

ANALYSIS OF DIFFERENT INLET CONDITIONS OF AIR IN A RECTANGULAR CHANNEL ON FORCED CONVECTION HEAT TRANSFER

S. P. WALDE¹ AND V. M. KRIPLANI²

¹ Student, IV Semester M.Tech (Heat Power Engineering) ² Professor
Mechanical Engineering Department, G.H.Raisoni College of Engineering, Nagpur.440016, India

Abstract

The effect of different inlet conditions of air in a rectangular channel is analyzed with passive heat transfer augmentation technique. Most of the investigations, in general, have involved, or assumed a channel flow with a typical straight inlet flow direction. Very little study has been done for the channel with turned flow. Therefore, an experimental study is carried out in a channel with 45⁰, 90⁰ turned flow. Reynolds number was varied from 3000 to 15,000 which indicate only turbulence flow. Furthermore baffle plate is introduced in order to increase total heat transfer surface area. Also the inlet temperature is varied and air is supplied at three different temperatures i.e. 45⁰C, 50⁰C, and 55⁰C in order to study the effect of temperature on heat transfer. Simultaneously the heat transfer, Nusselt number, heat transfer coefficient are analyzed. Experimental procedure was validated by comparing the data with straight inlet ($\theta = 0^0$) without baffle in the test section. The result showed that percentage increase in heat transfer for air entering at 55⁰C and at an inclination of 90⁰ to that of 0⁰ inclination at same temperature is 0.63025. Similarly the percentage increase in pressure drop between 90⁰ inclination and 0⁰ inclination with baffle in the test section is 0.78947 thus we can say that pressure drop increases with increase in inclination and is highest for 90⁰ inclination of inlet section.

Keywords : Baffle, heat transfer enhancement, rectangular channel, turbulence.