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A Steady State Characteristics of Four-Lobe Journal Bearing Lubricated with a Couple Stress Fluids in Turbulent Flow Regime

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Abstract : This paper presents the steady-state performance analysis of a four-lobe journal bearing lubricated with a couple stress fluids operating in the turbulent regime, following Constantinescu's turbulent lubrication theory. The modified Reynolds equation is solved numerically using the finite difference method taking into consideration the effects of the turbulence and the couple stress. In this analysis, the steady-state parameters in terms of the attitude angle, load carrying capacity, side leakage and friction coefficient are determined at various values of eccentricities ratio. The computed results show that the turbulence increases the load carrying capacity, the attitude angle and the friction coefficient for a journal bearing lubricated with a Newtonian or a couple stress fluids. It is found that the turbulence has strongly influence on the steady-state performances of the four-lobe journal bearing lubricated with Newtonian fluids or a couple stress fluids.

Keywords : Four-lobe journal bearings, static characteristics, couple-stress fluids, turbulent flow
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