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Analysis of the Impact of the Installation of Reactive Power Sources on the Quality of Electricity

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ABSTRACT

This article provided practical recommendations on reactive power compensation to increase the efficiency of the use of electricity in power supply networks of industrial enterprises. It has also been noted that in recent years there has been a significant impact on the quality of electricity, the supply of high-quality and uninterrupted electricity to consumers, the design of the reliability of power supply systems, and the technological process of production.

Currently, the issues of providing electricity consumers with high-quality, uninterrupted, as well as reliable electricity are of fundamental importance. For this, a number of cases and parameters are considered. That is, it is of practical importance to develop measures aimed at reducing them by taking control of active, reactive, and voltage wastes transmitted by power lines, wastes in power transformers that change the voltage to a wide extent, energy wastes, and application in production enterprises. Situation and processes such as reducing the waste of voltage and active power by compensating for reactive power, mainly taking into account the occurrence of wastes in electrical networks, have been investigated. In this, an analysis of the indicators of waste in electrical networks at the present time was initially carried out, according to which ways to reduce them in an appropriate way were presented. [1,2]

With a change in demand from the production of electricity to the use, weather conditions, the complexity of the energy system for transmission to transformer phases with an unbalanced load, as well as the use of complex and electronic equipment by consumers and many other factors open up the possibilities of voltage regulation and can lead to a decrease in the quality of electricity During daily operation, breakdowns can also occur in power supply systems at excessively low voltage,

which in such cases can be eliminated by voltage regulation. By controlling the production, transmission and consumption of reactive power at appropriate levels of the power supply system, controlling the AC voltage and keeping it within acceptable limits can reduce its losses [2].

Network elements load:

$$I = \frac{\sqrt{\mathrm{P}^2 + (Q + \Delta Q)^2}}{\sqrt{3}\,U}$$

When delivering electricity to consumers, it must be uninterrupted, reliable and qualityю. But lately this process is not enough at present , measures are being developet to minimize the possible solution to this problem. Operation of the mains is mainle taken into account for active and reactive power losses and losses in the grid.

Network power loss:

$$\Delta \mathrm{P}_{\text{л}} = \frac{\mathrm{P}^2 + Q^2}{U_{\mathrm{H}}{}^2} * R$$

Network reactive power supply:

$$\Delta Q_{\text{л}} = \frac{\mathrm{P}^2 + Q^2}{U_{\mathrm{H}}{}^2} * X$$

Energy loss:

$$\Delta \mathrm{A}_{\text{л}} = \Delta \mathrm{P}_{\text{Л}} * \tau$$

Where τ is the maximum annual working time of consumers.

In order to insure reliable operation of the power grid, our main goal in reducing waste is to analyses the losses associated with the emergence of the crown line in our couture, as well as to develop up-to-date universal recommendations for reducing power losses for each crown.

By configuration, and structure. Subsequent assessments are made under each system. The effect of the power losses on the transmission lines in the subsystems isolated by the electricity network configuration is evaluated.

Energy losses,both naturally and in terms of production,distribution and consumption, are not the same as those used for energy consumption. Because their costs are includes in higher costs and annual maintenance costs.

Any technical measures to reduce losses are costly. Losses are always lowered, and vise versa, with smaller funds available. It is possible to know all the measures to reduce losses to 2 groups. Organizational and technical. Organizational arrangements do not require overtime, or over-budgeting.

Organizational measures include:

1. Increase voltage depending on available tools and devices.
2. Extension of service life and improvement of power supply equipment repair.
3. Matching annual and dale load schedules with the same power consumption and so on.

Technical measures require large additional costs. To calculate loss reduction, this these measures are summarized as follows.

