CERTIFICATION OF APPROVAL

Numerical Stress Analysis of Selected Materials in Solid Expandable Tubular Repair for Casing Damaged Well

by

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Approved by,

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements ant that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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(Mohammad Zakuan bin Ahmad)

ABSTRACT

Solid expandable tubular is the technology of casing design which enables operator to reach the total depth required with a larger hole while starting with smaller hole compared to a conventional casing approach. The practice of solid expandable tubular in repairing casing damaged well will be described in this project. The demand of SET technology is huge despite of it is lacking of theoretical basis. The purpose of this project is to model solid expandable tubular and analyze the stress distribution for linear and non-linear behaviour using finite element method. This work produces axisymmetric modelling and analysis of the tubing which is developed using finite element software ANSYS to determine the displacement and stress for three materials which are aluminium, stainless steel, and titanium. These three materials are selected due to their significant differences in mechanical properties. Successful implementation of finite element analysis will allow the stress analysis to be conducted confidently without being too dependent on experimental work which is time and cost consuming.

The finite element analysis is preceded by modelling the geometry of the solid tubing, applying material's properties and appropriate boundary conditions. This project focuses on the use of ANYS software and understanding of linear and non-linear behaviour of metal to produce the required results. Axisymmetric analysis is chosen because the tubing is having axisymmetrical geometry. The analysis can reduce the computation time since the nodes and elements to be analyzed are lesser. The results obtained from the simulation are then compared and validated through theoretical calculation using Lame's theory on thick-wall cylinder for linear analysis while the non-linear analysis is based on the simplification of the stress-strain curve of each materials selected. The theory and simulations done justify the behaviour of the tubing where the diameter of the tubing increases while the thickness of the tubing decreases after expansion process. The stress distributions were proved to be different for linear and non-linear analysis.

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