REQUİREMENTS AND MAİN İNDİCATORS FOR THE QUALİTY OF ELECTRİCAL ENERGY

Abstract.
From the calculated results, it can be seen that the to different levels in different facilities differs to a certain extent. In this case, these differences are smaller for the 10-second period and larger for the 60-second period. In addition, the shape of the histogram and the character of the parameters of the deviation are the same for all facilities. In the case of a time period of 10 seconds, the value of the mathematical deviation differs from each other by ±0.5%, and in the period of 60 seconds, ±0.7%. However, the differences of the standard deviations do not exceed ±0.1%. Thus, when using the information obtained by the statistical analyzer of the quality of deviation, it is necessary to draw all the characteristics obtained by means of this facility: the shape of the histogram, the probability of falling into different levels, the average value and the standard deviation. As a lawyer, the most stable information about the road network is standard. Taking this into account, this quantity should be used when determining the quality of the change.
The following main results were obtained: The quality indicators of electric energy are determined by the distribution of voltage, waves, the symmetrical characteristic of the three-phase periodicity and the non-sinusoidal characteristic of the voltage. The proposed control system allows real-time monitoring of energy quality.

Keywords:energy quality,electrical energy,probability of falling, network is standard, average value, statistical analyzer, quality of deviation.

INTRODUCTION

Electrical receivers and devices of various purposes connected to the electric network are designed to be used with certain nominal parameters of the network, i.e. nominal voltage, nominal current, nominal frequency, nominal power, etc. for each device that provides its operating mode. It was appointed. Therefore, the required quality of electrical energy should be met when providing electricity to employees. At the same time, electrical receivers and devices can be connected to electrical networks in different locations, and for this reason, the quality of electric energy of the networks can be different in each location. Thus, the amount of distortion at the boundaries of electrical receivers will generally not be the same and will vary between electrical receivers depending on the length and nature of the grid.
The experience gained in the field of operation of electric grids shows that the measures taken in the field of reducing or completely eliminating the impact of electric grids on energy quality indicators are extremely successful. From this point of view, it is considered more convenient to create devices that work in small sizes compared to the nominal parameters. In this case, it is known that the technical-economic indicators of electrical receivers and devices will differ somewhat, but they should not go beyond acceptable limits.
According to the state standard 13109-67, the energy-normalized quality indicators for modern electric receivers fed from three-phase alternating current networks are deviation from the nominal value of the voltage, non-symmetry, non-sinusoidal of the voltage difference, and voltage fluctuations. It should be noted that among these indicators, the

variable current frequency indicator is not considered separately, because this indicator is included in the general system indicators.
Now let's briefly get acquainted with the meaning of each of the parameters characterizing the quality of electric power.

PROBLEM STATEMENT

Disruption quality or discontinuity mode in the electric grid is characterized by the sum of the discontinuity values in the characteristic points of the grid. In the event that within the boundaries of one transformation step, the deviation changes in relatively small limits, therefore, they use not the absolute values of the deviation U, but the value of its components B. As a rule, the degree of deviation is expressed as a percentage of the nominal deviation. Displacement gradient for any $\delta > \mu$ node of the lattice

$$V_{i\%} = \frac{U_i - U_n}{U_n} \cdot 100$$

is determined as, where Ui is the value of the deviation in the i-th corner of the grid; Un is the nominal current of the network.
Analyzing the regime of grid disturbance, those stations are considered characteristic where the value of the parameters of disturbance is greater.
In sufficiently large cases of the disturbance, the normal working modes of the majority of electrical receivers are disturbed, and as a result, the quality of the product released in industrial facilities decreases, or the production of waste products or the increase of electrical insulation damage, and the reduction of the service life of electrical equipment occur. These cases do not happen all at once, it depends on the duration of the current work regime, the working conditions of the previous regimes, etc.
If the complexity of dependencies caused by the impact of this mode, and at the same time the economic damage is large, the values of the parameters of the deviation are not allowed to exceed certain limits according to the DIST. These determined values are called technically acceptable values. Even if abnormal events are not observed within these limits, this in itself requires additional inspections.
It is accepted that within these limits, electrical receivers should have the necessary characteristics and perform their functions normally.
According to State standard 13109-67, the amount of deviation in the boundaries of heating facilities should not exceed $2.5 \div 5\%$.
In order to start the engines and devices, the deviation in their limits is allowed within the limits of -5+10% of the nominal value. The tolerance of the voltage at the input of other electrical receivers is $\pm 5\%$.
In principle, it is also possible to prepare electric receivers calculated for larger values of the grid voltage, but this causes them to be complicated and have larger values. Thus, the relinquishable prices of the lost sedition fees according to the State standard are determined by certain economic interests.
It is accepted to characterize the non-symmetry of the current with the values of reverse and zero-sequence currents. As a result, the total value of the deviations from the nominal value will increase, and this will worsen the deviation modes of the electrical receivers. The operation of rotating electric machines is badly affected by even very small alternating currents. In these engines, the first negative sequence

currents are 5-7 times larger than the second negative sequence currents. As a result, a high-frequency rotating magnetic field is generated, and double-speed electric current is generated in the motor cycles and currents are generated, which in turn causes the corresponding moving parts of the machines to be damaged.

