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SETUP, VALIDATION AND PROBABILISTIC ROBUSTNESS ESTIMATION OF A MODEL FOR PREDICTION OF LCF IN STEAM TURBINE ROTORS

ABSTRACT

Flexibility and availability together with fast startup times become more and more important for steam turbine operation. Exact knowledge about the turbine components stresses and lifetime consumption during transient operation is a prerequisite in order to meet these requirements.

A transient FE model of an intermediate pressure steam turbine rotor was generated, allowing the prediction of temperature and elastic stress field during turbine startup, load changes and shutdown. Operating data of the steam parameters and of a thermocouple inside the wall of the turbine inner casing were used to indirectly validate the thermal FE model in order to reproduce the measured metal temperatures in a proper accuracy.

Subsequently a probabilistic sensitivity study was performed in order to identify the influence of scattering or not well known boundary conditions on the calculated lifetime consumption of the steam turbine rotor during a cold start. This in fact provides information about the accuracy of the prediction. The results of the sensitivity study also help to improve the model accuracy by identifying the boundary conditions with the largest impact on lifetime prediction uncertainty, i.e. the boundary conditions that need further investigation.