ABSTRACT

Sereda O.G.

PROTECTION OF BRANCHED POWER GRID NETWORK WITH DISTRIBUTED LOAD FROM NEUTRAL WIRE BREAKAGE

The possibility of extending the list of implemented protections in circuit breaker trip units based on the digital processing of signals from current sensors is justified. The possibility of protection against neutral wire breakage anywhere in a branched power grid network with distributed load in the presence of nonlinear distortions is proved. The need for protection against neutral failures in any part of a long electricity grid is conditioned by the fact that in the presence of phase currents asymmetry and neutral failures there is a possibility of dangerous overvoltage in single-phase consumers as a result phase voltages distortion.

The feasibility of identification of neutral failure fact by the harmonic analysis of the phase currents spectrum in the presence of nonlinear distortions is proved. The neutral failure fact is fixed by comparing the expected value with the actual value of the neutral wire current at its breakage.

With linear loads in the electrical circuit when phase currents vary by sine wave is not difficult to determine the expected current in the neutral wire. However, office equipment is nonlinear load which creates phase currents sine wave distortion. The time curve of current variation has the full odd harmonics range. Therefore, to form the expected image of the electrical circuit for networks with nonlinear loads, it is necessary to carry out harmonic analysis of the phase currents spectrum.

Only then it is possible to build protection correctly allowing for peculiarities of different harmonics currents variation. The phase currents harmonic analysis is carried of owing to the wide use of instantaneous current values squared integration mathematical operations in relaying devices.

The new technical solution enabling in sliding monitoring mode to create of circuit breakers operation criterion during the protection of single - phase electric power consumers from neutral failures is proposed. The algorithm for functioning of circuit breakers microprocessor trip at the neutral wire failures, in which the phase currents harmonic analysis is carried out through mathematical operations widely used in relay protection devicec, allows perfectly combining it with the mathematical apparatus for construction of other types of network protection.