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Coupled Frequancies of a Fluid-Structure Interaction Cylindrical System

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An upright fixed circular cylindrical tank with rigid bottom and side wall, where as a part of the side wall is an axial-symmetrical vibrating thin shell with clamped edges, is partly filled with an incompressible and inviscid fluid. The fluid motion in the tank is supposed to be axisymmetrical and potential. Using the Bubnov-Galerkin method, the analytical solution of the problem about the determination of the free coupling vibrations of the obtained fluid–structure interaction system is found. The performed numerical calculations show that the elastic part of the tank side wall lowers the natural frequency in comparison with the case of the rigid tank as the coupled frequency increases with the increase of the shell thickness and decreases with the increase of the fluid depth.

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