Abstract

A subsea gas pipeline is a pipeline that is laid on the seabed or below it inside a trench. The most common pipeline is gas pipeline and oil pipeline. Pipeline is one of the most important gas transport technologies and it is used because it can transfer gas in huge quantities through great distances. Another benefit of the pipeline is easy to operate, safe, and economical when it is compared to other transport modes. The problem that often arises is the leakage due to internal or external impact. Soil Liquefaction is a phenomenon when the soil loses its strength and rigidity in response to stress. Soil liquefaction is usually occurs because of the earthquake vibrations and the movement of the sea waves. The earthquake vibration or the movement of the sea waves on the stress condition, cause the soil to behave like a liquid. Soil liquefaction is occurred only in sandy soil grains. While in the coarse grain and fine grain the liquefaction is difficult to occur. This paper presents a risk assessment of the pipeline owned by KKKS in the East Kalimantan that distributes natural gas. The pipeline of the KKKS in the East Kalimantan is located in onshore and offshore area. Risk assessment was conducted to know the affect of soil liquefaction due to pipeline, whether the risk is acceptable or not. When installing the subsea pipeline on that area it has to be known the soil liquefaction resistance. For
that purpose, the safety factor of the soil was calculated. The value of safety factor is obtained by comparing the cyclic resistance ratio (CRR) with the cyclic stress ratio (CSR). In this research, the assessment of safety factor was conducted in onshore and offshore areas. In the onshore area, calculation was divided into 6 points. From the assessment, it was obtained that some points of the value of safety factor were more than 1.0, especially those located in bore hole 02, 03, 04, and 05. To reduce the level of risk, mitigation is necessary to do in onshore areas. The selection of the mitigation, was carried by analytical hierarchy process (AHP) method. Expert choice software was utilized to complete the selection of this mitigation. Result of mitigation shows vibroflotation was the best method to reduce consequence of soil liquefaction. In the offshore area, calculation was divided into 8 points, those are pipe route 1, 2, 3, 4, 5, 6, 7, and 8. The calculation of all points in offshore area resulted in the value of safety factor were less than 1.0. Accordingly, offshore area can be categorized as safe area and it is not necessary to do mitigation.