عنوان مقاله:

On the Free Vibration of Rotating Liquid-Filled Cylindrical Shells

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خلاصه مقاله:

In the present paper an analytical model is proposed for the vibration of spinning cylindrical shells fully filled with ideal fluid. For this purpose, using the linearized navier-Stokes equations for the incompressible inviscid flow, a 2-D model is developed for fluid motion at each section of the cylinder. The resultant pressure exerted on the cylinder wall as the result of the fluid motion, are calculated in terms of elastic displacements of the cylinder. Applying the Hamilton principle, the governing equations of motion of the cylinder are derived and then combined with the equations describing the fluid pressure to obtain the coupled-field equations of the structural-fluid motion. Using the obtained model, the free vibration and the stability conditions of the cylinder are examined. The effect of material viscoelasticity and structural damping on the stability boundaries of thecylinder is investigated. Furthermore some test cases are used to study the effect of the important parameters of the critical spinning speed of the problem. For a number of examples the results of the stability analysis are presented and some conclusions are outlined.

کلمات کلیدی:

instability, fully-filled cylinder, spinning frequency

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