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Quality Delivery Of Electricity.

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Abstract: *Electricity is valued as a specific type of product required for various production processes. The desire to increase production in modern industrial enterprises, as well as the complexity of technological processes are mainly associated with the use of adjustable valve changers, high-power arc furnaces and welding equipment. A characteristic feature of the performance of these consumers is the impact of the networks that supply them on the quality of electricity. In turn, the normal operation of electrical equipment, the supply system depends on the quality of electricity. Electricity consumers can only perform the tasks assigned to them under certain conditions. The parameters that determine such conditions are called the quality of electricity.*

Keywords: frequency,voltage , metal , electricity, quality

I. Introduction

Any deviation of quality marks will result in underutilization of energy. It also leads to underutilization of electrical appliances and equipment, and a shortage of manufactured products, among others. Economic, mathematical and technical problems must be considered in solving the problem of electricity quality. The economic task involves the creation of methods for calculating losses in the supply of poor quality energy, the mathematical task is to calculate the quality indicators in one way or another, and the technical task is to improve the quality by creating technical means and measures. and quality marking and management methods. In general, "power quality" refers to the fact that the basic parameters of the energy system correspond to the established norm values, and with these values the production, transmission and distribution of energy.According to GOST-13109-97 the following are accepted for quality indicators of electric power:

1. When a single-phase current is supplied from the mains: frequency deviation: voltage deviation; frequency oscillation rate; voltage change rate; voltage nosinusoidality coefficient.

2. When supplied from three-phase power lines: frequency deviation: voltage deviation; frequency oscillation rate; voltage change rate; voltage nosinusoidality coefficient; voltage non-uniformity coefficient.

3. When supplied with AC mains:

Voltage drop; voltage oscillation coefficient.

Electricity quality indicators should be 0.95 in the set range.

In the analysis of the quality of electricity in the power supply system of the enterprise, it is necessary to control the following interval measurements:

1) Voltage control;

a) For enterprises operating five days a week and one working and non-working day at the nodes of the power system;

b) For continuous enterprises - not less than one day;

c) in other cases - two working days and one non-working day;

2) the coefficient of nosinusoidality of the voltage and the level of voltage fluctuations and frequency oscillations;

a) in electric arc steel melting furnaces - at maximum load (during melting) for 30 minutes;

b) in electric arc and contact welded electric networks - within 30 minutes;

c) in the period of 10-12 rolling in the rolling mills;

g) Power lines for residential and administrative buildings - in the event of voltage fluctuations for one hour;

d) All other cases within one day;

3) When controlling the coefficient of voltage symmetry;

a) for one hour at the time of maximum load in networks supplying single-phase electric furnaces (resistance furnaces, electric slag remelting, etc.) operating in steady state mode;

b) in networks providing loads operating in a rapidly changing mode (electric arc steel melting furnaces, electric arc and contact welding, etc.) - for one hour at maximum load;

c) In all other cases - during the day;

4) When controlling the coefficient of non-uniformity of voltage - during the day;

5) when controlling the voltage pulsation coefficient - for 30 minutes;

6) Frequency control should always be monitored.

II. Solution

The quality of electricity can be improved by using the experience of organizations that design and operate supply grids or related accessories.

Some of the conclusions based on the technical requirements are general and should be based on existing guidelines. In other cases, the specificity of the specific conditions (specificity of large-capacity shock-loading plants) must be taken into account.

Frequency deviation is an average value that indicates the difference between the actual value of the frequency and the nominal value in 10 minutes. Under normal conditions, the frequency deviation is allowed to vary by 0.1 Gs from the nominal value. It can change by 0.2 Gs in a short time.

Frequency oscillation is the difference between the maximum and minimum values of the fundamental frequency in the rapid change of mode parameters, when the rate of change of frequency is not less than 0.2 Gs per second.

