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Abstract. Special attention is paid to the development of the electricity supply system in the world. In particular, research aimed at significantly reducing the wastage of electricity in the network, improving its quality, and creating energy- and resource-saving modes of operation in the process of consumption is gaining importance. The quality of electricity in low-voltage power networks, in particular, the non-compliance of the voltage level with regulatory documents, leads to a decrease in the efficiency of the power supply of power networks, a violation of the technological process for electricity consumers. In this article, the problems of reducing electricity waste based on correction of voltage drop in low-voltage power networks are considered.

INTRODUCTION

It is necessary to calculate the waste of electricity, form electricity tariffs (calculation of waste standards), as well as to determine the places where electricity is wasted and to develop measures to reduce them, to justify the level of electricity waste [1, 28-33]. Currently, methods for calculating power and energy losses in all nominal voltage networks have been developed. In order to determine the normative values of electric power losses, the State Inspectorate for Control in Electric Power has approved the instruction "On the procedure for calculating the normative values of technological losses in the transmission and distribution of electric power through electric power networks."

For small power networks, the following methods are used:

- the method of calculating power and electricity waste, by elements using the power network and its mode parameters;

-method of calculation of electricity losses in -0,4 kV lines depending on the value of voltage drop.

The loss of electricity on a line with a voltage of 0,4 kV (as a percentage of the value of electricity supplied to the network) is determined by the following formula:

$$\Delta W_{\%} = 0{,}7 K_{\text{нотекис}} \Delta U \frac{\tau}{T_{\text{макс}}} \tag{1}$$

If the levels of the measured phase voltages on the transformer busbars are different, then the arithmetic mean value of the three phase voltages measured on the transformer busbars is accepted for determining DU. If the phase voltage is measured at the input of the three phases at the farthest point of the main line at the maximum value of the load, the smallest of the three measured values is accepted for calculation [2, 19-27, 34].

It can be seen from the expression (1) that the level of voltage drop due to the increase of the load at the network nodes from year to year worsens the technical and economic indicators of the network and the energy efficiency. It requires experimental confirmation to estimate the voltage level in low-voltage power networks.

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EXPERIMENTAL RESEARCH

It is known that conducting experimental research is one of the important stages in the qualitative performance of scientific research work. In this case, the accuracy and multi-functionality of the measuring devices used in the successful implementation of experimental construction work make complex experimental work much easier.

FIGURE 1. AR-6 power quality analyzer

Low voltage Tashkent state technical university, power supply department scientific research in his laboratory is available the same as the AR-6 and three phase in networks all electricity parameters measure and note reach for intended portable power analyzer device using take went.

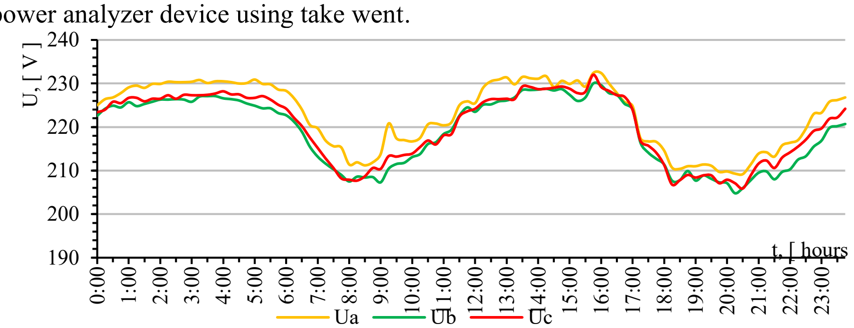

FIGURE 2. Information on voltage values at the TP output

The voltage level at the output of TP №443 can also be seen in Figure 2, which shows the measurement results obtained using the AR6 analyzer. In the figure, in the graph of the daily change of the voltage obtained with a time interval of 15 minutes, the voltage value decreases to 205 V at the output of transformer "B" phase 0,4 kV in the evening maximum mode of electricity consumers, which causes the nominal voltage deviation in consumers located far from the supply source to exceed the permitted value.

In Fig. 3 №443 TP 0,4 kV electricity transmission the air line at the end tension of value daily change dynamics experimental measurements based on seeing released at the end of the line tension level constant that it is lower than the nominal value to see possible [2, 10-18].

