The Influence of Injection Pockets on the Performance of Tilting-Pad Thrust Bearings - Part I: Theory

This is Part I of a two-part series of papers describing the effects of high-pressure injection pockets on the operating conditions of tilting-pad thrust bearings. In Part I a numerical model based on the Reynolds equation is developed extending the threedimensional thermoelastohydrodynamic (TEHD) analysis of tilting-pad thrust bearings to include the effects of high-pressure injection and recesses in the bearing pads. The model is applied to the analysis of an existing bearing of large dimensions and the influence of the pocket is analyzed. In the analysis, the high-pressure oil injection used for hydrostatic jacking is turned off (i.e., only the effect of the pocket is studied). It is shown that a shallow pocket positively influences the performance of the bearing because it has characteristics similar to those of a Rayleigh-step bearing. In Part II of the paper (Heinrichson, N., Fuerst, A., and Santos, I. F., 2007, ASME J. Tribol., 129(4), pp. 904–912) measurements of pressure profiles and oil film thickness for a test-pad are compared to theoretical results. The analysis of Part II deals both with flow situations, where the high-pressure injection is turned off, as well as with situations where it is turned on for hydrostatic jacking.