Study of Two-Dimensional Transverse Liquid Injection into Subsonic Air Stream

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Abstract

Numerical simulation of transverse liquid injection into subsonic air stream is presented in this study. The two-dimensional Reynolds Averaged Navier-Stokes equations along with the standard k-ε turbulence model are solved using FLUENT software. Two-phase flow is simulated by the Eulerian multiphase model. Nine different cases are studied and the results for the liquid jet boundaries and flow fields for water and air are presented. It is found that volume fraction of water decreases as the liquid jet flows downstream. The liquid to air mass ratio also decreases as the jet moves downstream. However, the liquid jet is bent and its width is increased. Velocity fields of water and air and static pressure of mixture increase with free-stream Mach number, M. However, the Mach number has only a marginal effect on break-up length, penetration height, and liquid to air mass ratio. Velocity of air, velocity of water, static pressure of mixture, liquid to air mass ratio, break-up length and penetration height increase when momentum ratio, q, is increased.

Key words: Transverse liquid jet, Penetration Height, Break-up length, FLUENT