CREATING ELECTRICAL LOAD MAPPING AND DETERMINING THE LOCATION OF THE MAIN REDUCTION SUBSTATION

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Abstract. *In this article reduction of electrical energy waste in the case of the plant's electricity consumption and in order to improve the efficiency indicator, a cartogram of electrical loads was built and the installation location of the head reducing padstation a was determined.*
Key words: *active power, reactive power, electric load cartogram, step-down substation .*

Аннотация. *В этой статье построена карта электрических нагрузок и определено местонахождение основной понижающей подстанции, чтобы уменьшить потери энергии и повысить эффективность станции с точки зрения необходимой электроэнергии.*

Ключевые слова: *активная мощность, реактивная мощность, картограмма электрических нагрузок, главная понижаюший подстанция.*

Annotatsiya. *Ushbu maqolada zavodning elektr energiyaga bo’lgan extiyojidan kelib chiqgan holatda elektr energiya isrofini kamaytirish hamda samaradorlik ko’rsatkichini yaxshilash maqsadida elektr yuklamalari kartogrammasi qurilgan va bosh pasaytuvchi padstansiyaning o‘rnatilish joyini aniqlangan.*
Kalit so’zlar: *aktiv quvvat, reaktiv quvvat, elektr yuklamalar kartogrammasi, bosh pasaytiruvchi podstansiya.*

To select the location of the BPP, a load cartogram is drawn on the enterprise master plan. Cartogram means the circles drawn in the fields of each section and objects. Their centers are the centers of objects and shop plans. The surfaces of the drawn circles are equal to the shop loads on the obtained scale. Centers of plant or enterprise loads are considered the symbolic center of electricity receivers. BPP and workshop substations should be located in this center if possible. This brings high-voltage electricity closer to consumers, reduces the length of high- and low-voltage distribution networks, reduces the length of expendable conductors, and reduces the loss of electricity. In addition, based on the cartogram, it is possible to imagine how the electric loads are distributed in the territory of the enterprise [1-6].

It is advisable to build the cartogram separately for active and reactive loads. Because the locations of active and reactive power consumers are different in the area of the enterprise, they can be connected to certain sources [9,10].

The radii of cartogram circles are determined from the following formulas:

$$r_{ia} = \sqrt{P_{xi} / \pi m}; \qquad r_{ip} = \sqrt{Q_{xi} / \pi m};$$

Here, P_{xi} is the calculated asset power of *i* -sex;

Q_{xi} - the calculated reactive power of *the i -sex;*

m is a scale for determining the face of a circle [7].

If the supply of active loads is performed from the electrical system, special capacitor batteries, synchronous compensators, valved static sources of reactive power can be used as a reactive power source. The location of installation of reactive power sources is found as a result of determining the symbolic center of loads based on the reactive power cartogram. Incorrect location of reactive power compensators leads to unnecessary movement of reactive power flows from the elements of the power supply system and causes additional failures of electricity [8-12].

The main step-down substation (BPP) is a main transformer substation designed for the enterprise's power supply. All sex transformer substations are supplied from BPP. Its installation location corresponds to the center of gravity of loads, that is, BPP is located in the area of high-power consumers [13] .

The center of electrical loads of the enterprise is determined using the coordinate values and calculated loads of each section:

$$x_0 = \frac{\sum_{i=1}^{n} P_i x_i}{\sum_{i=1}^{n} P_i}; \qquad y_0 = \frac{\sum_{i=1}^{n} P_i y_i}{\sum_{i=1}^{n} P_i};$$

bu y e rd a : P_i ; X_i ; The emotional active force of section and the coordinates of its geometric mark .

X_o and Y_o the center of conditional electric loads of the enterprise is determined by the coordinate values and shown on the main plan.

