Abstract

The present work deals with the steady nonlinear flow of an incompressible Navier-Stokes fluid in the annular region between two infinitely long eccentric cylinders the problem is described in terms of the bipolar system of coordinates (ξ, η, z). The motion is created by the rotation of the inner cylinder ξ_1 about its own axis, while the outer one ξ_2 is kept stationary.

The map of the stream functions is analyzed, and the secondary flow separation and reattachment points at the boundaries are discussed. The effects of the Reynolds number Re, the eccentricity ε and the clearance ratio c on the flow pattern are theoretically analyzed.

On the basis of the above calculations, a careful discussion of journal bearing applications at different values of Re, ε and c is reported. The obtained results show satisfactory agreement with the recent literature.