International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 4, Issue 4, April – 2020, Pages: 104-108

Methodology for Calculating the Generalized Efficiency of the Energy Supply System of Industrial Enterprises

[1]Gafurov Mirzokhid, [2]Oktamov KHayit, [3]Akiyev Yunus, [4]Avezov Abdullo

[1]Scientific Researcher, Department of Electrical Mechanics and Technology, Faculty of Energy Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan.
[2]Master, Department of Electrical Mechanics and Technology, Faculty of Energy Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan.
[3]Master, Department of Electrical Mechanics and Technology, Faculty of Energy Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan.
[4]Master, Department of Electrical Mechanics and Technology, Faculty of Energy Bukhara Engineering and Technology Institute, Bukhara, Uzbekistan.
E-mail address: mirzohid_gafurov@mail.ru

Abstract: *Industrial Company, to determine the overall efficiency of the power supply system and structural interpretation schemes are shown below in the table. This method is general and efficient to another, than the rate of efficiency of industrial enterprises index summarized as overall power system efficiency.*

Keywords: System electrospinning, automated systems, informational and analytical system, rabbi process, reactive engine, completeness coefficient.

Introduction

It is recommended that you enter a recording quality factor to more accurately evaluate the performance of the recording system. The quality of the recording is determined by the completeness, accuracy, reliability and speed of measurement.

Materials and Methods

The completeness of the recording is determined by the completeness coefficient K_c, which is determined by the ratio of the amount of information necessary when managing the production of information, which is determined by the recording system. Information recording is understood as the number of points at which the energy consumption of an enterprise is determined by computational methods. That is:

$$K_R = \frac{\sum_{i=1}^{N} V_i}{\sum_{i=1}^{N_0} V_{0i}},$$

Here, the texts available in the system i - object c V_i - record the amount of information; V_{oi} - the amount of registration information about the i- object in a complex registration system; N - is the number of objects measured in the existing recording system;

The coefficient of text identification systems - K_A is determined. The energy consumption coefficient in terms of the measurement value is determined by the ratio of the bill value.

$$K_A = \frac{\frac{1}{V}\cdot(\sum_{i=1}^{V_n} r_{in} + \sum_{i=1}^{V_p} r_{ip})}{\frac{1}{V_0}\cdot(\sum_{i=1}^{V_{0n}} r_{0in} + \sum_{i=1}^{V_{0p}} r_{0ip})},$$

Here r_{in}, r_{ip}, degree of accuracy of i- information , determined by the instruments of the recording system ; the level of information reliability is determined by the tools of an integrated registration and calculation system; V , V_0 - the total amount of information obtained from the existing and complex standard registration system at the enterprise; B , V_0, V_{0p} - the existing complex and standard reliable information from the system;

Recording accuracy refers to calculation indicators that determine the accuracy of energy recording and the instruments installed in the recording.

$$K_{AC} = \frac{S}{S_0},$$

Here, S and S_0 are accessible and trusted to the information received from the complex text system.

When introducing an integrated registration system at the enterprise, the accuracy of the information is $S_0 = 1$, as a result of which

$$K_{AC} = \frac{V - (V_{н.п} - V_{н.р})}{V} = 1 - \frac{(V_{н.п} - V_{н.р})}{V},$$

Here, $V_{N.P.}$ In $_{n.r.}$ - the amount of factual information detected by instruments and computational methods.

Recording system speed means the ability to receive information in a timely manner in accordance with production requirements. That is:

$$K_0 = \frac{\tau_{ср}}{\tau_{ср.0}},$$

The quality of the recording system is determined by the following expression for a specific type of energy resource:

$$K_{к.у} = K_П \cdot K_T \cdot K_Д \cdot K_0$$

The coefficient of the registration system of the power supply system is determined by the following expression:

$$К_у = К_{к.у} + \frac{N_{т.у}}{N_{т.р}} \cdot К_{т.у},$$

where $N_{T.r}$ - distribution points of electricity in the enterprise;

$N_{t.u}$ - electricity distribution points at an enterprise with a technical documentation system;

Results

To $_{KU}$ - coefficient characterizing the system of commercial registration at the enterprise. In this case, if the recording system is automated, $K_u = 0.5$, and if it is not automated, $K_u = 0.25$.

The reserve ratio is determined from the following expression:

$$К_{рез} = \frac{N_{эл} + N_{зах}}{2 \cdot N_{эл}}$$

Here, N is the external reserve capacity of the power supply system (SE), the number of elements;

$N_{z\,ax}$ - the number of reserved elements SE;

SC is connected to parallel components,

SE is a complete backup of the effect that $_{in}$ H + $N_{g\,ah} = 2 \cdot N_{unfamiliar}$.