II. RESULTS AND DISCUSSIONS.

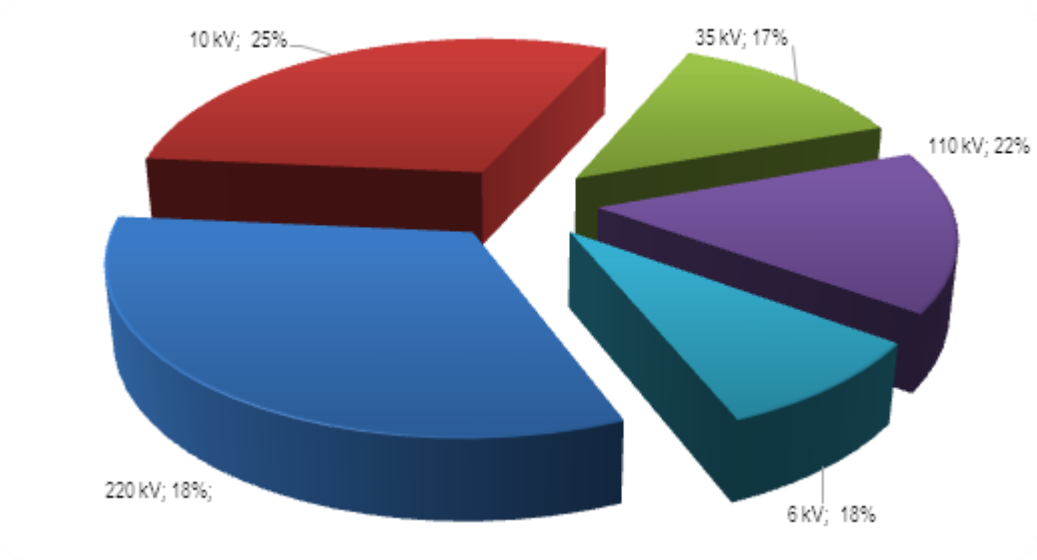
1. Switching the network to high rated voltage: $U_{\text{ном}}$
2. Using wires with cross-sectional surfaces.

3. Redlaciment overloaded transformers.
4. Installation of compensation devices.
5. Technicsl measures to reduce losses.

It is advisable to be based on the relevant economic calculations. [1,3] To determine the cause of electrical losses, a sample of control measurements and monthly calculations of power meters over a period of 4 to 6 years.Technical losses are, in turn,devidet into reactive losses and losses in power lines. Later, no other indicators of reactive energy loss are required. At the same time, the structural analysis of energy losses takes into account the strength of the lines this affects the energy lost along the line.

Structural analysis is performed in the following sequence. [5]

1. The ratio of technical losses to uninterrupted over supply to the network is determined by the nominal voltage classes.
2. It analyzes the proportion of jet losses in transmission lines.
3. The dynamics of loading and contingent constant losses are studied.
4. Factors for loading of reactive power coefficients and power transforms are analyzed.
5. The sources and causes of loss of electricity are identified.



Dynamics of power supply technical losses is necessary to evaluate the effectiveness of the mitigation measures this should be determinant for each class of nominal voltage.

Analysis shows that if electricity losses do not change over 5 years, the transmission system does not solve the problem of leakage, or the measures taken are ineffective.

Technical losses of electricity are higher in 10 kv networks, and analysis of the schematic state of the network confirms the results it is surefire advisable to revive these networks for further analysis.

Dynamics of technical reactive loses and the ratio of reactive energy transmitted through the network allows estimation of the accuracy of reactive energy. If technical losses of reactive energy are associated with reactive energy transmitted through the network, then real bite the economic part can be argued, otherwise a large metrological component of losses will be present.

Special to protect the power line from damage devices are used. Lightning ropes to protect them, lightning reflectors, tubular dischargers, and earthling devices. Substations are the main link in the power grid system. Depending on their location in the electricity system, the city, district electricity

also as a branch substation or an industrial enterprise substation referred to. The district substation mainly consumes energy from the district power grid and energy to industry, agriculture and other consumers provides. The primary voltage of district substations is 220, 110 kV the secondary voltage will be 35, 20, 10 or 6 kV.

Power dissipation load on any element of the electrical network depends on its nature and its change during the construction process. It does not change operating with load, ΔP for a period of time in with active power dissipation.The wasted energy is determined as follows:

$\Delta W = \Delta P \cdot t$

III. CONCLUSION

Wey cam conclude that in some substations, an active energy fossil can be reduced to 16,8% with a reactive energy loss of up to 20%. Based on the results of the study, wey can draw the following conic lusions.

1. Loss of jet energy has a significant impact on the efficiency and releability of the power grid, and their over lapping levels lead to a decrease in the profits of the tsclot network .
2. A method of analizing the circuits in the case of the current state of the elektrikcal network, which alows to determini the in fluencle of thous ands of reactive energy losses, has be in propossed.
3. He has dveloped a statiscal method for the structural analysis of reactive power losses in the operating conditions of the data used to edentifienergy losses.
4. This method alouwis us to identifiy ased lossws and identifiy their high values and causes.
5. Active energy loss reduction is also reflected in the distribution coplehes.

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