Flow Visualization around a Rotationally Oscillating Cylinder

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Abstract : In this study, it was aimed to control the flow actively by giving an oscillating rotational motion to a vertically placed cylinder, and flow characteristics were determined. In the study, firstly, the flow structure around the flat cylinder was investigated with dye experiments, and then the cylinders with different oscillation angles ($\theta = 60°$, $\theta = 120°$, and $\theta = 180°$) and different rotation speeds (15 rpm and 30 rpm) the flow structure around it was examined. Thus, the effectiveness of oscillation and rotation speed in flow control has been investigated. In the dye experiments, the dye/water mixture obtained by mixing Rhodamine 6G in powder form with water, which shines under laser light and allows detailed observation of the flow structure, was used. During the experiments, the dye was injected into the flow with the help of a thin needle at a distance that would not affect the flow from the front of the cylinder. In dye experiments, 100 frames per second were taken with a Canon brand EOS M50 (24MP) digital mirrorless camera at a resolution of 1280 * 720 pixels. Then, the images taken were analyzed, and the pictures representing the flow structure for each experiment were obtained. As a result of the study, it was observed that no separation points were formed at 180° swing angle at 15 rpm speed, 120° and 180° swing angle at 30 rpm, and the flow was controlled according to the fixed cylinder.

Keywords : active flow control, cylinder, flow visualization rotationally oscillating

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