The oscillation of the frequency shall not exceed 0.2 Gs, except for ruxsat0.1 Gs, which is permissible to deviate. ;

$$\delta f = f_{\max} - f_{\min} \qquad \delta f\,\% = \frac{f_{\max} - f_{\min}}{f_{ном}} * 100\%$$

Fluctuations in frequency and vibration levels at fixed intervals also affect the reliability of power consumers and the same type of electrical equipment. Asynchronous and synchronous motors with constant torque on the shaft also change the frequency of rotation depending on the frequency of the network. For example, for asynchronous motors, this relationship is defined as follows.

$$\omega = \frac{2\pi f_1}{P}(1-s)$$

Here, s is the motor displacement; f is the frequency of the supply voltage, Gs; P - motor pair pairs.

Depending on the second level of speed, synchronous motors change their output to a constant speed; In some cases, technological processes can be disrupted.

The ability to produce mechanisms based on frequency depends on their structure. In this case, the active power consumed is determined from the following formula.

$$P = af^n$$

Here, n is an acceptable value of 0 ÷ 4.

For metal-cutting machines, the speed of the motors is proportional to the speed = 1 for fans and centrifugal pumps; depending on the nature of the operation = 2 ÷ 4.

The main reasons for voltage fluctuations in the power supply system are changes in the behavior of electricity consumers, changes in the state of the power supply system, changes in the adequate resistance of the 10-6 kV line.

Voltage fluctuations in these norms also affect the technical and economic performance of consumers.

Voltage fluctuations depend on a number of frequently changing factors. The effects of voltage fluctuations depend not only on the value, but also on the duration of the voltage fluctuation and the amount of consumers affected by the voltage fluctuation. For example, for some consumers, short-term voltage fluctuations can be more costly than overhead.

To describe the quality of the voltage, an estimation method based on probability theory has been developed, which is based on mathematical statistics. This method was first proposed by P.Ayere. According to this method, a step-by-step voltage variation must be performed using the mean square of the voltage deviation during the T period to determine if the economic performance of the consumer is good and to conduct it accurately and conveniently. The author refers to this method as non-uniform voltage:

$$(\delta U_{ok})^2 = \frac{10000}{T}\int_O^T (\delta U_i)^2 dr \qquad (\delta U_t) = \frac{U_t - U_H}{U_H} - t$$

voltage fluctuations over time;

voltage deviation at the point of view of the network at the time.

The unit of measurement for voltage variation is the square of the percentage:

1 (%) 2 or 1/10000. For example, in a voltage variation of 25 (%) 2, the square of the relative deviation is 25/10000, and the deviation itself is 5/100 or 5%.

Special analyzers are used to analyze the voltage in the power grid. They can be used to measure the standard of deviation. It is also possible to measure the average value of the voltage deviation during the period T:

$$U_{урт} = \frac{100}{T}\int_O^T U_i dt$$

these values are used to determine the variance of the values, ie the deviation of the random values from the mean:

$$\sigma^2 = (\delta U_{урт\cdot кв})^2 - (U_{урт})^2$$

the values obtained and the probability of deviation from the given value are determined. To do this, normal function distribution (probability integral) tables are used.

III. Conclusion

At present, it is possible to observe that large-scale positive reforms are being carried out in the spheres of the economy of our country, and as a result, the production potential of the sectors of the economy is growing year by year. This, in turn, will increase the demand for electricity. In particular, according to the estimated dynamics of electricity production and consumption, the value of electricity expected to be consumed by the economy by 2030 is expected to reach 85 billion kWh, or 99% more than in 2020. The population's electricity consumption is estimated at 21.9 billion kWh.

By 2030, the value of electricity generation is expected to reach 120.8 billion kWh, or an increase of about 80% compared to 2020. Improving the efficiency of electricity generation and meeting consumer demand for electricity by reducing fuel consumption for

the supply of electricity by up to 10% through the introduction of modern technologies and energy-saving equipment in the implementation of the planned program. balance diversification is achieved.

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