The coefficient of technical efficiency of the power supply system is determined by adding the efficiency factors of the power and secondary circuits from the following expression:

$$K_{ЭТТ} = \sum_{n=1}^{n}\left(\frac{1}{n+3} \cdot K_n\right) = \frac{1}{4} \cdot \eta_{ЭТТ} + \frac{1}{5} \cdot \cos\varphi_{ЭТТ} + \frac{1}{6} \cdot K_{кач} + \frac{1}{7} \cdot K_{ав} + \frac{1}{8} \cdot K_{зах} + \frac{1}{9} \cdot К_у =$$

$$= 0{,}25 \cdot \eta_{сэс} + 0{,}2 \cdot \cos\varphi_{сэс} + 0{,}16 \cdot K_{кач} + 0{,}14 \cdot K_{ав} + 0{,}125 \cdot K_{рез} + 0{,}11 \cdot К_у.$$

where ē Power supply system - SE UWC enterprise;

cos φ is the power factor taking into account the reactive power of the solar cell;

To $_{kach}$ - Coefficient characterizing the quality of electric power at the output of solar cells;

Coefficient of automation;

The safety factor of the element K_{zax} - SE;

K_u - coefficient recording system SE.

To calculate the standard value of the generalized indicator of SE efficiency, we use the standard values of energy efficiency indicators. For example, when you take the following values:

The permissible value of the voltage deviation is - 5%.

Permissible voltage asymmetry is 2%.

The permissible value of losses in the power supply system is -5%.

International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 4, Issue 4, April – 2020, Pages: 104-108

The nominal value of the power factor is 0.96.
Availability of the ASKUE system at the enterprise, i.e. E : $K_u = 0.5$.
The number of spare elements in the power supply system is at least 50%.
The share of substations with automatic backup devices in the enterprise is −100%.
The share of substations with automatic redundant connection at the enterprise is −100%.
A network that is able to regulate the power of the pods , increasing the proportion to 100%.

The above values are based on the power system in force to determine the efficiency. Permissible power quality factor at the output of the power supply system:

$$K_{кач} = K_{\Delta U} \cdot K_{сим} \cdot K_{\sin} = 0{,}95 \cdot 0{,}99 \cdot 0{,}99 = 0{,}93.$$

Coefficient of automation of the power supply system:

$$K_{ав} = 0{,}5 \cdot 1 + 0{,}15 \cdot 1 + 0{,}1 \cdot 1 = 0{,}75.$$

The coefficient of technical efficiency of the power supply system:

$$K_{Н.ЭТТ} = \frac{1}{4} \cdot \eta_{ЭТТ} + \frac{1}{5} \cdot \cos\varphi_{ЭТТ} + \frac{1}{6} \cdot K_{кач} + \frac{1}{7} \cdot K_{ав} + \frac{1}{8} \cdot K_{зах} + \frac{1}{9} \cdot K_{у} =$$
$$= 0{,}25 \cdot 0{,}95 + 0{,}2 \cdot 0{,}96 + 0{,}16 \cdot 0{,}93 + 0{,}14 \cdot 0{,}75 + 0{,}125 \cdot 1 + 0{,}11 \cdot 0{,}5 =$$
$$= 0{,}237 + 0{,}192 + 0{,}149 + 0{,}105 + 0{,}094 + 0{,}055 = 0{,}8.$$

Dissolution

The efficiency factor of the power supply system is used to assess the effectiveness of the project developed during the design of the power supply system, and when choosing the most rational scheme of the power supply system of the enterprise. During operation of the power supply system, indicators characterizing consumption are determined by the information measurement system, the current value of the power supply efficiency indicator is determined and compared with the normative indicator, and thus the efficiency of the power supply system is monitored.

Power supply to the definition in the coefficient of efficiency of the regulatory system power consumption characterize the size of the following standard values: Voltage

- ✓ Sting deviation - 5%;
- ✓ permitted bumps - 2%;
- ✓ regulatory waste limit - 5%;
- ✓ regulatory waste limit - 5%;
- ✓ standard ratio power - 0.96;
- ✓ number of substations with an automatic backup connection device - 100%;
- ✓ number of substations with voltage regulation device - 100%;
- ✓ Determine the standard efficiency, assuming that the number of substations with a power factor adjustment device is 100%:

$$K_{ESS} = \frac{1}{4} \cdot \eta_{ESS} + \frac{1}{5} \cdot \cos\varphi_{ESS} + \frac{1}{6} \cdot K_{A} + \frac{1}{7} \cdot K_{AC} + \frac{1}{8} \cdot K_{A} + \frac{1}{9} \cdot K_{TH} =$$
$$= 0{,}25 \cdot 0{,}95 + 0{,}2 \cdot 0{,}96 + 0{,}16 \cdot 0{,}93 + 0{,}14 \cdot 0{,}75 + 0{,}125 \cdot 1 + 0{,}11 \cdot 0{,}5 =$$
$$= 0{,}237 + 0{,}192 + 0{,}149 + 0{,}105 + 0{,}094 + 0{,}055 = 0{,}8.$$

