

# Effects of Seal Geometry on Rotordynamic Fluid Forces

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## ABSTRACT

This paper reports about experimental investigations of the rotordynamic fluid force on a centrifugal impeller with three types of wear-ring seal; i.e., a face seal, and two types of toothed seal with a rotor seal tooth and inside/outside stator seal tooth. The impeller is equipped with a vaneless diffuser. Experiments were conducted to measure the rotordynamic fluid force on the impeller in whirling motion directly using the 4-axis force sensor, and the unsteady pressure at the impeller outlet. It was found that, (1) At low flow rate, the fluid force and fluid force moment have a peak at a certain whirling speed caused by a coupling between the whirl and vaneless diffuser rotating stall. (2) The change of seal geometry affects the direction of fluid force through the change of the unsteady leakage flow due to the whirl.

**Keywords:** Rotordynamic Forces, Seal Geometry, Whirling Motion, Rotating Stall, Centrifugal Impeller