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Study on Flow Structure Behind Multiple Circular Cylinders in a Tandem Arrangement Under the Effect of Magnetic Field

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Abstract

The fast-moving technologies and the increasing rate of growth population indicates that the demand for energy will continue to be spiking and prominent in the discussion of the upcoming future. Therefore, to cater to the need for sustainable and clean energy, the idea of nuclear fusion is proposed and studied. Because the nuclear fusion reaction happens at a high temperature, the concept of

magnetic field is adapted to the nuclear or plasma fusion reaction. The energy will be harnessed inside a blanket module of the fusion reaction plant. However, the presence of the magnetic field affects the fluid flow inside the blanket module where it reduces the heat transfer efficiency in the channel. This research examines the flow structure behind multiple bluff bodies arranged in tandem in a channel under the influence of a magnetic field with the aim to increase the heat transfer efficiency inside the channel. The effect of gap ratio, G/h = [1-2.4] and Hartmann friction parameter, H = [0-800], were analysed to determine the critical Reynolds number and Nusselt number. It was found that the presence of the downstream cylinder with gap ratios, G/h = 1.2, 1.4 and 1.6, causes the flow to be unsteady at a lower Reynolds number compared to those of a single cylinder . The multiple cylinders proved to increase the Nusselt number. Increasing the Hartmann friction parameter increases the critical Reynolds number and decreases the Nusselt number.

Author keywords

Flow Past Cylinder ; Magnetic field ; Magnetohydrodynamic; Tandem ; Vortex shedding

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