The center of electrical loads, where BPP is installed, is not always determined at the point determined by calculation. Him installation the following factors based on done is increased:

- to BPP high tension from the side coming the airline workers movement prohibited or less commute from the regions take transition necessary;

- BPP possibility until big powerful to consumers closer by doing placing need

Account using determined downloads center above two on demand answer as long as it gives , that's it center of the enterprise real upload center is considered

Electric downloads cartogram this is in the master plan of the enterprise of downloads how that it is distributed imagination to do in order to sex power depends respectively based on the defined radius drawn is a circle. Circle sex downloads big smallness represents [14].

Using the expressions given in the theoretical part given in the table consumers factory in the area is located there is workshops . Theirs coordinate values and accounting downloads using of the enterprise electricity downloads center is determined [15]:

No	Factory workshops	X	Y	P_h, kW
1	1st sex	19.5	7	400
2	2nd sex	19.5	10.3	650
3	3rd sex	5	10.7	1500
4	4th sex	9.5	17.9	250

$$x_0 = \frac{\sum_{i=1}^{n} P_i x_i}{\sum_{i=1}^{n} P_i} = \frac{400*19,5+650*19,5+1500*5+250*9,5}{400+650+1500+250} = 10,84$$

$$y_0 = \frac{\sum_{i=1}^{n} P_i y_i}{\sum_{i=1}^{n} P_i} = \frac{400*7+650*10,3+1500*10,7+250*17,9}{400+650+1500+250} = 10,72$$

1st session using the expressions given in the theoretical part we determine the cartogram of electrical loads for [16]:

$P_{\sum h}$ =400 kW, $P_{h.yo}$ =30 kW.

$$r_1 = \sqrt{\frac{\sum P_x}{\pi * m}} = \sqrt{\frac{400}{3{,}14 * 3}} = \sqrt{\frac{400}{9{,}42}} = 6{,}52\ m$$

Accept that m=3 we do

$$\alpha = \frac{P_{h.yo} \cdot 360^0}{P_{h\sum}} = \frac{30}{400} * 360 = 27^0$$

2nd sex Let's determine the cartogram of electrical loads for : $P_{\sum h}$ =650 kW, $P_{h.yo}$ =50 kW.

$$r_1 = \sqrt{\frac{\sum P_x}{\pi * m}} = \sqrt{\frac{650}{3{,}14 * 3}} = \sqrt{\frac{650}{9{,}42}} = 8{,}3\ m$$

Accept that m=3 we do [17].

$$\alpha = \frac{P_{h.yo} \cdot 360^0}{P_{h\sum}} = \frac{50}{650} * 360 = 28^0$$

3rd sex we determine the cartogram of electrical loads for [18]:
$P_{\sum h}$ =1500 kW, $P_{h.yo}$ =80 kW.

$$r_1 = \sqrt{\frac{\sum P_x}{\pi * m}} = \sqrt{\frac{1500}{3{,}14 * 3}} = \sqrt{\frac{1500}{9{,}42}} = 12{,}6\ m$$

Accept that m=3 we do

$$\alpha = \frac{P_{h.yo} \cdot 360^0}{P_{h\sum}} = \frac{80}{1500} * 360 = 19^0$$

4 th sex Let's determine the cartogram of electrical loads for : $P_{\sum h}$ =250 kW, $P_{h.yo}$ =35 kW.

$$r_1 = \sqrt{\frac{\sum P_x}{\pi * m}} = \sqrt{\frac{250}{3{,}14 * 3}} = \sqrt{\frac{250}{9{,}42}} = 5.2\ m$$

Accept that m=3 we do

$$\alpha = \frac{P_{h.yo} \cdot 360^0}{P_{h\Sigma}} = \frac{35}{250} * 360 = 28^0$$

Based on the analysis and results, it can be said that x_o =10.84 on x axis and y_o =10.72 on y axis of the factory. This result determines the place of installation of the enterprise's BPP. Cartogram of loadings for the 1st session a=27 ^{o}, for the 2nd session a=28 ^{o}, for the 3rd session a=19 ^{o}, for the 4th session a=28 ^{o}.

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