

## **Finite element analysis of electromagnetic field and losses in a turbogenerator rotor**

Michael G. Pantelyat and Nikolaj G. Shulzhenko

Institute of Problems in Machinery of the National Academy of Sciences of Ukraine,  
Pozharsky Str. 2/10, UA-61046 Kharkov Ukraine  
Phone +380572959546, +380572942701, fax +380572944635, E-mail: SHULZH@ipmach.kharkov.ua

### **Abstract**

A finite element technique for computer simulation of transient electromagnetic fields, eddy currents density and power losses distributions due to negative sequence currents in synchronous generator rotors at various operational conditions is developed. Time-varying electromagnetic field calculation is performed in two-dimensional formulation in the Cartesian coordinate system using magnetic vector potential. The differential equation describing electromagnetic field distribution is solved in a coordinate system that moves synchronously with the rotor. The numerical technique is applied to the study of a 300 MW synchronous turbogenerator rotor during a line-to-line short circuit and long-time unbalanced load supply. Influence of the slot wedge material on electromagnetic processes in the rotor neglecting phenomena in the end zone of the rotor is investigated. It is demonstrated that titanium wedges are preferable in comparison with duralumin ones because utilization of titanium wedges results in essential decrease of eddy currents density and losses in the turbogenerator rotor at all investigated operational conditions.