Fluid-structure coupled analysis of underwater cylindrical shells(PDF)

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Title: Fluid-structure coupled analysis of underwater cylindrical shells

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摘要: Underwater cylindrical shell structures have been found a wide of application in many engineering fields,such as the element of marine,oil platforms,etc.The coupled vibration analysis is a hot issue for these underwater structures.The vibration characteristics of underwater structures are influenced not only by hydrodynamic pressure but also by hydrostatic pressure corresponding to different water depths.In this study,an acoustic finite element method was used to evaluate the underwater structures.Taken the hydrostatic pressure into account in terms of initial stress stiffness,an acoustical fluid-structure coupled analysis of underwater cylindrical shells has been made to study the effect of hydrodynamic pressures on natural frequency and sound radiation.By comparing with the frequencies obtained by the acoustic finite element method and by the added mass method based on the Bessel function,the validity of present analysis was checked.Finally,test samples of the sound radiation of stiffened cylindrical shells were acquired by a harmonic acoustic analysis.The results showed that hydrostatic pressure plays an important role in determining a large submerged body motion,and the characteristics of sound radiation change with water depth. Furthermore,the analysis methods and the results are of significant reference value for studies of other complicated submarine structures.

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