In the presence of zero and zero sequence currents, the accumulated currents in individual phases of the grid elements increase, which leads to an increase in power and energy losses, and this situation is unacceptable due to the lack of a short circuit. Zero-sequence currents are terminated by permanent grounding. In this case, the soil is additionally dried (at the expense of the current) and the resistance of earthing facilities is increased. This is inadmissible from the point of view of relay protection, and also has a strong impact on low-speed communication facilities, as well as on the blocking facilities used on the railway.

In order to prevent eusterilized cases, the allowable value of one-year deviations for all electricity receivers with the state standard should not exceed 2% of the nominal deviation. For asynchronous motors, it is allowed to slightly increase this value, depending on their rotation pattern. The value of zero consecutive annual interest is not fixed. However, for three-phase distribution networks with single-phase electric receivers, it is shown that the influencing value of the voltage on the walls of the electric receivers cannot exceed the acceptable limits, taking into account all the influencing factors - zero- and negative-sequence voltages, even-sequence voltage fluctuations and high harmonics of the voltage.

The non-sinusoidal shape of the excitation curve is characterized by the presence of other higher harmonics U_γ in the spectral composition of that curve, except for the basic frequency harmonic U_1 (here, γ is the serial number of the harmonic).

Since the pitch curve is symmetrical in nature, it contains double harmonics, i.e. 2, 4, 6, 8, etc. there are no accordions. In addition, in three-phase cycles, if there is at least one unit, since the three-phase electric receiver is connected, all harmonicas with the 3-th type are black. However, in the composition of the signal, the so-called canonical harmonics are 5, 7, 11, 13, 17, 19, 23, etc. harmonics affect, which also reflect the inconsistencies in non-symmetrical modes.

It should also be noted that high-frequency non-sinusoidal currents cause greater additional currents in rotating machines, as well as increased dielectric losses and additional currents in capacitors.

At the same time, it is possible for resonance events to occur in electric grids at high frequencies. In this case, the prices of electricity and currents in different parts of the network have increased sharply.

Depending on the operating conditions of electrical receivers, the non-sinusoidal nature of the oscillation, i.e. the harmonic composition, cannot be normalized. First of all, this is justified by the fact that the influence of harmonics occurs together with the influence of other factors (for example, asymmetry). Therefore, it is necessary to make sure that the magnitude of the disturbances in the boundaries of the electrical receivers does not go beyond the permissible limits and that the heat of the engines does not exceed the normal limit. This means that all influencing factors should be considered together.

Sometimes, to evaluate the non-sinusoidal, the displacement value of the non-sinusoidal displacement is used:

$$U \approx U_1 + 0{,}005\sum_{\gamma=3}^{13} U_\gamma$$

Using this parameter, we can also calculate the non-sinusoidal model for non-sinusoidal displacement:

$$K_{q.s.} = \frac{\sum_{\gamma=3}^{13} U_\gamma}{U_1}$$

The elimination of stagnation and development of industrial production in our republic is organically connected with the effective operation of its electricity facilities. The effective work of electroeneretics facilities, in turn, is highly dependent on the compliance of the equipment that forms the basis of these facilities with the requirements that meet the world standard, and the application of automated and automatic technical systems based on the application of modern achievements of information technologies.

It is known that in the management of the technological process itself, as well as in the realization of the finished product, the operational determination of the parameters characterizing the object and the product and their control is one of the main factors of the general working principle of electroeneretics objects. The application of control and diagnostic systems based on the use of transmitters and switches that meet modern requirements in the field of electronics allows not only to determine whether the finished product meets the standards, but also to locate undesirable tendencies in technological processes based on the indicators of the output product and to prevent them in time.

Initial parameter changes are the main elements of the automatic control and diagnostic systems intended for electric power facilities, and are technical tools that directly affect the accuracy and precision of the systems, which are important indicators.

