ABSTRACT

This final project discusses about optimization of offshore pipeline replacement at Bekapai field TOTAL E&P Indonesie, Balikpapan. This optimization is studied because the design life of pipeline finished and the production flowrate of well in this area declined. The variable in this study is outside pipe diameter and pipe wall thickness, while the constraint which is considered is hoop stress, system collapse, and propagation buckling. Design parameter which is calculated is stress analysis (hoop stress, longitudinal stress, bending stress, and combined stress), buckling analysis (local buckling, global buckling, propagation buckling and system collapse check), pipeline stability (on bottom stability: vertical and lateral stability check), free span calculation of pipeline (free span analysis), and laying analysis with OFFPIPE software to check the percentage of maximum allowable yield stress at overbend and sag bend area each material grade. The variation of material grade is grade B, X42, X46, X52, and X56 based on API 5L 2000.

This result study find that the minimum pipe inside diameter is Ø 2.525 in. With this minimum diameter, its outside diameter just reach 2.375 in (API 5L 2000). This diameter too small, so it is determined the dimension of diameter which is common in market and can to be installed, this is Ø 4.5 in dan Ø 6.625 in. Pipe wall thickness for Ø 4.5 in that comply the percentage of maximum yield stress in OFFPIPE modelling each material grade to be continued is 6.020 mm (0.237 in).
7.140 mm (0.281 in), 5.563 mm (0.219 in), 4.775 mm (0.188 in), and 4.775 mm (0.188 in), while pipe wall thickness for Ø 6.625 in is 7.112 mm (0.28 in), 9.530 mm (0.375 in), 6.35 mm (0.25 in), 5.563 mm (0.219 in), and 5.563 mm (0.219 in).

Optimization graphic in this study shows that optimum point of outside diameter and pipe wall thickness is (7.2, 0.1132) and it occurs at material grade X52. It is meaning that at material grade X52, optimum outside diameter is 7.2 in and optimum pipe wall thickness is 0.1132 in. With the weight of pipe = 36.029 lb/in. Because of this outside diameter and pipe wall thickness is no ready in pipe schedule (API 5L 2000), so it is selected that limit to this outside diameter and pipe wall thickness, it is outside diameter 8.625 in and pipe wall thickness 0.125 in. So optimum outside diameter and optimum pipe wall thickness that can be installed and operable in BK-BP1 platform Bekapai field to be continued is outside diameter 8.625 in and pipe wall thickness 0.125 in.

Key words: optimization, offshore pipeline replacement, constraint, material grade, line sizing