

Effect of multiple jet impingement plate configurations on Reynolds Number in a pipe

ABSTRACT

Experimental investigations were carried out to study the effect of varying multiple jet impingement plate configurations on Reynolds Number (Re) in a closed conduit. Air was considered as the working fluid. There were six multiple impingement plates used for this experiment where each plate has a different hole configurations that include the hole diameter, hole orientation, pitch in x-direction and pitch in y-direction. Four sets of orifice plate with diameter of 0.02, 0.03, 0.04, and 0.05 m were used to get the mass flow rate in the pipe. Air was sucked through the impingement plate for five different settings of suction fan with an interval of 10Hz from 10 to 50Hz. By taking the data for constant suction fan setting at 50Hz, it was found that the impingement hole orientation for both in-line and staggered does not give any effect on the Re obtained since the differences was considerably small and fell within the accepted errors. Meanwhile, impingement hole diameter was found to be directly proportional with the Re obtained. It was also found that the different pitch in multiple hole impingement plate resulted in changes of Re . The results show that the Re was decreasing with higher pitch. The uncertainty analyses for the Re were also presented.0

Keyword: Multiple jet impingement plate configurations; Reynolds Number; Pipe