



TURBULENCE CHARACTERISTICS IN THE WAKE FLOW BEHIND A HEATED CYLINDER WITH DIFFERENT SURFACE ROUGHNESS

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KEYWORDS:

Main subjects: fluid dynamics

Fluid: low speed air flow

Visualization method(s): particle image velocimetry

Other keywords: image processing, Planar-PIV, turbulence

ABSTRACT: The flow pattern behind a circular cylinder is associated with various instabilities. These instabilities are characterized with the Reynolds number and include the wake, separated shear layer and boundary layer. Depending on the physical application of the cylinder, increasing the level of turbulence on the surface of the cylinder would be a target for drag reduction and heat transfer enhancement.

To increase the heat transfer coefficient in a heated cylinder, certain types of heat exchange surfaces, such as fins and foams, are installed on the surface area of the cylinder. The aim of the present study is to investigate the flow pattern past the cylinder with and without the extended surfaces.

The Particle Image Velocimetry (PIV) has been carried out in the wake region behind the circular cylinder in three different cases. The purpose of this analysis is to develop conventional correlations and to investigate the flow characteristics for different surface geometries. The experiments are conducted for a wide range of Reynolds numbers (based on the mean air velocity and the cylinder diameter) from 3000 to 15000.

Two dimensional results of planar-PIV reveal the important aspects of the local flow features of the circular finned- and foamed-cylinders. These include turbulent boundary layer developments over the surface and a delay to the separation of the flow resulting in the smaller wake size.

References

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