EFFECT OF HEAT FLOW RATE Q ON CONVECTIVE HEAT TRANSFER H OF FLUID JET IMPINGEMENT COOLING ON HOT PLATE.

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ABSTRACT

In order to evaluate the coefficient of convective heat transfer, h, an impingement air cooling method was designed and developed for this target. Studies were carried out to determine the Convective Heat Transfer Coefficient, *h*, under multiple jets of impinging cold air on a target heated flat plate. Tests were run with air-distribution plates with hole diameters, *d*, of *1.5mm, 2.0mm, 2.5mm* and *3.0mm.* The target plate is a carbon-steel flat plate of *6mm* thickness, instrumented with a total of three *Chromel-Alumel* K-type thermocouples. The plate is electrically heated using a variable supply current input. Tests were run at various cooling air flow rate *G*, between *1.0kg/m^3, sec* to *3.0kg/m^3, sec*. Distribution plate-to-target plate distance *Z(mm*), was varied between 1*00mm* to *200mm.* Heat input to the target plate *Q Watt*, was varied to give a heat flux rate between *10* to *100 watts*. Results obtained were reduced and analyzed by evaluating for the dependence of *h* on the impingement jet diameter, Jet Reynolds Number, and the coolant mass flow rate *G*. Based on the results obtained, considerations were done on the effect of heat input Q watts and Convective Heat Transfer Coefficient, h, w/m^2,^{o}C.

KEYWORDS: Reynold's Number, Nusselt Number, Prandtl Number, Impingement Cooling, Heat Transfer Coefficient.