This indicator describes the technical capabilities of the power system. Nevertheless, the technical capabilities of the power supply system are positively assessed as cost-effective. Therefore, we define an indicator that determines the economic efficiency of the energy supply system. To do this, we will determine the following coefficients. We determine the coefficient that determines the share of electricity in the energy consumed by the enterprise from the following expression:

$$K_{E.light} = \frac{W_{0.E}}{W_{0.All}},$$

International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 4, Issue 4, April – 2020, Pages: 104-108

where W $_{o.el}$ is the specific energy consumption per unit of output; W $_{o. about schaya}$ - total energy, sweat reblyaemaya per unit of output. We determine the coefficient that determines the share of electricity costs in the unit cost of production from the following expression:

$$К_{уд.с} = \frac{C_{эл}}{C_{пр}},$$

where C $_{about l .}$ - all electric costs incurred in the production of the product, mln. soums; With $_{total}$.- the annual cost of production, million soums.

The economic efficiency of the power supply system is determined by the weight of electric power in the energy capacity of the product and is determined from the following expression.

$$К_{эк.эф} = \frac{К_{эл.ё}}{К_{уд.с}} = \frac{W_{0.эл}}{W_{0.общ}} \cdot \frac{C_{пр}}{C_{эл}},$$

Corporate power supply system The effectiveness of electrical equipment should depend on the load factor. This is due to the fact that with a low load factor, capital costs are spent above the norm, and the coefficient of economic efficiency is low . The higher the load factor , the lower the reliability of the power system . Thus, the calculation efficiency coefficient taking into account the output of the load factor. We get the optimal value of the load factor equal to the maximum value. For this we use the following expression.

$$k_{з.тр} = \frac{S_{\max.н}}{S_{\max.тр}} \text{ Or } k_{з.л} = \frac{S_{\max.н}}{S_{\max.л}}$$

Here , then C $_{max is packed}$ - the average energy consumption of the enterprise and MVA;
S $_{max .tr}$ - installed capacity of transformers on the steps of the power supply system , MVA;
S $_{max .l}$ - maximum power transmitted by the power transmission system lines from power transmission lines, MVA.

The maximum power consumption is obtained at the highest power in the daily load schedule of the enterprise. The applied power of transformers of a separate stage of the power supply system of an enterprise is determined by the following expression:

$$S_{\max.тр} = \sum_{k=1}^{k_{\max}} (n \cdot S_{н.т}(k)),$$

Here , k is the store number of HL;
n is the number of transformers at the substation, pcs.

The maximum power transmitted through the power line is determined by the permissible current and rated voltage:

$$S_{\max.л} = \sum_{k=1}^{k_{\max}} (n \cdot \sqrt{3} \cdot U_{н}(k) \cdot I_{дд}(k)),$$

Transformers for optimal load k = 0.7, for the transmission of electricity $_{z}$ k = 0.5. Any deviation from this value will reduce the efficiency of the power supply system . Therefore, the effect on the efficiency of the power supply system is taken into account as follows: We determine the deviation of the load factor of the transformers from the optimal value from the following expression:

$$k'_{з.тр} = 1 - |k_{з.тр} - 0{,}7|;$$

$$k'_{з.л} = 1 - |k_{з.л} - 0{,}5|;$$

Conclusions

In this case, the load factor at the optimal value is 1. Deviation in any direction leads to a decrease by 1. A decrease in the load factor leads to underutilization of the installed capacity, an increase in capital costs and a decrease in the power factor. An increase in the load factor leads to a decrease in the reliability of the power supply system. Because an increase in load leads to a decrease in reliability. Highest efficiency at optimum load. The load factor has almost the same effect on the elements of the power circuit and the secondary circuit. Therefore, we determine the effect of the load factor on efficiency by the following expression:

$$K_{e.tex} = K_{tex} \cdot k'_{Z.tr} \cdot k'_{zl} = K_{tex} \cdot K_{Z.ESS}.$$

Acknowledgements

This indicator also characterizes the level of improvement of the power supply system. This ratio provides an overall estimate of the power system supply. These calculations are performed in addition to the existing calculation methodology.

References

1. Gafurov M.O. Basic measures of energy conservation at industrial enterprises and their effectiveness. - http://7universum.com/en/tech/archive/item/8578

2. Allaev K.R. Energy of the world and Uzbekistan. - Tashkent: Finance, 2007, 386 p.
3 . Allaev K.R. Electricity Uzbekistan Uzbekistan and the World - Tashkent: Finance, 2009, 465 p.
4 . Allaev K.R., Sadullaev N.N. A mathematical model of a generalized forecasting power supply system. // Bulletin of Tash State Technical University. - Tashkent, 2009, No. 1, 100-104.
5 . Ametistov E.V., Danilov A.L., Bobryakov A.V., Gavrilov A.I. Energy efficiency in information-analytical systems: opportunities and exercises. - M.: Ener-State Research, 2003, No. 4, p. 9-15.