



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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SHORT ABSTRACT

Linear stability analysis of steady two-dimensional flow past elliptic cylinders of different aspect ratio (Ar) is conducted. Computations are carried out for flow Reynolds number (Re) in the range 30-200. First, the main characteristics of the steady flow, like the bubble length, bubble width, separation Reynolds number, separation angle, drag coefficient, coefficients of the front and rear stagnation pressure, and the maximum vorticity on the cylinder surface have been obtained. The effect of blockage on the steady flow results has been studied by varying the location of the side boundaries. In certain cases, the flow properties are found to vary in a nonmonotonic fashion with change in the blockage. From the linear stability calculations, we find that there are three sets of complex eigenmodes (PWM, SWM and TWM) which become unstable with increase in Re . The critical Re for the onset of instability of these modes and the corresponding Strouhal number (St) have been computed. The effect of blockage on the linear stability results is also studied. Structural sensitivity analysis is conducted to find the region best suited for effecting control of the unstable modes. We carry out unsteady computations by selectively suppressing one or more linear modes to see the kind of flow which evolves and, as a result, make an attempt to understand the role of the unstable linear modes in the fully developed nonlinear flow.