

**EXPERIMENTAL STUDY ABOUT FLOW
CHARACTERISTICS PASSING THROUGH FOUR
SLICED CYLINDERS I-TYPE 53° LAPPED OVER IN-
LINEDLY WITH LENGTH DISTANCE L/D = 4 NEAR
SIDE WALL**

"Case Study for Gap Ratio ($1,067 \leq G/D \leq 1,267$)"

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Abstract

Different studies show that many interesting and unexpected fluid phenomena may occur when bodies are placed one beside the other. Moreover, this array of multiple cylinder are also often located near a flat plate, and it's an interesting topic to be investigated. This kind of study can be applied to many engineering problems such as undersea pipelines, building construction and tube in heat exchanger, etc. For special shape of bluff body, it was proposed a I-type cylinder. The I-type cylinder is a circular cylinder which is cut at both sides in parallel with the-y axis. Hence, the aim of this study is to investigate the flow characteristics around four sliced cylinders i-type 53° in-lined arrangement placed a near wall with varying gap between wall and cylinders.

The experiments were carried out in a subsonic wind tunnel with test section of 660 mm height, 660 mm width, and 1780 mm length. Four of I-type cylinders with cutting angle of 53° are made from PVC tube were used as model which has an external diameters, D , of 60 mm and at two ends of the cylinder spanning the wind tunnel test section. A smooth acrylic flat plate 6 mm in thickness and 1160 mm in length was installed 100 mm above the bottom surface of the test section. The leading edge of

the plate was a sharp edge with an angle of 30° . The upstream of cylinders arrangement was located at 430 mm downstream from the leading edge of the flat plate. The free stream velocity in the wind tunnel was constantly maintained at 14,312 m/s, corresponding to Reynolds Number of $Re = 5,4 \times 10^5$ (based on diameter circular cylinders D and the free stream velocity). The center to center spacing between two cylinders was constantly maintained at $L/D=4$. The gap distance between the bottom of the cylinders and the flat plate relative to the cylinder diameter (G/D) were varied from 1,067 to 1,267. An data aquisisi and a pressure tranduser makes possible to measure the pressure distribution around the cylinders and the plane wall. The velocity profiles behind the cylinder was measured using a Pitot-static Tube connected to the pressure tranduser. Surface oil film technique were used to investigate the flow patterns on the cylinders.

The result shows that the influence of blockage effect from sidewall to the characteristics of fluid flow pass through four cylinders type I- 53° for variation gap ratio $1,067 \leq G/D \leq 1,267$ is weak. In this variation gap ratio, flow characteristics around cylinders upstream are almost symmetry; flow characteristics around cylinders downstream are influenced by wake from cylinders upstream; the pressure in sidewall, the value of C_{Dp} and C_{Lp} , also the velocity profiles behind the cylinders are close to the value of centerline's condition.

Key words: I-type Cylinder, In-Lined arrangement, near a plane wall.