

The Peculiarities of Steady State Condition of Medium Voltage Cable Line 10 kV in Partial Compensation Mode of Neutral Grounding at Single-phase to Ground Fault

Valeriu Bosneaga, Victor Suslov, Ion Stratan, Ina Dobra

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Abstract

This work is devoted to the study of the steady state mode of cable line of medium voltage 10 kV at single-phase short circuit with failure current under-compensation at the fault point using an arcing reactor. For the study, a model of a cable line section was elaborated and implemented in the MATLAB-SIMULINK package using available standard elements for modeling the cable line and the supply and additional three-phase transformers. At this the specifics of operation of additional transformer for creation an artificial neutral for connection of arc suppressing reactor was taken into account. A clear picture of the processes occurring in the cable line during under-compensation mode has been obtained, taking into account the real parameters of the cable and transformers. It is shown that in the under-compensation mode, the triangle of linear supply voltages is displaced in a plane-parallel manner so that its vertex connected to the fault point depicts an arc of a circle, which is located in the 1st and 4th quadrants of the complex plane. In this case, the phase currents measured at the beginning of the line (to the left of the fault point) do not depend on the location of the fault. The analysis of symmetrical components of the currents is carried out. It is shown that at a fixed degree of under-compensation with a decreasing of resistance at the fault point this current increase to a certain maximum, determined by the chosen degree of under-compensation and network parameters.

Keywords: single phase short circuit, cable line voltages circle diagrams, circle diagrams currents, symmetrical components, cable line of medium voltage

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