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EFFECT OF CENTRIFUGAL INERTIA ON THE LOAD CAPACITY OF THRUST GAS BEARING

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Teams Link

Abstract

It has been known for many decades that both rigid and foil thrust bearings are two options in the market for high-speed turbomachinery systems. Their advantages encompass the lower manufacturing cost, the lighter weight, and the flexibility in allowing "component misalignment and runout." When the operating fluid is air, the classical lubrication theory works perfectly. Any additional terms of the inertia effect might be somehow less significant and sometimes negligible since the viscous forces will be dominant, but this may not be the case if the bearing operates in a harsh environment, such as a high-pressure environment. Nonetheless, this is a different scenario when dealing with water or denser gases lubricated bearings since the inertia forces have significance and effects as same as the viscous forces. Therefore, the classical lubrication theory, where the inertia forces are very small – Modified Reynolds number (Re) << 1 – should be rederived and modified to include those additional terms. As they play a major role in affecting the bearing performance by reducing its load capacity, they should be considered. This thesis shows the comparison of both solutions when inertial terms are considered and when they are not through the comparison of the local Reynold number, pressure, streamlines, deflections, and load capacity.