

Contribution to active and passive Control of Flow around a Cylinder

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Abstract : This numerical study aims to develop a coupled, passive and active control strategy of the flow around a cylinder of diameter D . The strategy consists to positioned a cylindrical rod in front of a deforming cylinder. The quasi-elliptical deformation of cylinder follow a sinusoidal law in order to reduce the drag force. To analyze the evolution of unsteady vortices, the Large Eddy Simulation approach is used in this 2D simulation, carried out using ANSYS - Fluent. The movement of deformation is reproduced using an internal subroutine, introduced in the form of a User Defined Function UDF. Two diameters of the rod were tested for a rod placed at a distance of $L = 3 \times d$, with an amplitudes of deformation $A = 5\%$, $A = 25\%$ and $A = 50\%$ of the cylinder diameter, the frequency of deformation take the values $f_d = 1f_n$, $5f_n$ and $8f_n$, which f_n represents the naturel vortex shedding frequency. The results show substantial changes in the flow behavior and for a rod of 6mm (1% D) with amplitude $A = 25\%$, and with a $2f_n$ frequency, drag reduction of 60 % was recorded.

Keywords : CFD, Flow separation, Active control, Boundary layer, rod, Cylinde

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