

Unity check of typical offshore wellhead platform in Malaysia using Aceh earthquake loading data and SAP2000

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ABSTRACT

One of the most significant regional earthquakes which brought catastrophic impacts is the magnitude of $M_w = 9.1$ earthquake which occurred on the western coast of Banda Aceh, North Sumatera had generated a massive Indian Ocean tsunami on December 26th, 2004. Apart from that, several local earthquakes also occurred in Bukit Tinggi, Pahang and Ranau, Sabah according to Malaysian Meteorological Department (METMalaysia). However, oil and gas industry plays a vital role in Malaysian economy due to the significant contribution to the country's gross domestic product. In fact, the existing fixed offshore structure in Malaysia region only take into considerations the wind load, wave load, and current load rather than earthquake load. The objective of this study is to perform unity check for every element of offshore wellhead platform when subjected to 2004 Aceh earthquake loading. All the environmental loads such as wave, wind, and current load have been designed by referring the American Petroleum Institute (API) design criteria. The computer software SAP2000 is selected to model and analyse the offshore structure. There are three types of analysis that have been performed in this study which are the free vibration analysis, time history analysis, and response spectrum analysis. The time history of earthquake data from 2004 Aceh earthquake has been used in performing time history analysis. For the response spectrum analysis, the analysis was performed by using response spectra curves in Eurocode 8. As a result, the offshore wellhead platforms in Malaysia are situated under a safe condition when subjected to low seismic activity based on the study.

KEYWORDS:

Earthquake; unity check; offshore wellhead platform; computer software