

Crush Analysis of a Steel Tube Umbilical Cable During Decommissioning

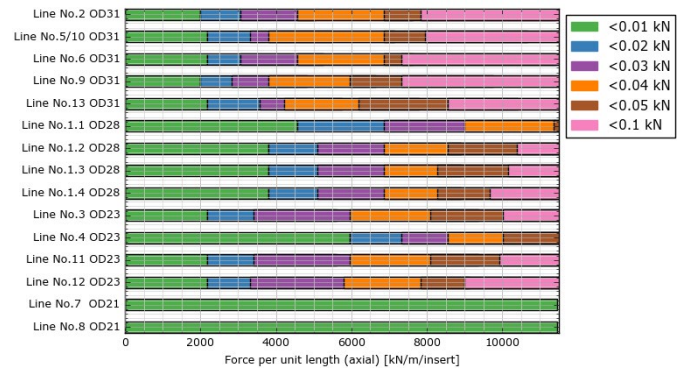
The Steel Tube Umbilical (STU) forms an integral part of the production line in the offshore oil and gas industry. As production lines reach the end of their design life, an increasing number of STU will require decommissioning. To facilitate this, suitable recovery tools will be required to grasp and manipulate the STU during the decommissioning operation. Recovery tools will need to be designed to impart a radial force to engage the conduit filler sections onto the steel tubes with sufficient contact pressure to support the self-weight of the STU.

AgileTek Engineering have developed a methodology to calculate the radial crush load which combines both two-dimensional and three-dimensional approaches.

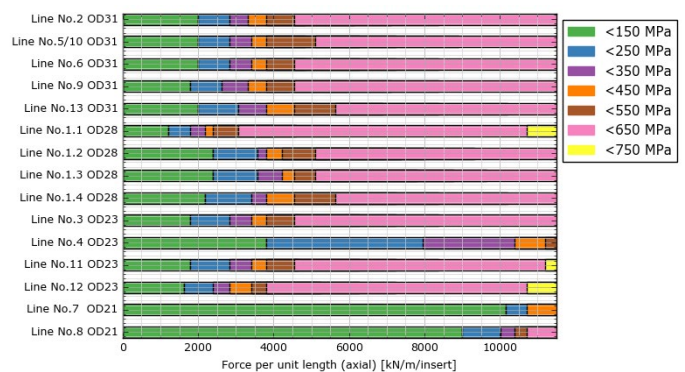
The key output of the work was to calculate the radial force required to induce the onset of plastic deformation in the steel tubes under contact from the client's designed recovery tool.

Due to the helical geometry of an STU, there are three-dimensional effects to consider, AgileTek developed an analytical method to supplement the two-dimensional modelling.

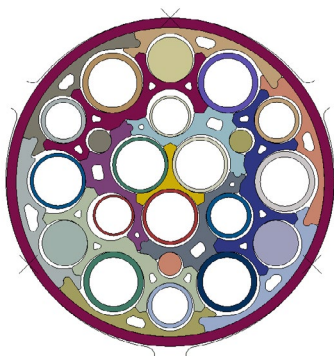
The outputs of the analysis are used to calculate the correct radial force to apply during the recovery operation. This was used to design a suitable recovery tool which was deployed successfully the project.



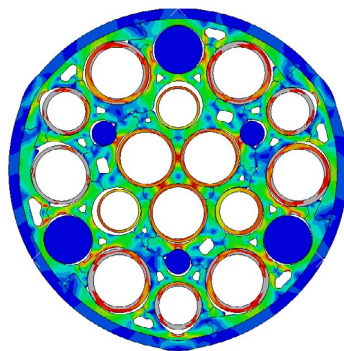
Applied force versus contact force



Applied force versus tensile stress



STU cross-section including radial clamps



von Mises stress at 2612kN/m/insert