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CFD RESULTS OF INLET AND REVERSE PUMPING FLOW FOR COMMON LABYRINTH SEAL LEAK PATH GEOMETRIES

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ABSTRACT

Labyrinth seals in various kinds of turbo machines often generate driving force components that may increase the unstable vibration of the rotor. The evaluation of labyrinth seal destabilizing forces have been documented by CFD analysis but only limited results have considered the leak path geometry influence on the resulting entry and reverse pumping flow prior to the labyrinth seal geometry. In this research, the ANSYS-TASCFlow, a commercial CFD program, is used to simulate leak path and labyrinth seal flows of various centrifugal compressor eye seal leak flow geometries. For each case, 3D models with eccentric rotor are solved to obtain the leakage flow, velocity vector, chamber pressure, and the average chamber swirl entering the seal. Comparison to bulk flow analysis for the same geometries and sealing conditions will be discussed.

Keywords: labyrinth, seals, leakage, stability, rotordynamics