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Numerical study on suppression mechanism of vortex-induced vibration by Lorentz forces

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Electro-magnetic control of VIV is investigated numerically based on the stream function-vorticity equations in the exponential-polar coordinates attached on the moving cylinder for Re=150. Lorentz force for controlling the vibration cylinder is classified into the field Lorentz force and the wall Lorentz force. The symmetric field Lorentz force will decrease the lift oscillation, and in turn, suppresses the VIV, whereas wall Lorentz force has no effect on the lift. The cylinder vibration increases as the work done by the lift dominates the energy transfer, otherwise the cylinder vibration decreases. If the net transferred energy per motion is equal to zero, the cylinder will vibrate steadily or be fixed.

Keywords: flow control, vortex-induced vibration, electro-magnetic control