК	61,2	1,8
11	Territory lighting	22,8	0,7
Totsl		**3459,3**	100

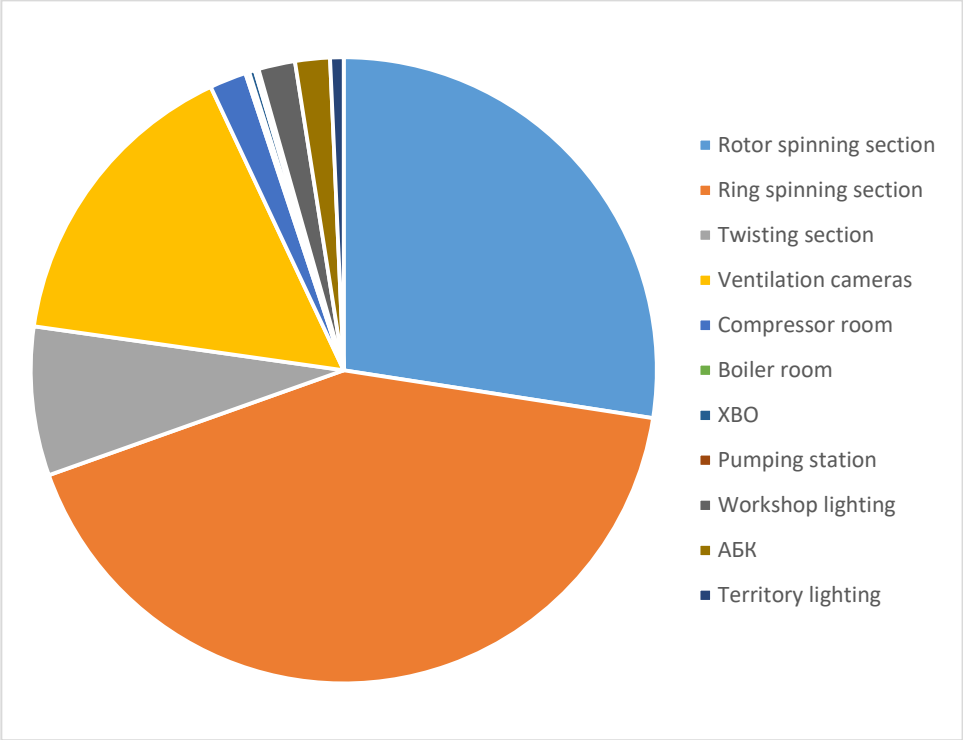

Fig. 1. The balance of power consumption in production shops and the enterprise in scrap.

The balance of power consumption shows that the main consumer of power is: pneumatic spinning section - 27.5%, ring spinning section - 42.2%, twisting section - 7.7%, ventilation. cameras -15.8. The rest of the sections consume from - 0.2% to - 1.9% of the total power consumption [9-12].

To determine the regularity of changes in power consumption and specific power consumption, the hourly productivity was studied, taking into account that for each type of yarn such a speed of spindles is required, which determines the productivity of the machine.

To calculate and analyze the predicted value of specific power 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.

$$d = \frac{P_{\text{п}} \cdot K \cdot 10^9}{n_{\text{в}} \cdot 60 \cdot T \cdot m \cdot k_{\text{п}}} \quad (1)$$

where $P_{\text{п}}$- power consumption of the machine, to the yarn twist value, T - yarn thickness, *m* - number of spindles per machine, *n* - spindle speed, k- useful time coefficient.

Accounting for the consumption of energy resources and energy carriers can be carried out by appropriate devices, and in the absence of them, by calculation, experimental, experimental calculation, average statistical methods.

Experimental and computational-experimental methods were adopted as the main calculation methods, covering the consumption of electric energy and fuel for basic and auxiliary production needs (ventilation, lighting, etc.), including losses in networks [13-16].

The norms should contribute to the assessment of internal reserves of fuel and electric energy saving, fulfillment of planned targets and achievement of economic production indicators.

On the basis of the predicted values of the volume of production, the norms of consumption of electric energy and fuel for the production of a unit of finished goods for each production are developed, taking into account its specifics, and it should reflect the energy intensity of the product.

Taking into account the specification of "VERIGOROW IPAGI" LLC, the specific energy consumption should be taken as a calculation unit: for yarn production kW * h / kg.

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

$$P_{\text{ном}} = \sum P_{\text{тех}} + \sum P_{\text{в.к.}} + \sum P_{\text{ком}} + \sum P_{\text{котел}} + \sum P_{\text{ХВО}} + \sum P_{\text{насос}} + \sum P_{\text{осв}} + \sum P_{\text{АБК,}} \; kW \quad (2)$$

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

For the rotor spinning section:

$$P_{\text{ном}}^{n} = 1242{,}3 \; kW$$

For ring spinning:

$$P_{\text{ном}}^{\text{к}} = 1760{,}8 \; kW$$

For yarn twisting section:

$$P_{\text{ном}}^{\text{кр}} = 465{,}2 \; kW$$

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

$$d = \frac{\sum P_{\text{ном}}}{\sum \text{A}}, \frac{kW}{kg} \quad (3)$$

Table 3. The summary values of specific energy consumption by product range are given in

Rotor spinning section		Ring spinning section		Torsion section	
Range	УРЭ	Range	УРЭ	Range	УРЭ
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 electricity consumption per unit of output allows you to comply with the most advantageous mode of equipment loading, control over energy use in shops and at the enterprise as a whole.

Thus, the value of the specific power consumption by type of product varies: for a rotor spinning section from 2.1 to 4.9 kW / kg, for a ring spinning section from 3 to 8.5 kW / kg, for a yarn twisting section from 1.4 to 3.3

kW / kg. It should be noted that the value of specific energy consumption for each assortment is calculated taking into account the technological regulations for a specific assortment is optimal [17-19].

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

Analysis of production work for 2018-2020 shows that some of the equipment works depending on the demand of consumers. In particular, 8 out of 10 ring spinning machines can work, and 6 of 8 rotor spinning machines can work 6. In addition, reed and twisting machines work on demand. Thus, the variability of the operation of the entire fleet of technological equipment throughout the year leads to energy savings [20-24].

Table 4.

Years	Calculated energy consumption kW*h	Actual energy consumption kW*h	Difference (+) cost overruns (-) economics
2018	22789140,85	15962583	- 6826557,85
2019	16462628,7	16242862	- 219766,7
2020 (9 month)	18710403,96	15576015	- 3134388,96

Rationing of electricity consumption in yarn production, taking into account the likelihood of the nature of the process of electricity consumption of spinning machines, makes it possible to determine the required electricity consumption per unit of output (yarn) for specific production conditions, establish a baseline value to determine the need for electricity for the planned period and ensure its rational consumption.

The main method for the development of norms for the consumption of electric energy for the enterprise as a whole and for technological processes is the calculation method - the statistical method, which is based on the analysis of statistical data for a number of previous years on the actual consumption of electric energy, the volume of products, factors affecting their change.

The developed norms are not data once and for all. 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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