

The influences of wall Lorentz force and field Lorentz force on the cylinder drag reduction

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Abstract

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Abstract In this paper, the effects of Lorentz force on drag reduction for a circular cylinder have been studied experimentally and numerically. Based on its effects on drag reduction, the Lorentz force is found to be classified into two parts: one acts directly on the cylinder, named as the wall Lorentz force, and the other called the field Lorentz force acts on the fluid inside the boundary layer. The wall Lorentz force leads to the generation of a thrust, whereas the field Lorentz force results in drag increase. Since the former dominates the drag variation, the drag would reduce accordingly and even turn into negative (thrust) with the application of Lorentz force.

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