

عنوان مقاله:

CFD simulation of the influence of straight-through labyrinth seal leakage flow on the rotordynamic behaviour of steam turbines

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خلاصه مقاله:

The efficiency of the power plants depends to a great extent on the efficiency of the turbines and therefore the reduction of unintentional leakage losses is very important. One way of increasing the efficiency is to minimize the unwanted leakage between rotor and casing of the turbine. To achieve this goal, the radial gap between the shaft and the casing must be reduced to a size as small as possible. At the same time rubbing of the rotor must be avoided, because this may destroy the sealing or in the worst case, the rotor. In this work, an investigation of the influence of the sealing gap on the operating behaviour of the rotor-dynamics of steam turbines has been studied using computational fluid dynamics (CFD). A brief summary of the current state of research on the labyrinth seal flow and rotor-dynamics of the steam turbine were made, it followed by creation of several seal models using ANSYS ICEM and applying the ANSYS CFX as the simulation tool, the validation of CFD results were done by comparison to the experimental results. The straight-through labyrinth seal of a large scale steam turbine considered for analysis and a 3-D model with eccentric rotor is simulated in order to obtain the rotor-dynamic force components. The task is accomplished with the adoption of rotating relative coordinate system to solve the problem as steady state in order to reduce the large computational effort. The rotor-dynamic force components are derived by integrating the pressure distribution on the rotor surface. Results presented that the measurement data and the simulation results are in a good qualitative agreement.

کلمات کلیدی:

Labyrinth seal, leakage flow, steam turbine, CFD, seal forces

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