EXPERIMENTAL STUDY OF FLOW CHARACTERISTICS ABOUT LONGITUDINAL DISTANCE EFFECT BETWEEN D-SHAPED CYLINDER AS A PASSIVE CONTROL TO DRAG FORCE ON A MAIN CIRCULAR CYLINDER

“Case Study For Variation of Distance Between Two Cylinder (0,6 ≤ S/D ≤ 1,5) and Disturbance Cylinder”

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Abstract

Applications of circular cylinder has increased over the growing development, applications are frequently encountered in the field of construction and techniques. However, use circular cylindrical geometry can not be separated from a problematic about the existence of a drag force which tends to be detrimental. Drag force is generated by the adverse pressure and shear stress on circular cylinders. This research aims to overcome the problems above on how to reduce the drag force on a circular cylinder by increasing the ability of fluid to overcome adverse pressure and shear stress.

Passive flow control is one method which used in this research where D shape cylinder with a small ratio of the main circular cylinder is used to accelerate the transition from laminar to turbulent flow in the main circular cylinder so that it can be overcome the adverse pressure and shear stress on the flow in a circular cylinder. The present research was carried out experimentally in a wind tunnel (Wind Tunnel) by using a circular cylinder as the main cylinder and a D shape cylinder as disturbance cylinder with d/D= 0.125. The main cylinder diameter (D) = 60 mm and a length (L) = 600 mm. D-shape cylinder has a diameter (ds) = 7.5 mm and a length (L) = 600 mm. The Research use D shape cylinder and circular cylinder as
disturbance cylinder. Eksperiment conducted in the wind tunnel using a Reynolds number of $5.3 \times 10^4$ with the variation of distance between both of cylinder $0.6 \leq S/D \leq 1.5$. Characteristics of flow, which will be observed is the distribution of pressure ($C_p$), velocity profile, pressure drag coefficient ($C_{DP}$), total drag coefficient ($C_{DT}$) and flow visualisation using oil flow picture method on the main cylinder.

The experimental result show that the reduction of drag coefficient on main cylinder ($C_{DP}$ and $C_{DT}$) opposite with the number of distance ($S/D$). The optimum distance between both of cylinder to reduced drag force on main cylinder is $S/D=1.375$ for all kind disturbance cylinder. D-shaped circular with cutting angle ($\theta_s$) $65^0$ gives the highest drag force reduction on main cylinder

**Key words:** passive flow control, Disturbance cylinder, circular cylinder, the drag force Adverse pressure