Comparison studies on the dynamic performance of high speed turbocharger rotor supported on oil-free bearings versus conventional floating ring systems

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Abstract

Present work focuses on the dynamic modelling of the dual disc rotor supported on oil-free bearings idealizing a turbocharger rotor bearing system. The nonlinear hydrodynamic bearing forces are computed and the discretized the equations of motion using finite element method are solved with time integration scheme. The disc unbalance forces are also accounted. Same model is compared with the oil-lubricated bearing system, the bearing forces are provided as oil and floating ring forces expressed in terms of nodal displacements in two bending directions. Effects of temperature on the viscosity are accounted using Dowson equation and the results are compared with oil-free and oil lubricated bearing Turbocharger. It is planned to investigate the effect of the bearing clearances and preload due to thermal expansion on the overall dynamic charcterstics of bump foil radial bearing supported rotor.