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Analysis Of The Modes Of The Power Consumption And Regulation Of The Expense Of The Electric Power On Release Of The Glassware

MuratovKh.M., KadirovK.Sh., OtakhonovM.X.

DSc., Professor, Director of theLLC «Scientific and technical center» of JSC "Uzbekenergo"
PhD, Senior Scientist of the LLC «Scientific and technical center» of JSC "Uzbekenergo"
Junior Scientist of the LLC «Scientific and technical center» of JSC "Uzbekenergo"

ABSTRACT: Analysis results of the modes of a power consumption and development of consumption rates of the electric power on release of JSC "Kvarts" are given in article. For regulation of an expense of the electric power in production of a glass ware the settlement and pilot method is used. Calculation of an expense of the electric power is executed on the basis of specific expenses of the electric power on products assortments. As a result of determined of size of a specific expense of the electric power for each range of products.

KEY WORDS: electric power, regulation, specific expense, capacity, settlement and pilot method.

I. INTRODUCTION

JSC "Kvarts" is the largest enterprise in Uzbekistan on production sheet the color, tinted and tempered glasses, glass jars and bottles.

In the territory of the enterprise 5 main and 9 non-productive departments are located:

- dosing and mixing shop (DMS);
- machine shaft production (MSP);
- production of polished glasses (PPG);
- station of the protective atmospheres (SPA);
- ceramic shop.

At the same time in production machine shaft for production of a glassware, natural gas, an electrical energy and compressed air which is produced in the compressor shop, is used.

II. SIGNIFICANCE OF THE SYSTEM

The shop on production of a glassware of MSP is divided into 3 sites: MSP No.1, MSP No.2 and MSP No.3. On the site of MSP No.1 – 6 lines, on the site of MSP No. 2 – 3 lines, on the site of MSP No. 3 – 3 lines are established. In the shop are made a glass jar and a bottle on the glass forming machines PVM-12A and the air-blown machines VV-7. The container glass is developed by melting of furnace charge of the set structure and formation of products from glass melt.

III. LITERATURE SURVEY

The production process of glassware consists of the following transactions:

- warehousing of raw materials
- preparation of raw materials

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- furnace charge preparation
- cooking of glass melt
- formation of a glassware
- annealing of a glassware
- quality control of glass
- packaging of a glassware
- warehousing of finished productions

The feeder the glass forming machines is intended for final preparation of glass melt for development, registration and issue at some point of glass melt drops with the set temperature, weight, a configuration and speed. The mass of a drop shall correspond to the mass of the developed product.

Ready weight with a temperature of 1100± 50°C through the output channel arrives in glass - the forming machine.

Feeder the glass forming machines represents the mechanism equipped with the device of formation, a glass pool. Glass melt in the portions corresponding to weight developed a container glass, moves a feeder at first in draft, and then in a fair form glass - the forming machine.

IV. METHODOLOGY

Formed glass containers are delivered from machine in the annealing furnace.

In table 1 result of tool researches of power consumption of the equipment of the MSP shop are given below.

TABLE 1

№	Name ofthe site	Established power,kW	Power consumption, kW
	Site No. 1		
1	Machine line 1	55,85	25,3
2	Machine line 2	54,35	23,9
3	Machine line 3	56,75	22,8
4	Machine line 4	55,65	29,8
5	Machine line 5	55,25	31,9
6	Machine line 6	54,45	29,3
7	Basement	755,5	237
8	Furnace line	58,9	26
9	Auxiliary needs	60,8	21
10	Laboratory	54,75	41,8
	Altogether	***1262,25***	***488,8***
	Site No. 2		
1	Machine line 1	42,53	34,8
2	Machine line 2	42,53	34,8
3	Auxiliary needs	81,7	56,7
4	Furnace line and basement	984,73	172,2
	Altogether	***1151,49***	***298,5***
	Site No. 3		
1	Machine line 1	49,41	24,6
2	Machine line 2	51,41	25,6

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3	Machine line 3	49,41	28,4
4	Furnace line	24,4	14
5	Basement	628,5	270,4
6	Auxiliary needs	***114,05***	15
	Altogether	***917,18***	***378***

From table 1 it is visible that the total power consumption of site No.1 of the MSP shop makes 488,8 kW.

V. EXPERIMENTAL RESULTS

The settlement size of power consumption of the capital equipment on each machine line makes:
- machine line 1 – P_1 = 25,3 kW
- machine line 2 – P_2 = 23,9 kW
- machine line 3 – P_3 = 22,8 kW
- machine line 4 – P_4 = 29,8 kW
- machine line 5 – P_5 = 31,9 kW
- machine line 6 – P_6 = 29,3 kW

This power is reached during the simultaneous work of all park of processing equipment.
The settlement size of power consumption of auxiliary objects makes:
- basements – 237 kW
- furnace line – 26 kW
- auxiliary needs – 21 kW
- laboratory – 41,8 kW

Total power consumption of auxiliary objects makes 325,8 kW.

