Evaluation of flow-induced vibration of multiple-cylinders by immersed finite element method

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ABSTRACT

Flow-induced vibration (FIV) is an important topic in nuclear engineering due to the failure of tubes in heat exchanger or steam generator. Various simulation methods have been proposed to predict the vibration characteristics in the mechanical components, however, the computational methods are limited to single cylinder vibration in fluid flow with several fixed cylinders. In this talk, the immersed finite element method (IFEM) [1,2] for fluid-structure interaction is utilized to examine the vibrations of several cylinders in fluid. A mass-spring-damper model of cylinder, called elastically mounted cylinder, is coupled with IFEM simulation. For connecting the elastically mounted cylinders with IFEM, an extra force term is incorporated in IFEM. The suggested method is compared with previous experimental/simulation data of single cylinder in fluid flow. Then, various arrays of cylinders in confined area are simulated to quantify the vibration modes along with the positions of cylinders. Finally, the vibration characteristics of multiple-cylinders are fully discussed for expansion of IFEM.

REFERENCES

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