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EARTH FAULT PROTECTION IMPROVEMENT ON DISTRIBUTION NETWORKS

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Abstract

The purpose of the article is to improve the single-phase earth fault protection for compensated electrical networks by eliminating the disadvantages of the known protection methods. The developed mathematical model revealed the possibility of non-selective protection operation due to the influence of aperiodic components in currents and voltages in transients. Insufficient sensitivity of protection at phase to earth faults due to active resistors greater than 10-20 ohms was also detected. The dependence of the reactive power on the frequency of the signals, isolated by the Hoertzel filters was obtained. These filters are taken as a basis because they require less computational cost than a discrete Fourier transform. It is suggested to perform differentiation before applying current and voltage of zero sequence to the frequency filters, which reduces the influence of aperiodic components on the phase errors of the relay and greatly enhances the useful signals. To increase the sensitivity of the relay when the phase is grounded through active resistance up to 100 Ohms, the relay circuit includes Hoertzel filters (for current and voltage) to select the components for two different frequencies (both higher than fundamental), and reactive power is found as the sum of power for the first and second frequencies. The sensitivity of enhanced protection algorithms compared to known algorithms is increased 10-20 times. References 13, figures 6, tables 2.

Key words: phase-to-earth fault, compensated electrical network, selective protection, Hoertzel algorithm, zero-sequence current and voltage, reactive power.

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