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Vortex-Induced Vibrations of a rigid cylinder with forced axial rotations[1] FRANCISCO HUERA-HUARTE, Universitat Rovira i Virgili — The vortex-induced vibrations (VIV) of a rigid cylinder forced to oscillate around its axis with different amplitudes and frequencies has been studied. A rig allows the cylinder to vibrate with one degree-of-freedom cross-flow, and at the same time rotations can be applied. We will show the effects of the ratio of the frequency of rotational oscillations to that of the VIV, on the dynamics of the system. A very wide parameter space has been covered, including cases in which the forced frequency is controlled in closed loop using the frequency of VIV oscillations. The model hangs from an air bearing rig so the full one degree-of-freedom dynamic response of the system can be measured in detail when subject to different uniform currents imposed in a recirculating water tunnel, while the rotational oscillations are imposed. The latter are also measured using non-intrusive techniques. The flow dynamics around the system have been measured using planar Particle Image Velocimetry for specific cases. Results will show very complex dynamics and the effect of the amplitude, frequency and phase of rotation imposed to the cylinder, which is compared to the classical well-known VIV response of low mass-damping systems.

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