Study of Heat Transfer from a Sphere Body to Flowing Media

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Received on: 4/8/2004
Accepted on: 3/1/2008

Abstract
In the present research the convective heat transfer from a hollow copper sphere (10.2 cm in diameter) to air is studied at different temperatures of sphere surface. The experiments were carried out in an experimental channel (245 x 48 x 50 cm) and the velocity of air was changed by varying the orientation of the gate of the channel which has four levels. A fan of moderate capacity generates air into the channel.

The sphere was heated by hot water at approximately constant wall at different measured temperatures 40, 50, 60, 70 and 80 °C and local heat transfer coefficients were calculated. This process was done by placing ten thermocouples into the inner surface of sphere. These thermocouples were connected to a digital reader which gives the instantaneous temperature of a specified region. The thermocouples were numbered and distributed in an equal angular displacement of 36 degrees.

The determination of heat transfer coefficient was done through two regions, the first called the front region, which faces the fan, and the second called the wake or backward region in which vortices were generated and built-up. A variance of temperature was recognized between these two regions in such a way that front heat transfer coefficient was higher than that for backward region.

The analysis of the present work is based on Reynolds number which is change from 12894 to 33282 depends on the velocity of the used fan. The experimental results of this study were compared with Kendoush analytical correlation (1995) together with a number of certain other mathematical equations obtained from the literature. It was found that this comparison was good especially at higher temperatures.

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Keywords: Forced Convection, Heat on a Sphere Body, Flowing around spheroids Bodies.