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Effect of spring non-linearity on vortex-induced vibration of a circular cylinder[1] RAHUL MISHRA, Monash University, Australia, RAJNEESH BHARDWAJ, IIT Bombay, India, MARK THOMPSON, Monash University, Australia — The vortex-induced vibration (VIV) of a circular cylinder subject to non-linear structural support has been studied computationally for fixed mass ratio ($m^* = 2.546$) in the two-dimensional Reynolds number regime. Unlike for the classic case for which the structure support consists of a spring and damper in parallel, this study considers a system composed of two springs and one damper, where the two springs are in parallel and the damper is in series with one of the springs. The arrangement of the springs and damper is similar to the Standard Linear Solid (SLS) model used for modelling the behavior of a viscoelastic material. The spring in series with the damper is linear and that parallel to the damper provides a non-linear force. The non-linear structural system is governed by the following three parameters: (a) the ratio of the spring constant (R), (b) damping ratio (ζ), and (c) non-linearity strength (λ). The focus of the present study is to examine the response of the cylinder to VIV subject to changing ζ and λ. The main feature of this non-linear system is its ability to sustain vibration for a greater range of flow velocity; potentially useful for vibratory energy extraction.

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