

Flow Characteristics and Drag Reduction Mechanism on the Groove Shape of the Circular Cylinder with Grooves

by

Yutaka WAKAI, Shinichi TAKAYAMA and Katsumi AOKI

(received on Sep. 30, 2004 & accepted on Dec. 22, 2004)

Abstract

This paper describes the flow characteristics for a circular cylinder with grooves of different shapes. The purpose of this study is to clarify the surface structure in relation to the effectiveness of drag reduction, and the mechanism of drag reduction. Circular cylinders with 32 grooves in the direction of the span were used in this study. The grooves took one of three shapes (arc, triangle, or square). The pressure of the surface was measured with a semiconductor pressure transducer at $Re=0.4\times 10^5\sim 3.9\times 10^5$. The drag coefficient was calculated from the pressure distribution and by numerical analysis. The vortex shedding frequency at the wake flow area and the velocity near the surface were measured using a hot-wire anemometer. The flow characteristics near the surface were clarified by numerical analysis. It was clear that the drag coefficient is dependent on the shapes of the grooves.

Keywords: Circular cylinder, Fluid force, Flow visualization, Shape of Groove, Numerical analysis

-
- * 1 Graduate Student, Course of Mechanical Engineering.
 - * 2 Graduate Student, Course of Mechanical Engineering.
 - * 3 Professor, Department of Mechanical Engineering.