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Vortex-Induced Vibrations of Two Cylinders in Close Proximity

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Abstract : The phenomenon of vortex-induced vibration has applications in off-shore industry, power transmission, energy extraction, etc. Two cylinders in crossflow whose centers are displaced in transverse direction are considered in the present work. The effects of the gap distance between the cylinders on the vortex shedding are presented. The inline distance between the cylinder centers is kept at zero. Two setups are considered for the study: first, we assume the two cylinders vibrate as a single rigid body mounted on a spring, and in the other case, each cylinder is mounted on a separate spring with no rigid connection to the other cylinder. The study focuses on the effect of transverse gap on the fluid-structure coupled response of two setups mentioned and corresponding flow contours. Incompressible flow is assumed in the Eulerian framework. The cylinder movement is modeled by a single degree of freedom rigid body motion (translational motion) in the Lagrangian framework. The governing equations were numerically solved by standard Petrov-Galerkin second order finite element schemes.

Keywords : cross-flow, vortex-induced vibrations, cylinder, close proximity
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