Vortex induced vibration of two tandem cylinders in subcritical regime

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Vortex induced vibrations (VIV) have been widely studied for a singular cylinder. Many engineering applications also involve multiple body configurations and particularly cylinders in tandem, with a strong interaction between cylinders through wake interference, depending on the spacing between them.

The specific features of this interaction has been widely studied in terms of topology[1]. Some studies[2] also propose to extend the well-known wake oscillator model from one to two tandem cylinders. These models based on a Van der Pol oscillator require empirical coefficients, particularly for the coupling terms between cylinder wakes, which have to be experimentally identified. Different configurations are thus required compared to the simple cases already studied[3].

We propose to carry out an extensive experimental campaign in the low-subsonic wind tunnel of University of Liège to feed a VIV model. The quality of measures extends the knowledge in several aspects: (i) measurement in air instead of water, (ii) extensive pressure measurement on both cylinders, in case of (iii) free vibration test (both cylinders in free response) and extended to (iv) forced vibration test.

The parametric study consists in studying the geometric effects (spacing and angle of attack between cylinders) and, on a side basis, the influence of turbulence properties (intensity, integral length scales) is studied regarding their effect on the syncronization of both cylinders and their wakes.

The proposed work consists in a novel and complete (i) flow characterization in static, free and forced motion of both cylinders, (ii) identification of experimental parameters used to supply an improved VIV model.

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