

Innovative Solutions for Ageing Xmas Tree Remediation: A Novel Tree-on-Tree Approach

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Problem Statement

Aging wellheads and Xmas tree present significant challenges in the oil and gas industry, including integrity issues, increased maintenance costs and potential safety hazards. With an increasing number of wells reaching the end of their operational life, with more than 20 years since its first gas delivery, two wells, E110 and E101 in offshore Sarawak were facing production deferment threat due to multiple failure of Xmas tree valves. Despite series of rectification efforts through conventional gate valves change out and sealant injection, both remediation efforts failed, resulting in the wells losing the integrity of well barrier. Well intervention plan to secure the wells was affected due to difficulty to rig up slickline unit, as the wells lost its two-barrier philosophy due to all Xmas tree valves failing.

Challenges and Solutions

The situation worsened as both Xmas trees were obsolete, hence maintaining and servicing the trees is costly and time-consuming. Limited availability of spare parts and detailed drawings further exacerbate maintenance challenges, forcing the operator to explore unconventional methods to restore barriers at surface. For E110, tree-on-tree concept was introduced without the need for nipple down of existing obsolete Xmas tree as illustrated in **Fig.1**. The new Xmas tree was installed on top of obsolete Xmas tree. For E101, top valve, with a valve assembly, was installed at tree cap as an alternative to failed crown valve issues. Detailed risk assessment includes the assessment of structural integrity and bending moment, deviation of well barrier operating philosophy, practicality for future well intervention works, corrosion assessment on existing trees and maintenance plan prior to maturation of this novel approach.

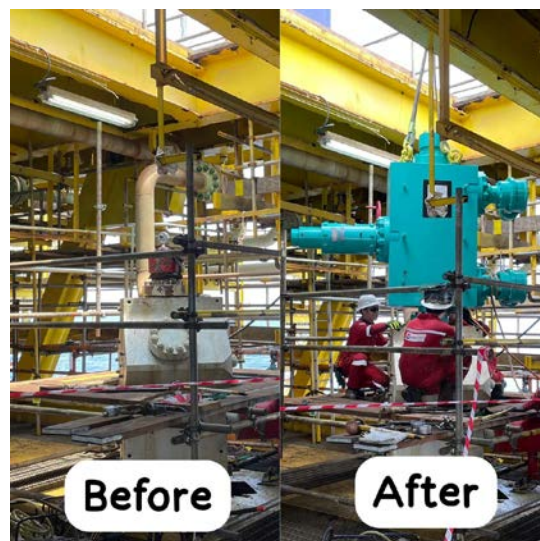


Fig. 1—Installation of new Xmas tree on top of existing corroded Xmas Tree.



Fig. 2—Completed installation of new Xmas tree on top of existing tree due to difficulties to remove the corroded existing tree and high risk of leaking due to unknown flange connection

Results

Well, E1110 and E101 productions were successfully safeguarded, with well integrity barrier managed to be restored through this Xmas tree-on-tree concept in October 2023. Integrity of Xmas tree assessment also proved the operability and efficiency of this concept after six months of production. This concept paved the way for optimized days to restore obsolete trees, without the need for nipple down and increased the success rate of operations by eliminating the uncertainty of obsolete trees due to lack of data available. A tree-on-tree concept was introduced without the need for nipple down of existing obsolete Xmas tree. The new Xmas tree was installed on top of obsolete Xmas tree.