Civil Infrastructure Researches, Vol. 6, Issue.1, Spring and Summer 2020, pp. 89-102

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Seismic Vulnerability Assessment of Derrick-Supported Flare-Stacks Using Fragility Curves

Risk reduction and management of oil, gas, and petrochemical plants are important in terms of energy supply, financial implications, life loss, and repairs. Probabilistic analysis and reliability methods are effective approaches for calculating the risk and cost to such plants, which are composed of units with different types of equipment and structures that have different responses and consequences. One major piece of equipment in a plant that has been shut down is the flare. Depending on the height, the flares can be self-supported, guy-supported, or derrick-supported. The current study investigated the seismic probability behavior of a derrick-supported flare. An existing flare was investigated using the finite element method and incremental dynamic analysis as a case study. The different limit states of the structures were considered when calculating the fragility curves using the results of incremental dynamic analysis. The results showed that the seismic demand on the main structure of the flare stack in the ordinary seismic intensity range was not significant due to the flexible behavior of the structure.

Keywords: Incremental dynamic analysis, Flare, Fragility curve, Seismic vulnerability, Probabilistic assessment.

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Received 29 November 2020, Revised 30 December 2020, Accepted 05 January 2021.
DOI: 10.22091/cer.2021.6244.1218