The internal parameters of the circuit elements lead to the error of electrical and non-electrical quantities. In order to prevent the change of the working mode, the internal parameters of the measuring devices should wash the special conditions. It is impossible to change the operating mode of the system during the periodical connection of road equipment. Such an effect on the results of the movement of the objects is called the deviation of the method of movement.

I, Pinformation about the size of indicators is formed during the test of electric motors in faultless operation and short-circuit modes, characterizes their main technical-economic operational indicators, allows to forecast the technical apparatus and technological process, to evaluate the technical condition. Therefore, in order to more fully use the information contained in the malfunction and short-circuit indicators, the results of I, U, P sizes, product oil determination, diagnostics, static processing, and the solution of the issues of quality control for quality control time is analyzed in detail. This situation requires providing of electric motors with sufficiently high efficiency indicators of fault-free and short-circuit measurement systems and devices.

In recent years, the digital measurement tools and methods of integrated parameters of changing current signals have developed a lot. However, the achievements in this field seem very little compared to the achievements in the field of measuring systems and digital devices of parameters of changing current signals. The reason for this is a number of methodological and technical problems encountered during digital measurement of integrated parameters of alternating current signals.

One of the important directions in the direction of the creation of electric power transmitters and converters is related to the power measurement of non-sinusoidal signals under alarm conditions. The widespread use of non-linear elements in electronic and electrical equipment is the main reason for the appearance of harmonic distortions in the feed lines (voltage and current lines) of the corresponding processors. In this regard, many studies have been carried out, and scientific research work has been carried out precisely related to the analysis of effective methods for determining electrical parameters in non-sinusoidal periods.

One of the important issues that arise in the presence of non-sinusoidal signals is related to the accurate estimation of the period of the input signals. Thus, during the integration of the instantaneous power, the averaging (integration) period is taken as a function of nT. Here, T is the repetition period of the input signal (frequency or current), and n is an integer $\left(n=\overline{1,m}\right)$. Due to the fact that n is different from all numbers, it comes to the field. This error, which is known as "spectral distortion" in the field of discrete processing of signals, can be diagnosed in different ways.

There are different methods of electric shock applied in practice. Conventionally, they are equivalent to direct and indirect quotations. When using the direct estimation method, the value of the measured quantity is determined directly by the indication of the device. For example, current measurement - amperemeters, current - voltmeter and so on.

If the measured quantity is determined by calculating the readings of several devices, it is an indirect method, for example, finding power based on the readings of an ammeter and a voltmeter:

$$P=\frac{1}{M}\sum_{j=1}^{M}U_j^*\cdot I_j^*$$

If we take into account the errors that arise during the measurement of current and current:

$$U_j^* = U_j + \varepsilon_j,$$

$$\varepsilon_j = \overline{\varepsilon_j} + \varepsilon_j^0,$$

$$I_j^* = I_j + \gamma_j,$$

$$\gamma_j = \overline{\gamma_j} + \gamma_j^0$$

they are. At this time, those who have a relatively large amount of money are aware of the seriousness of the crisis. Alternating current signals have a non-sinusoidal character due to the above reason.

$$P = \frac{1}{M}\sum_{j=1}^{M} U_j^* \cdot I_j^* = \frac{1}{M}\sum_{j=1}^{M}\left(U_j + \varepsilon_j\right)\cdot\left(I_j + \gamma_j\right) =$$

$$= \frac{1}{M}\sum_{j=1}^{M}\left(U_j + \overline{\varepsilon_j} + \varepsilon_j^0\right)\cdot\left(I_j + \overline{\gamma_j} + \gamma_j^0\right) =$$

$$= \frac{1}{M}\sum_{j=1}^{M} U_j I_j + U_j\overline{\gamma_j} + U_j\gamma_j^0 + \overline{\varepsilon_j} I_j + \overline{\varepsilon_j}\,\overline{\gamma_j} + \overline{\varepsilon_j}\gamma_j^0 + \varepsilon_j^0 I_j + \varepsilon_j^0\overline{\gamma_j} + \varepsilon_j^0\gamma_j^0$$

By adding random and statistical errors to the sinusoidal signal, when the above is checked in practice using the Matlab software package. As shown in 1.1 and 1.2, we can see the acquisition of a non-sinusoidal signal

$$k_{\text{fc}} = 2;\ T = 120\textit{мин.}$$

CONCLUSION

Thus, when using the information obtained by the statistical analyzer of the quality of deviation, it is necessary to draw all the characteristics obtained by means of this facility: the shape of the histogram, the probability of falling into different levels, the average value and the standard deviation. As a lawyer, the most stable information about the road network is standard. Taking this into account, this quantity should be used when determining the quality of the change.

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