

Hydrodynamic Instability in Helical Flow

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Nature of work: Experiments

Area: Chemical Engineering

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Brief description: The helical flow geometry, produced by the axial flow through the annular gap between two rotating concentric cylinders, is important in many industrial applications. Examples include flow of drilling mud in oil drilling, plastic extrusion, tubular membrane filtration and vortex flow reactors. Under certain conditions, the flow becomes unstable with formation of vortices that travel along the longitudinal direction. While such flow instabilities are undesirable in flow property measurements and in extrusion, they are regarded as advantages in other applications. For instance, vortex formation increases mixing and reaction rates in a catalytic reactor; improves rock carrying ability of drilling fluids; and promotes self cleaning in membrane filtration. In this project, helical flow instability will be studied by flow visualisation and numerical modelling. Various test fluids having different rheological properties will be used to determine the onset and conditions of flow instability and characteristics of vortex formation and growth.

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