Abstract

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Experimental Investigation for Hydrodynamic Flow Due to Obliquely Free Circular Water Jet Impinging on Horizontal Flat Plate

The inclination circular liquid jet impingement on a horizontal target smooth plate has been investigated experimentally. The hydrodynamic flow structure of unique nocircular profile due to oblique jet is studied in the present work. The nozzle inclination angle is varied from [30o to 90o from horizontal], while the water flow rate is varied from 2 to 5lpm at constant nozzle-to-target separation distance of 30 mm. The nozzle used during the experiments is of circular shape of 5.5 mm diameter. A circular hydraulic jump symmetrical profile was observed due to normal impinging of free water surface jet, but the radial spreading flow structure due to oblique circular jet was different and the hydrodynamic profile of the jump location having elliptical shape structure. The effect of jet inclination angle and the water flow rate on the dimensionless film thickness and the dimensionless hydraulic jump profile in azimuthal direction. The experimental investigation shows that the thin layer film thickness spreading in radial direction decreases gradually until it reaches its minimum value then increases gradually up to location of hydraulic jump. The results show that for oblique jet impingement the thin layer film thickness is non uniform distribution in azimuthal direction. The experimental results indicate that jet inclination angle has significant effect on dimensionless film thickness and flow structure. The thin liquid film area bounded by the jump increases as the jet inclination angle (with the horizontal) increases, being maximum when the jet impinges normal to the horizontal plate. The area bounded being maximum as jet impinging normally on horizontal plate. The striking difference between the non-circular and circular hydraulic jumps is also considered.