

**Name: Nasser Fadil Hussain, Analytical and Experimental Investigation of Fully Developed Mixed Convection in an Inclined Circular Cylinder, University of Technology, Department of Mechanical Engineering, Master, Supervisor name: Prof. Dr. Abdulhassan Abd Karamallah & Dr. Akeel Abdulah Mohammed, 2009, 142 page.**

#### **ABSTRACT:**

The present investigation aims to study experimentally and theoretically the problem of mixed convection heat transfer in a fully developed region of the uniform heated inclined cylinder for a laminar air flow.

The influence of Reynolds number and heat flux on the temperature and velocity profiles, and also on the temperature and local Nusselt number variations were theoretically investigated by means of numerical study for a fully developed upward air flow in the entrance region of an axial symmetric vertical cylinder. Whereas the governing equations were solved by a finite difference method and Gauss elimination technique in two directions (axial direction and radial direction).

The experimental part covered a wide range of heat flux and Reynolds number (heat flux varies from  $152 \text{ W/m}^2$  to  $812 \text{ W/m}^2$ , and Reynolds number varies from 518 to 2041) with different angles of cylinder inclination  $\{0^\circ, 30^\circ, 60^\circ, \text{ and } 90^\circ \text{ for aiding flow and } -30^\circ, -60^\circ, \text{ and } -90^\circ \text{ for opposing flow}\}$ . To achieve the hydrodynamically fully developed condition at the entrance region of the test section, a calming section made from aluminum with  $(L/D=22.2)$  is used for this purpose.

It was found from the experimental results that the surface temperature distribution along the cylinder in the horizontal position is lower than that in the inclined and vertical positions, and the local Nusselt number value increases as the Reynolds number increases, and the