

Temperature profile data in the zone of flow establishment above a model air-cooled heat exchanger with 0.56 m² face area operating under natural convection

Abstract

The aim of this study was to analyze the temperature profile in the Zone of Flow Establishment (ZFE) above a 0.56 m² hot screen placed at different height above an electrically heated model air-cooled heat exchanger operating under natural convection. Installation of screens increased the temperature difference from 30 to 140 K with respect to ambient that resulted in the air velocity increased at the inlet of the special duct from 0.67 m sec⁻¹ to more than 2.0 m sec⁻¹ under different heat loads ranging from 1 to 2.5 kW. The investigation of temperature profile was done above the hot screens placed at 0.35, 0.65, 0.95 and 1.25 m height over the electrically heated model air-cooled heat exchanger. The results show that the exit air temperature near to the electric heater and above the hot screens did not differ significantly but at heights of 0.09 m and upward the temperature difference differed by 2 to 6 K depending on the height of the hot screens. Maximum temperature difference was observed for hot screen placed at 0.65 and 0.95 m. Although, the temperatures at the beginning of the zone of flow establishment were almost the same for every heat load, the radial profile of temperature turned from parabolic in shape to uniformly flat for the configuration without screen and with screen respectively. This indicates turbulence increase above the hot screens. © Asian Network for Scientific Information.