

References

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ANALYSIS OF NEUTRAL MODE SELECTION CRITERIA FOR DISTRIBUTION NETWORKS OF OPEN PIT MINES

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The effectiveness of any type of network neutral mode operation is determined by the appropriate technical and economic conformity of the uninterrupted power supply to consumers, the amount of capital investment and operating costs. Withal it is taken into account that all kinds of emergency disconnections of power transmission lines and substations, as a rule, lead either to the complete de-energization of consumers or to restrictions on electricity consumption. In general, the evaluation of efficiency and the selection of network neutral mode operation are carried out on the basis of a technical and economic comparison of options. At the same time, reliability of power supply, electrical safety and efficiency of the system should be considered as the determining criteria for evaluating the neutral mode operation of open pit distribution networks [1, 2].

Other things being equal, reliability of power supply of electric receivers or reliability of open pit distribution networks is mainly determined by the damage of network elements and the quality of the operation of relay protection devices. The degree of influence of these factors on the reliability of the distribution networks depends on the neutral mode, which in turn determines the level of internal overvoltages and the nature of the transient processes in single-phase earth faults [3].

From the point of view of earth faults protection availability as well as its operation quality, it is possible to consider the most favorable electric networks with a resistor in neutral, where the current and directional ground protection devices used in isolated neutral networks show more reliable and high-quality operation due to the transient processes suppression. The compensated neutral networks with are in the most unfavorable situation according to the condition that the protection from single-phase earth faults is secured.

The lowest level of operational reliability corresponds to networks with fully isolated neutral, as well as networks with compensated neutral at compensation detuning of 20% or more from resonance. This is due to the high damageability of the elements of power supply systems from the effects of internal overvoltages and ferro-resonance phenomena.

In the case of compensated networks, in the absence of automatic resonance tuning of the compensation mode, a combined neutral operation mode is recommended, i.e. except for the creation of an inductive component of the single-phase earth fault current, it is also proposed to create an active component that is recommended at a level of 30-50% of the capacitive, which ensures operational performance adequate to power supply system only with a resistor in neutral, even with detuning of the arc reactor up to 50% from resonance compensation mode.

Key words: neutral mode, distribution networks of open pit mines, power supply

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