Risk Analysis of Kodeco’s Subsea Gas Pipeline Due To Soil Liquefaction of Seabed Sediment

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Abstract

This thesis discusses the risk of failure analysis of piping systems due to the possibility of soil liquefaction. The piping system owned by PT. Kodeco Energy Co. Ltd was selected for analysis. It connects the Poleng reviewed Process Platform (PPP) in the north of Madura Island and Onshore Receiving Facilities (ORF) in Gresik. Soil liquefaction is a natural phenomenon in which the soil changes their properties due to increasing pore water pressure and reducing shear stress. As a result, the soil will behave like a liquid (liquefy). This phenomenon possibly leads to land subsidence in the area of piping system.

Risk analysis was conducted using Monte Carlo methods. This method aims to find the probability of failure (frequency) for the system concerned. The calculation of consequences obtained from the stresses analysis of the system, include: hoop stress, axial stress, longitudinal stress and combined stress. Then the risk matrix can be determined by incorporated the values of event frequency and consequence of occurrence into the matrix. This effort aims to determine the level of hazard.

The analysis shows that the Safety Factor (SF) is much greater than 1 (SF>>1) for every pipeline position concerned under influence of various design wave heights. Therefore the author concludes that failure of the piping system by soil liquefaction will not occur.

Key words: soil liquefaction, shear stress, effective stress, pore water pressure, CRR (Cyclic Resistance Ratio), CSR (Cyclic Stress Ratio), Monte Carlo method.