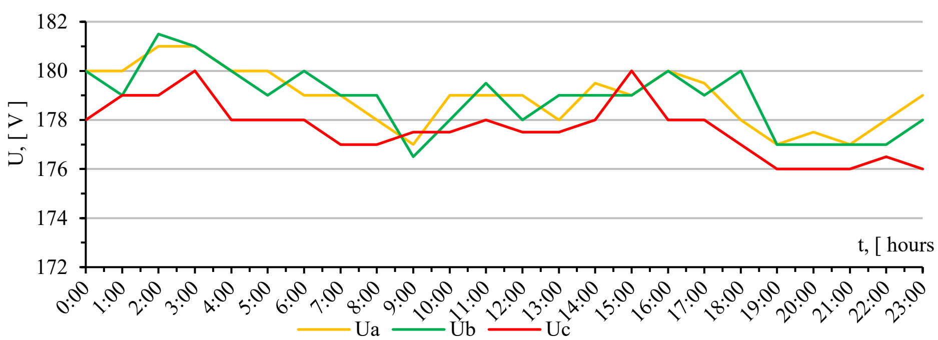

FIGURE 3. Voltage condition at the end of TP №443, 0,4 kV overhead line

Based on the above, it can be concluded that in the 0,4 kV power grid, which is the object of research one of the urgent tasks is to use voltage adjustment systems in order to solve the above problems [3].

RESEARCH RESULTS

Current at the time electricity in networks nominal tension level save stand up for distribution at the substation centralized voltage adjustment , consumer in substations local voltage adjust with together is used [4]. Lecturer in supply branches without waking up again with connector transformers (PBV) are wide is used. 10/0,4 kV with PBV such electricity networks the widest spread.

Using PBV transformer transformation coefficient change through voltage day during enough to correct possibility does not give because in this the transformer again connect for consumers from the network often interruption need and this this kind of adjust method big disadvantage is considered [5, 6, 35-41].

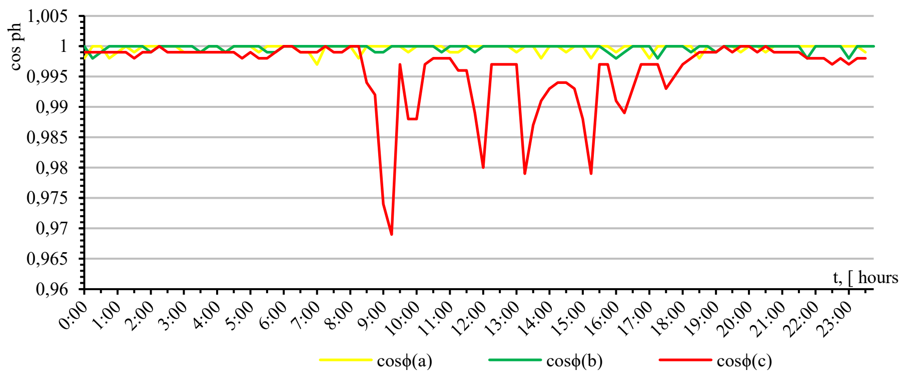

FIGURE 4. №443 TP 0,4 kV output cosph level

Electric in networks static condenser batteries through reactive power compensation and electricity of the network longitudinally of the elements reactive resistance change through of tension deviation change possible [13-20, 7, 1]. Electric in energy control according to state Inspection "Uzdavenergonazorat" dated September 9, 2008 power compensation according to things organize reach order on " in Regulation No. 168 defined to norms mainly, 0,4 kV electricity from the network provided consumers for power of the coefficient normative value As tgφ = 0,25 (cosφ=0,97). acceptance done 4 in photo №443TP cosφ daily average value from 0.969 less not this while on the network power coefficient value normative in value that means From this while voltage in adjustment individual and group reactive power compensation effect does not give obviously is happening Village electricity 0,4 kV in networks tense centralized to correct application , phase voltage sometimes up to 150-160 V instead of the usual 220 V falls Static condenser batteries important disadvantages, production issued reactive of power to voltage quadratic dependence being , this tension resonance cause release can.

The greatest voltage losses at the final consumer reach up to about 35% are observed in the current line (Fig. 5a). This is determined, first of all, by the fact that the cross-sectional surfaces of the wires do not correspond to the existing loads and the length of the line. Replacing the existing non-insulated wires of class A with SIP-2 insulated wires will reduce voltage loss up to 9%. As a temporary measure until the reconstruction of the facility, it is advisable to use voltage-correcting transformers in 0,4 kV networks to improve the quality of electricity and adjust the voltage.

As a final solution to the problem of low voltage in the 0,4 kV overhead line with a large KRT distance, when there is no possibility to split the overhead line, there is no possibility to install an additional complete transformer substation (KTP) in the provision of the 6 (10) kV network, or the cost of separating the 0,4 kV overhead line is to install the KRT gives the most effective work in conditions several times higher than its price. Voltage rectifier transformers are divided into 2 types, without a control system and with a control system. KRTs without a control system have an additional voltage adjustment, regardless of the electrical load in the mains. This does not always provide sufficient accuracy and can cause overvoltage conditions in electricity consumers. In such conditions, it is necessary to carry out scientific research work on the creation of KRTs with an automatic voltage adjustment control system.

