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Active control of jacket type offshore platforms subjected to rapid strain rate load

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Abstract

The general computational models and high-performance algorithms were recently used by the authors for active control of large structures. One of the active control of structures approach is active tuned mass damper that also called ATMD. In ATMDs system, located actuator between structure and TMD system applied a calculated force in real time. Reducing of vibration effects caused by shock loading or rapid strain rate with ATMD is the goal of this paper to decrease offshore platforms damages. Considering the importance of energy, oil exports and its economic effects, offshore platform is one of the country's strategic facilities. Collision of ships, compressor explosion, and sudden failure of several vital members can be created shock loading or rapid strain rate. The platform was modeled with Opensees and was excited by four types shock loading or rapid strain rate, then obtained response from displacement of top level was stored The effect of soil-structure interaction was considered in this study. In this paper four pile was considered to joint offshore platform to soil. Not only ATMD but also structure damping with using Rayleigh approach was considered to reduce vibration caused by rapid strain rate loads. Therefore, it could be expressed using this active tuned mass damper could partially reduce platform vibration. Results were presented for jacket type offshore platform. It was demonstrated that response of an offshore platform to rapid strain rate loadings can be reduced substantially to a fraction of the response of the uncontrolled offshore platform. First time, controlling jacket type offshore platform with active tuned mass damper was investigated in this study.

Key words: Active control, Jacket type offshore platform, LQR.