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Prediction of Flow Over Bluff Bodies In A Gas Turbine Combustion Chamber Using Cfd Code

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Abstract- The recirculating flows behind flame stabilizers in a gas turbine combustion chamber have been the subject of extensive research in recent years with a view to optimize combustion in the context of frequent fuel price rises and enforcement of tighter air pollution regulations. Swirlers and bluff body flame holders are widely used in many engineering applications like gas turbine combustion chamber, aircraft jet engine after burners and ramjets and other high intensity combustors to stabilize the flame and improve the combustion efficiency by establishing a highly turbulent recirculation zone. The recirculation zone can be set up in the wake of bluff body such as disc or cone or alternatively it can be generated by the action of swirl, the swirling motion sets up a static pressure field to balance the centrifugal forces of swirling flow and the recirculation zone can be set up without the presence of a central bluff body at sufficiently high degrees of swirl. Theoretical investigation of two dimensional recirculating flows have been carried out under isothermal and reacting conditions. Mean velocity and turbulence measurements have been made in isothermal flows behind bluff bodies placed Axi- symmetrically in a cylindrical chamber at entrance. The bodies tested are at 60° apex angle cone and a cylinder. These bodies are having same blockage ratio of 16% (based on area). The measurements have been made for a single inlet velocity of 30 m/sec. Of the two bluff bodies, the cone is found to develop a recirculation zone of comparatively large volume / surface area ratio and a large surface area. In the present analysis Axial velocity, Radial velocity and Turbulence intensity are predicted for different shapes of bluff bodies over the chamber. A k~ε model has been used for modeling turbulence.