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ANALYTICAL AND CFD-CALCULATION OF THE HEAT CONDITION OF FOIL WINDINGS OF OIL DISTRIBUTING TRANSFORMERS

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Abstract

An analytical method of calculating the thermal condition of foil windings of lower voltage oil distribution transformers has been developed. At known oil temperatures in the tank, this technique provides the identification of heat-recoil ratios on winding surfaces, taking into account their design features and heat loads, as well as calculating the excess esexcesses of the average temperature of the winding and its most heated point above the oil and over the cooling environment. In order to calculate the excess temperature of the winding over the oil by the method of separating variables using the final cosinus-conversion Fourier obtained the solution of the edge problem for the Poisson equation with heterogeneous boundary conditions on the surfaces of the rectangular section winding with anisotropic properties and with its uneven distribution of losses. In addition, an alternative approach has been developed to determine the thermal state of an axisymmetric transformer model by numerical CFD modeling of the system of equations of motion and continuity of the Navier-Stokes coolant. This allows you to obtain the distribution of the oil velocity field and absolute temperatures, both of the oil in the tank, and of the foil and ball windings of the transformer using the minimum empirical data on the physical properties of the oil and the heat transfer of the tanks. The methods are verified by known experimental data for transformers TM-1000/35 and TM-630/10. References 11,

figures 4, tables 2.

Key words: transformers distributive, windings, foil, oily cooling, heat, CFD-modeling.

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