Numerical Analysis of Heat Transfer and Flow of Stator Duct Models

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Abstract

This paper describes the analysis of the •uid •ow in the stator ducts of a hydrogenerator using computational •uid dynamics. The main objective is to de•ne permissible simpli•cations of the model in order to speed up the simulation. Therefore, the rotor–stator interaction is signi•cant and needs to be taken under consideration. The software package ANSYS CFX supports two possibilities to connect these two reference models for steady-state simulations, the Frozen Rotor and the Stage model. Their differences are shown on a couple of parameters comparing these completely different reference models. Another important aspect pointed out in this paper is a comparison of the •uid •ow and the heat transfer along one of the stator ducts. Last but not least, a quality and sensitivity study has been accomplished. The dependence of the computed wall heat transfer coef•cient on the quality of the mesh near the wall is illustrated. Furthermore, the differences obtained lead to two particular turbulence models with different near-wall treatments, both of which have been applied.