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DRAG REDUCTION USING HIGH MOLECULAR WEIGHT POLYMERS IN TAYLOR-COUETTE FLOW

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ABSTRACT

Turbulent drag reduction with high molecular weight polymers is examined experimentally using Taylor-Couette (TC) flow set-up. The set-up consisted of a rotating inner cylinder and a static outer cylinder with radius ratio (η) =0.76 and aspect ratio (Γ) =10.57. A reaction torque sensor was used to measure the torque acting on the inner cylinder. Experiments were conducted on a wide range of Reynolds numbers varying from 50,000 to 280,000 and the dimensionless torque (G) was used to scale the torque which compared well with the previous TC studies. For drag reduction, four different concentrations i.e. 80, 120, 160 & 200 PPM of polyacrylamide/Drag Reducing Agent (DRA) solutions were used. The skin friction coefficient (c_f) was used to infer the drag reduction in the experiments. The effect of concentration and Re on Drag Reduction was investigated. A maximum drag reduction of 63% was observed for 160 PPM solution. The TC set up is a suitable configuration for drag reduction testing and is more convenient than channel flow set up. The results were found to scale well with the turbulent drag in wall bounded shear flows (such as pipe/channel flow).

KEYWORDS: Drag Reduction, Taylor-Couette Flow, Turbulent Flow, Skin Friction Coefficient, Polymer

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