

ABSTRACT

An experimental study was made of velocity profiles of water flowing at low Reynolds numbers vertically upward in a heated round tube. The tube walls were maintained at constant temperature. Velocity was measured visually using dye injection techniques.

All measurements were made at a fixed length to diameter ratio of 64.6. The values of Reynolds number, based on radius, investigated ranged from 60 to 130. Experimental results were plotted as dimensionless velocity versus dimensionless radius at different ratios of Grashof to radius Reynolds number. Experimental profiles were compared with Hanratty, Rosen and Kabel's analytical solution (1958) for the constant heat flux case.

The results show that:

1. At a given value of length to diameter ratio, it is found that the greater the value of Grashof to radius Reynolds number ratio, the larger the distortion of velocity profile.
2. At a given value of Grashof to radius Reynolds number ratio, the distortion of velocity profile is proportional to the value of length to diameter ratio.
3. When the center line dimensionless velocity reached 1.5, the entering fully-developed profile was distorted to a

flat profile. This point agrees with analytical solution for constant heat flux.

EFFECT OF HEAT TRANSFER ON VELOCITY PROFILES
AT LOW REYNOLDS NUMBERS IN A VERTICAL TUBE

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CERTIFICATE OF APPROVAL OF THESIS

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