

# **A study of the vibrations of fluid coupled coaxial cylindrical shell**

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Circular cylindrical tanks are extensively used as a fluid storage in industry, municipal water supply constructions and other devices. Such systems are subjected to intensive dynamic loads that might lead to cyclic tensions, stability loss, and other negative effects. That is why the study of the dynamic behavior of fluid in tanks is important in the earthquake-proof design and reliability assessment of fluid storage tanks.

In this paper some study of the vibrations of fluid coupled coaxial cylindrical shell is presented. A fluid-structure interaction system (FSIS) of two coaxial circular cylindrical shells with the same height partially filled with an incompressible inviscid fluid to the same depth in the inner shell and in the outer annular gap between them is under consideration. The outer shell is rigid and the inner is elastic. The shells' bottom is an absolutely rigid plate.

Objectives of the study include: determination of the natural frequencies and forms of the free vibrations of FSISs; reflection of running waves in the elastic shell of FSISs; investigation of a nonstationary vibration response of FSISs under a horizontal excitation; examination of nonlinear vibrations of FSISs; preliminary steps in numerical computer simulation of the above problems.

The linear equation and the velocity potential theory are used for the motion of the elastic shell and fluids, respectively. The dynamic and kinematical linearized boundary conditions at the free surfaces in the inner shell and in the other annular gap are used. The method of Galerkin is applied to solve the considered problems.

The investigation can be applied as a base for further study of nonlinear vibrations and considering FSISs where the elastic shell does not have an ideal shape and possesses some initial deformations.