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Managing Shallow Gas for Offshore Platforms via Fit-For-Purpose Solutions: Case Study for Offshore Malaysia

Authors : Noorizal Huang, Christian Girsang, Mohamad Razi Mansoor

Abstract : Shallow gas seepage was first spotted at a central processing platform offshore Malaysia in 2010, acknowledged as Platform T in this paper. Frequent monitoring of the gas seepage was performed through remotely operated vehicle (ROV) baseline survey and a comprehensive geophysical survey was conducted to understand the characteristics of the gas seepage and to ensure that the integrity of the foundation at Platform T was not compromised. The origin of the gas back then was unknown. A soil investigation campaign was performed in 2016 to study the origin of the gas seepage. Two boreholes were drilled; a composite borehole to 150m below seabed for the purpose of soil sampling and in-situ testing and a pilot hole to 155m below the seabed, which was later converted to a fit-for-purpose relief well as an alternate migration path for the gas. During the soil investigation campaign, dissipation tests were performed at several layers which were potentially the source or migration path for the gas. Five (5) soil samples were segregated for headspace test, to identify the gas type which subsequently can be used to identify the origin of the gas. Dissipation tests performed at four depth intervals indicates pore water pressure less than 20 % of the effective vertical stress and appear to continue decreasing if the test had not been stopped. It was concluded that a low to a negligible amount of excess pore pressure exist in clayey silt layers. Results from headspace test show presence of methane corresponding to the clayey silt layers as reported in the boring logs. The gas most likely comes from biogenic sources, feeding on organic matter in situ over a large depth range. It is unlikely that there are large pockets of gas in the soil due to its homogeneous clayey nature and the lack of excess pore pressure in other permeable clayey silt layers encountered. Instead, it is more likely that when pore water at certain depth encounters a more permeable path, such as a borehole, it rises up through this path due to the temperature gradient in the soil. As the water rises the pressure decreases, which could cause gases dissolved in the water to come out of solution and form bubbles. As a result, the gas will have no impact on the integrity of the foundation at Platform T. The fit-for-purpose relief well design as well as adopting headspace testing can be used to address the shallow gas issue at Platform T in a cost effective and efficient manners.

Keywords : dissipation test, headspace test, excess pore pressure, relief well, shallow gas
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