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Numerical Study of the Flow of a Shear Thinning Fluid Past a Circular Cylinder Forced to Oscillate Sinusoidally[1] UMANG PATEL, JONATHAN ROTHSTEIN, YAHYA MODARRES-SADEGHI, University of Massachusetts Amherst — Current study numerically investigates two-dimensional laminar flow of shear-thinning fluids past a circular cylinder forced to oscillate in cross-flow direction. Merged PISO-SIMPLE algorithm (PIMPLE) has been used to solve the governing equations on unstructured grid. The sinusoidal oscillations of cylinder were handled by solving cell-centre laplacian for mesh motion displacement. Oscillation frequency has been kept in such a way that reduced velocity remains close to 6. The shear-dependent viscosity has been modelled by the Carreau model where power index is kept below unity to model shear thinning fluid. Reynolds number is defined based on zero shear-rate viscosity. Vortex shedding is observed at very low Reynolds number as compared with the Newtonian fluid since shear-thinning effects are causing the flow to destabilize. For various values of Reynolds number and Carreau model parameters, lift and drag coefficients as well as time- averaged normalized viscosity have been reported. As opposed to Newtonian fluids, we observed the decrease in mean drag value with increasing Reynolds number due to shear thinning effects. The forced oscillations result in shedding of vortices at Reynolds numbers lower than the critical Reynolds number to observe shedding in a fixed cylinder.

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