

The Effect of Swirl Braked Grooved Seals on the Stability and the Unbalance Response of a Flexible Rotor

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ABSTRACT

Swirl Braked Grooved Seal (SBGS) is an advanced grooved annular seal for rotor-dynamic stability improvement. SBGS has circumferential or helical grooves in which several swirl brakes are placed. The swirl brakes can prevent the circumferential flow that might generate unstable dynamic fluid force in the seal. The stability and the unbalance response of a simply supported Jeffcott rotor, having a seal near the disk, are analyzed by FEM in which measured rotordynamic coefficients of seals are used. The rotordynamic analysis is performed for 18 different types of seals, including 13 SBGS, 4 conventional grooved seals (1 circumferential and 3 helical), and a smooth seal. Results show that the SBGS with circumferential grooves have high stability and low sensitivity to unbalance. On the other hand, the swirl brakes did not improve either stability or unbalance response for the helically grooved seals.

Keywords: grooved seal, swirl break, fluid force, stability, unbalance response