

Abstract Submitted
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Flow past a circular cylinder with momentum injection: Optimal control cylinder design SUBHASH REDDY, PRASAD PATNAIK, Indian Institute of Technology, Madras — The primary aim of this work is to suppress vortex shedding behind a circular cylinder by placing two small rotating control cylinders very close to it and hence injecting momentum into the boundary layer. The position and circulation strengths of the control cylinders are the important aspects of our study. Solving the complete Navier-Stokes (NS) equations can be time consuming while identifying the position and circulation strength of the control cylinders. Instead, reduced order models (ROM) can be used to save the computational expenditure associated with solving the complete NS model. Physics-based approaches to reduced order modeling include many of the techniques for modeling and simplification commonly used in fluid dynamics analysis such as potential flow analysis, vortex methods etc. Each of these are approximations to the full NS equations and each can serve as effective ROMs under appropriate conditions. In the present study, we try to achieve potential flow behavior by optimum positioning of the control cylinders and hence potential flow analysis is carried out with different analytical methods like Föppl vortex model and conformal mapping techniques. For these optimum values, the analytical solution obtained is compared with the numerical viscous flow simulations.

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