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Influence of flexible fins on vortex-induced load over a circular cylinder at low Reynolds number RAJEEV K JAIMAN, PARDHA S GURUGUBELLI, Natl Univ of Singapore — Rigid fins/fairings are known to reduce the vortex induced periodic forces exerting on a cylinder by extending the shear layers interaction further downstream to avoid alternate oppositely-signed shed vortices in the afterbody region. In this work, we present a numerical analysis on the effect of flexible fins with their leading edges fixed tangentially to the cylinder and the trailing edges are free to flap in the wake of two-dimensional (2D) cylinder. Two-dimensional simulations are carried out with varying non-dimensional flexural rigidity, $K_B \in [0.01, 1]$ at a fixed a non-dimensional mass ratio, $m^* = 0.1$ and Reynolds number, $Re = 100$, defined based on the cylinder diameter. We investigate the role of flexibility in altering the wake flow and load generation over the cylinder body. As the K_B is reduced, there exists a critical K_B below which the flexible fins lose their stability to perform flapping and the drag acting on combined cylinder flexible fins begins to increase. However surprisingly, we observe that due to the flexible fin flapping the periodic lift forces acting on the cylinder drops significantly. We show that we can achieve an approx. 62.5% decrease in the nett periodic lift forces when compared to the bare cylinder.

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