

Pressure distribution on a semi-circular concave surface impinged by a single row of circular jets.

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Abstract

Experimental investigation is carried out to study the variation of pressure distribution on a concave semi-circular surface impinged by a single row of round multiple jets to study the effect of curvature ($D/d = 4.25, 6.1$ and 8.5), jet to plate distance ($z/d = 1, 4$ and 6), jet to jet distance ($s/d = 2.4, 4$ and 5.6) on the pressure distribution of the concave surface. Pressures are measured at three different angular locations namely $0^\circ, 30^\circ$ and 60° by a micro manometer. Reynolds number of 20000 is maintained constant. Coefficient of pressure is reported for 15 different configurations obtained by changing jet to jet spacing, jet to plate spacing and curvature. It is observed that the coefficient of pressure reduces as the jet to plate distance increases for a given jet to jet distance and given curvature. Stagnation pressures are maximum for $s/d = 4$ whereas they decrease for $s/d = 2.4$ and 5.6 for a given jet to plate distance and a given curvature. Stagnation points are shifted away from the geometric centre of the jet in the flow direction (direction of flow of air in the jet tube). This shift increases with the increase in jet to plate distance (z/d). There are secondary pressure peaks in between two stagnation primary peaks which suggest an upwash. Secondary peaks vanish for lower jet to jet distances ($s/d = 2.4$). It is attributed to the mixing of the jets before they reach the surface. Actual mass flow rate through each jet exit is calculated. Coefficient of discharge is around 0.65 which is less than that reported for a flat plate in the literature. Hence, the resistance offered by concave curved surface is more than that offered by a flat surface.