

Numerical simulation of VIV for an elastic cylinder mounted on the spring supports with low mass-ratio(PDF)

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Title: Numerical simulation of VIV for an elastic cylinder mounted on the spring supports with low mass-ratio

作者: 徐俊凌; 朱仁庆

Author(s): XU Jun-ling and ZHU Ren-qing*
School of Naval Architecture and Ocean Engineering, Jiangsu University of Science and Technology, Zhenjiang 212003, China

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摘要: With the development of the offshore deep water oil industry many researchers are focusing on the vortex-induced vibrations (VIV) of deep risers. In the present work, Reynolds - averaged Navier - Stokes (RANS) equations were combined with the SST turbulent model to simulate the stream-wise and transverse motion of an elastically mounted cylinder with a low mass-ratio, a natural frequency ratio of and an Re number between 5 300 and 32 000. The four-order Runge - Kutta method was applied to solve the oscillating equation of the cylinder. The relationship between reduced velocity and parameters of the cylinder, including the lift coefficient, the drag coefficient, displacement and the vortex structure were then compared with recent experimental results and discussed in detail. The present numerical simulation reproduced effects have been observed in experiments, such as the lock-in phenomenon, the hysteretic phenomenon and beating behavior.

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