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INVESTIGATION OF DYNAMIC CHARACTERISTICS OF SHELLS WITH HOLES AND ADDED MASS

Thin cylindrical shells are widely used in construction, engineering and other industries. In case of designing a reservoir for the isothermal storage of liquefied gases such cases are inevitable, when housing requires various technical holes. A point wise added mass can appear into practice in the form of suspended spotlights, radar, architectural inclusions in buildings and structures of various purposes. It is known, that the dynamic asymmetry as an initial irregular geometric shape, including holes, and the added mass leads to specific effects in shells.

In the paper the impact of a cut on the frequency and form of its own vibrations of thin circular cylindrical shells is theoretically examined with the help of the equations of linear shallow shell theory. For modal equations with Nav'e boundary conditions, we used the Bubnov — Galerkin method. The authors have expressed a formula for finding the lowest of the split-frequency vibrations of a shell with a cutout. It is stated, that in case of an appropriate choice of added mass value the lower frequencies are comparable with the case of vibrations of a shell with a hole. By numerical and experimental modeling and finite element method in the environment of MSC "Nastran" oscillation frequencies a shell supporting a concentrated mass and a shell with a cutout were compared. It is shown, that the results of the dynamic analysis of shells with holes with a suitable choice of the attached mass values are comparable with the results of the analysis of shells carrying a point mass. It was concluded that the edges in the holes, significantly affect the reduction in the lowest frequency, and need to be strengthened.

Key words: natural vibrations, cylindrical shells, technical holes, added mass, dynamic characteristics.

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