COMPUTATION OF TURBULENT JET IN A CONFINED COUNTERFLOW

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Abstract

The mean flow field of a turbulent jet issuing into a confined, uniform counterflow is studied. Computations are performed for a range of jet-to-counterflow velocity ratio ranging from 2 to 20 and jet exit-to-confining duct diameter ratio from 5 to 100. The flow field is dominated by a large recirculation region due to the interaction between the jet and the counterflow. The velocity profiles in a limited region of the jet are found to be self-similar. The jet penetration length varies linearly with velocity ratio for large values of diameter ratio. The presence of the external bounding walls cause departure from this linear relationship. A model for velocity decay along the jet centreline available for the unconfined case is shown to be useful for the confined cases also. An interesting double-peak in turbulence intensity along the jet centerline is observed.

Keywords: Turbulent Jet, Counterflow, Penetration Length, Potential Core, Entrainment