Because the power consumption of auxiliary objects of the MSP shop site No.1 (basements, furnace line, auxiliary needs, laboratory, lighting) participates in work of each machine line, we define individual share of power consumption of auxiliary objects

$$\Delta P = \frac{\sum P_{aux}}{n} = \frac{325{,}8}{6} = 54{,}3 \quad kW$$

The settlement size of power consumption of each machine line taking into account individual share of power consumption of auxiliary needs will make:

machine line 1 - $P_{L1} = P_{main}^{L1} + \Delta P = 25{,}3 + 54{,}3 = 79{,}6 \quad kW$

machine line 2 - $P_{L2} = P_{main}^{L2} + \Delta P = 23{,}9 + 54{,}3 = 78{,}2 \quad kW$

machine line 3 - $P_{L3} = P_{main}^{L3} + \Delta P = 22{,}8 + 54{,}3 = 77{,}1 \quad kW$

machine line 4 - $P_{L4} = P_{main}^{L4} + \Delta P = 29{,}8 + 54{,}3 = 84{,}1 \quad kW$

machine line 5 - $P_{L5} = P_{main}^{L5} + \Delta P = 31{,}9 + 54{,}3 = 86{,}2 \; kW$

machine line 6 - $P_{L6} = P_{main}^{L6} + \Delta P = 29{,}3 + 54{,}3 = 83{,}6 \quad kW$

Settlement sizes of power consumption are permanent for each line isn't dependent on the range of products.

We determine hourly average performance (A_{L1}) of products by assortments and based on data of power consumption of each machine line of the MSP site No.1 for 2018.

We determine the size of a specific expense of the electric power for each assortment:

$$d = \frac{P_{L1}}{A_{L1}} = \frac{79{,}6}{0{,}71} = 112{,}11 \quad kW \cdot h / t$$

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TABLE 2. Machine line 1

2018 year, months	Range of products	Work time, hour	Development, ton	Hourly capacity, ton/hour	Specific expense of the electric power, kW·h/t	Settlement size of an expense of the electric power, kW·h
January	Prazdnich.	103	70,68	0,7	112,11	7923,93
	Orion 0,45	188	130,95	0,79	100,76	13194,52
	Prins 0,5 l	329	230,67	0,73	109,04	25152,26
	Stoletov 0,45 l	103	63,92	0,64	124,38	7950,37
February	Stoletov 0,45 l	76	51,18	0,68	117,06	5991,13
	Mineral 0,45	185	119,93	0,76	104,74	12561,47
	Hamkor 0,45	383	234,87	0,72	110,56	25967,23
March	Hamkor 0,45	31	23,66	0,76	104,74	2478,15
	Serjant 0,45	257	168,34	0,7	113,71	19141,94
	Smirnov 1,0	295	251,65	0,89	89,44	22507,58
	Jasmin 0,5 l	128	82,48	0,64	124,38	10258,86
April	Jasmin 0,5 l	124	92,19	0,75	106,13	9784,12
	Znatnaya 0,7	233	141,29	0,85	93,65	13231,81
	Odin plyus	256	224,13	0,88	90,45	20272,56
	Hrustal 1,0	79	62,62	0,83	95,9	6005,26
May	Hrustal 1,0	173	152,5	0,99	80,4	12261,00
	Smirnov 1,0	283	264,43	0,99	80,4	21260,17
	Koren 0,7 l	264	154,21	0,64	124,38	19180,64
June	Koren 0,7 l	8	6,65	0,84	94,76	630,17
	Medov. 0	688	512,83	0,76	104,74	53713,81
July	Medov. 0,45	616	504,22	0,83	95,9	48354,70
	Belaya 0,45	104	78,41	0,77	103,38	8106,03
August	Belaya 0,45	78	69,84	0,9	88,44	6176,65
	Medov. 0,45	232	142,57	0,79	100,76	14365,35
	Mineral 0,45	416	285,62	0,78	102,05	29147,52
September	Mineral 0,45	78	61,39	0,84	94,76	5817,32
	Smirnov 1,0	471	325,37	0,84	94,76	30832,06
	Hrustal0,7	128	101,58	0,81	98,27	9982,27
October	Hrustal0,7	434	344,86	0,86	92,56	31920,24
	BAKARDI	286	213,96	0,89	89,44	19136,58
November	BAKARDI	96	93,39	0,95	81,79	7638,37
	Odin plyus	340	264,97	0,84	94,76	25108,56
	BAKARDI	176	132,98	0,92	86,52	11505,43
December	BAKARDI	312	236,86	0,95	83,79	19846,50
	FIIN 0,7l	344	312,97	0,93	85,59	26787,10
	Byanka 0,5l	60	40,9	0,75	106,13	4340,72
Altogether			**6837,4**			**608532,2**

