A B S T R A C T

This thesis is concerned with the problem of explaining the synergism observed in the drag reduction due to polymer-polymer, polymer-fibre mixtures solutions in turbulent flow.

Pressure drop measurements have been made across one inch diameter pipe line during the turbulent flow of polymer-polymer, and polymer-fibre mixture solutions. Flow Reynolds numbers ranged from 20000 to 60000. Both positive and negative deviations from linear additive line have been observed in percentage drag reduction of the mixture solutions depending upon the composition, flow rate and polymer species in the mixture. The percentage drag reduction has been predicted theoretically by using an interaction parameter. This interaction parameter is believed to depend upon the interaction between molecules of components in the polymer mixture. The random coil size and regidity of the polymer molecule appear to be responsible for synergism observed in percentage drag reduction. A qualitative relationship has been established between the synergism in percentage drag reduction and solvation number of the polymer. In general mixtures having larger solvation number seem to give positive synergism.

The drag reducing effectiveness of the pure polymers has been measured in the recirculatory flow system and the results obtained are compared with that of turbulent rheometer results.

The shear stability of pure polymers, polymer-polymer mixtures and polymer-fibre mixtures has been studied. It has been found that the shear stability of the mixture is in between the shear stability of the pure component polymers at the same concentration level.

In addition to the above studies ultrasonic velocity measurements have been made in the solutions of drag reducing polymers. A new method based on 'Rao Formula' has been developed for the speedy structural analysis of polymer molecules for the first time.