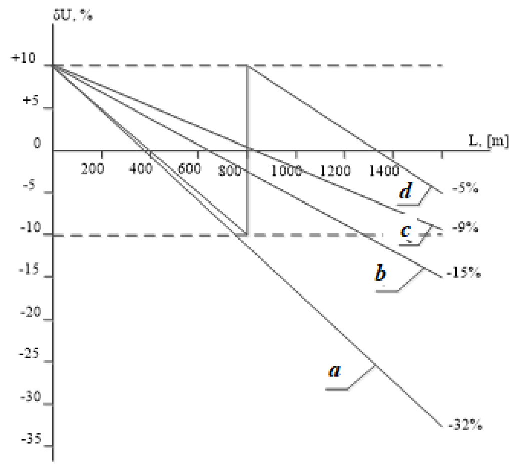

FIGURE 5. Diagram of voltage loss in the line: a- line with non-insulated wires of brand A; b- variant of the line with SIP-2 brand wires; c-RQKQ Installation of; d-installation of KRT on line.

One in Figure 6 phase voltage adjuster of the transformer principled scheme the author by offer done Recommendation The proposed scheme is as follows consists of: three 1,2,3 transformers, magnetizer throttle, sensing organ (KRT control system) and tension relay 4. Here transformer 1 's primary winding transformer 2 of primary voltage in series with winding relay 4 of normal closed contact through power to the source is connected. Transformer 1 of secondary winding his primary to the winding suitable respectively to the source in series with the load is connected. Transformer 2 secondary winding transformer 3 of primary to the winding suitable respectively and of transformer 3 secondary winding magnetizing of the throttle primary to the winding are connected in series. Magnetic throttle magnetizing winding feeler of the organ to exit connected [7, 42-47, 50, 51, 52].

Device as follows works: source of the network tension value to nominal value equal to or from him high if, voltage relay to work falls and voltage adjuster the entire supply of the transformer in the chain normal closed contact opens and voltage adjuster transformer turns off. Supply voltage from the nominal value when the voltage decreases relay 4 is turned off and the entire voltage adjust of the device manage system supply the chain normal closed the contact closes , at the same time magnetization to the winding constant current signal given , his value access of voltage to the value of depend Corrected as described in paragraph 3.3 of tension size access of voltage to the size of reverse is proportional and that's it suitable magnetic throttle magnetizing so that size access of voltage to the size of reverse proportional respectively changes [7-11, 48, 49].

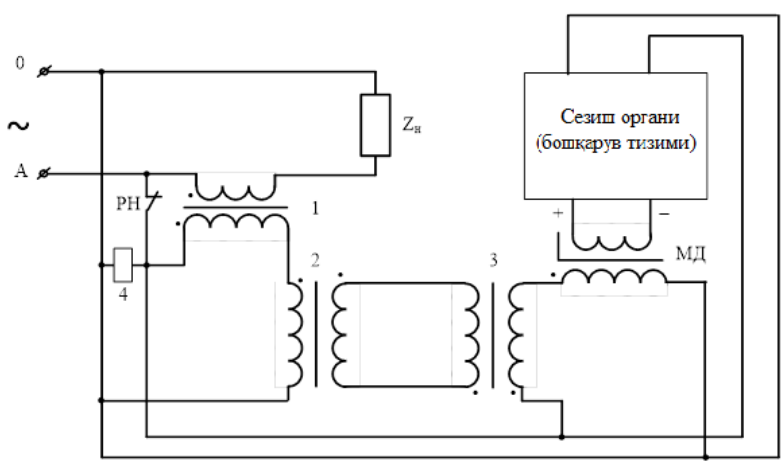

FIGURE 6. Tension adjuster of the transformer one linear principled scheme.

In conclusion, based on the results of experimental research conducted in low-voltage power networks, voltage regulators in power networks with low-voltage population electric load specific consumers to limit the wastage of electricity from exceeding the normative value due to the reduction of the voltage value in the network sections in the operating modes of maximum power consumption from the authorized GOST indicators creates the need to install transformers. When the voltage of the supply network changes from 150 V to 205 V, the voltage at the output of the voltage rectifier transformer changes from 221 V to 227 V, which is 0.9% of the nominal voltage. Based on the results of this experiment, the voltage adjustment based on the improved control system provides an automatic smooth adjustment of the voltage on the electrical load, taking into account the input voltage through the transformer [8-10].

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