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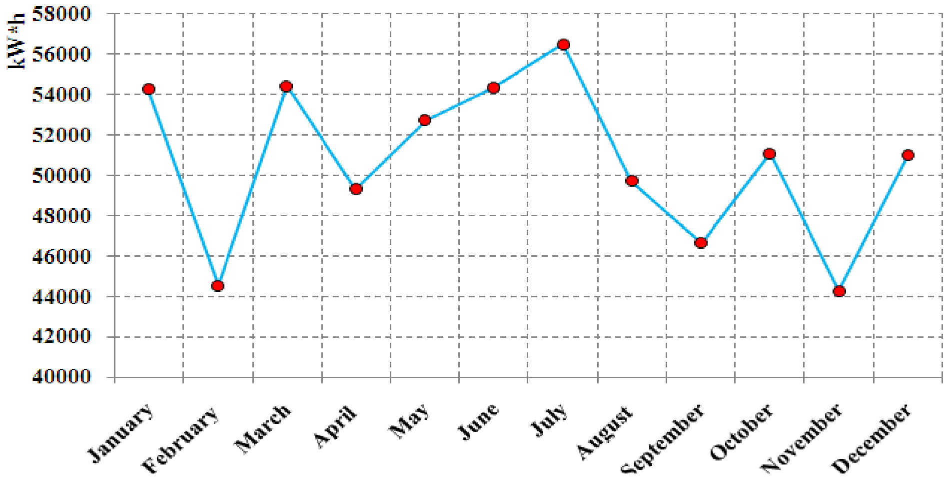

Fig.1. The settlement size of an expense of the electric power for 2018, kW·h

Calculation of an expense of the electric power is executed on the basis of specific expenses of the electric power on products assortments. Resultant values of energy indicators of all sites on production of glassware of the MSP shop are provided in table 3.

TABLE 3

№	Name of line	Produce, ton	Calculation of an expense of the electric power, kW·h
		Site No1	
1	Machine line 1	6837,44	608532,2
2	Machine line 2	7129,14	634493,5
3	Machine line 3	5892,8	524459,2
4	Machine line 4	6232,72	554712,1
5	Machine line 5	2186,34	194584,3
6	Machine line 6	6214,9	553126,1
	Altogether	***34493,34***	***3069907,4***
		Site No2	
1	Machine line 1	14312,5	1388312,5
2	Machine line 2	15812,79	1533840,63
	Altogether	***30125,29***	***2922153,13***
		Site No3	
1	Machine line 1	7021,97	1287823
2	Machine line 2	6327,12	1160919
3	Machine line 3	6448,19	1181985
	Altogether	***19797,28***	***3630727***

We determine a specific expense of the electric power by site No.1 of the MSP shop:

$$e_{MSP1} = \frac{W_1 + W_2 + W_3 + W_4 + W_5 + W_6}{\Pi_1 + \Pi_1 + \Pi_3 + \Pi_4 + \Pi_5 + \Pi_6} =$$

$$= \frac{608532{,}2 + 634493{,}5 + 524459{,}2 + 554712{,}1 + 194584{,}3 + 553126{,}1}{6837{,}44 + 7129{,}14 + 5892{,}8 + 6232{,}72 + 2186{,}34 + 6214{,}9} = \frac{3069907}{34493{,}34} =$$

$$\approx 89 \quad kW \cdot h / t$$

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We determine a specific expense of the electric power by site No.2 of the MSP shop:

$$e_{MSP2} = \frac{W_1 + W_2}{\Pi_1 + \Pi_1} \approx \frac{1388312{,}5 + 1533840{,}63}{14312{,}5 + 15812{,}79} \approx \frac{2922153{,}13}{30125{,}29} \approx 97\, kW \cdot h / t$$

We determine a specific expense of the electric power by site No.3 of the MSP shop:

$$e_{MSP3} = \frac{W_1 + W_2 + W_3}{\Pi_1 + \Pi_1 + \Pi_3} = \frac{1287823 + 1160919 + 1181985}{7021{,}97 + 6327{,}12 + 6448{,}19} = \frac{3630727}{19797{,}28} \approx 184\, kW \cdot h / t$$

VI. CONCLUSION AND FUTURE WORK

Thus, the analysis of the modes and regulation of an expense of the electric power in production of a glassware taking into account probabilistic nature of process of a power consumption of technological machines allows to determine for specific working conditions a necessary expense of the electric power per unit of products, to establish initial size for determination of need for the electric power for the planned period and to provide its rational expenditure.

Developed regulations aren't once and for all data. It is very important to control timely observance of regulations and to introduce necessary amendments they corresponded to the level of modern scientific achievements and the best practices in area of enhancement of engineering procedure and operation of the equipment.

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