

Chiera, C.; Connell, H. J.; Shepherd, J. J.

Perturbation methods applied to the helical flow of a Casson fluid. (English) Zbl 1195.76014
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Summary: The helical flow of a Casson fluid between infinitely long coaxial cylinders is analyzed, when the inner cylinder has a given constant angular velocity, and a constant axial flow rate is imposed. Perturbation methods are applied in two circumstances of physical interest - that of low axial flow rates; and that of small intercylindrical gap width - to yield approximate expressions describing the fluid velocity field; and the Reiner-Riwlin equation, the fundamental relationship linking the angular velocity of the inner cylinder, the torque experienced there, and the given axial flow rate. The accuracy of these expressions is tested by comparison with solutions generated using numerical computation.

MSC:

[76A05](#) Non-Newtonian fluids

[76M45](#) Asymptotic methods, singular perturbations applied to problems in fluid mechanics

Cited in 1 Document

Keywords:

[perturbation methods](#); [helical flow](#); [Casson fluid](#); [rheometry](#)

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