Prediction of Flow Induced Vibration of a Circular Cylinder Using LES

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Abstract

The vortex induced vibration of a 2D circular cylinder in turbulent flow is studied at a Reynolds number of 13000 using the large eddy simulation technique by solving the incompressible Navier-Stokes equations and the continuity equations together. The computational tool used is Ansys fluent 14. SIMPLE is the pressure-velocity coupling used for the solution with a fixed time step of 5e-04. Numerical simulations of both rigid and moving cylinders are carried out. The results obtained from the LES for the rigid cylinder are compared with the experimental values. To simulate the vibrations of the cylinder,'Dynamic Mesh' setup was used associated with the six-degree of freedom (SDOF) tool. The motion of the moving cylinder is obtained by solving the equation of motion in the direction transverse to the flow for zero and a few values of structural damping with the help of a user defined function (UDF) associated with the moving body. The computed response of the moving cylinder is compared with experimental data along with the aerodynamic Lift and Drag coefficients, vortex shedding frequency and vibrating frequency which showed a good agreement.

References

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