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Experimental Study and CFD modeling of high speed water jets in air ANIRBAN GUHA, R.M. BARRON, R. BALACHANDAR, Mechanical Enigineering Department,University of Windsor — High speed turbulent water jets are extensively used in industrial cleaning applications. They interact vigorously with the surrounding air and loose mass in the form of water droplets which moves along with the entrained air stream. The transfer of momentum to the surroundings reduces the jet velocity and thus the pressure at the impinging surface is significantly lower than the supply pressure. Laser Doppler Anemometer (LDA) measurements of velocity field and pressure measurements at different axial and radial locations were performed. The potential core of the jet was found to extend to around 100 nozzle diameters. The dynamic pressure along the centerline was found to decay linearly, which can be used to estimate the decay of water volume fraction along the centerline. An empirical formulation of mass transfer (in the form of droplets) from water phase to the surroundings has been developed and incorporated into the commercial CFD code FLUENT. The flow was simulated using the RNG k-ε turbulence model and Eulerian-Eulerian multiphase model. The predicted pressure distribution at the impinging surface was found to match closely with the experimental findings.

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