

CERTIFICATION OF APPROVAL

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

by

Mohammad Zakuan bin Ahmad

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Approved by,

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(Dr Mohamad Zaki bin Abdullah)

Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

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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 and 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 Lamé'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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TABLE OF CONTENT

CERTIFICATION OF APPROVAL	i
CERTIFICATION OF ORIGINALITY	ii
ABSTRACT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENT	v
LIST OF FIGURES	vii
LIST OF TABLES	ix
CHAPTER 1 INTRODUCTION	
1.1 Background of Study	1
1.2 Problem Statement	3
1.2.1 Problem Identification	3
1.2.2 Significant of the Project	3
1.3 Objectives	3
1.4 Scope of Study	4
1.5 Project Relevancy	4
1.6 Project Feasibility	5
CHAPTER 2 THEORY AND LITERATURE REVIEW	
2.1 ANSYS	6
2.2 Finite Element Analysis	7
2.3 Solid Expandable Tubular	8
2.3.1 Tubing Expansion Process	9
2.3.2 Advantages of Solid Expandable Tubular Technology	10
2.3.2.1 Slimming the Wellbore Design to Enhance Drilling Economics in Field Development	10
2.3.2.2 Constructing Extended-Reach Wells	11
2.3.2.3 Enable Practical Well Re-entry in Mature Field	11
2.3.2.4 Facilitate Intelligent Well Technology Application in Existing Multilateral Wells	12
2.3.2.5 Deepwater Application	13
2.3.2.6 Optimizing Well Design	14
2.4 The Lamé's Equation Theory	15
2.5 Isotropic Hardening	18
CHAPTER 3 METHODOLOGY	
3.1 Research Methodology	20
3.2 Meshing Size Selection	21
3.3 Finite Element Modeling and Simulations for Linear Analysis Using ANSYS	21
3.3.1 Preliminary Decisions	22

3.3.2	Preprocessing	22
3.3.3	Solution	26
3.3.4	Post Processing	28
3.4	Finite Element Modeling and Simulations for Non-linear Analysis Using ANSYS	29
3.5	Project Activities	31
3.6	Project Milestone	31
3.7	Tools and Equipments	32
CHAPTER 4 RESULTS AND DISCUSSION		
4.1	Linear Finite Element Analysis of Stress Distribution for Thick Wall Cylinder	33
4.1.1	Stainless Steel 304	33
4.1.2	Aluminium 2014-T6	36
4.1.3	Titanium (Ti-6Al-4v)	39
4.1.4	Validation of Linear Finite Element Analysis with Analytical Solution	41
4.2	Non-Linear Finite Element Analysis of Stress Distribution for Thick Wall Cylinder	43
4.2.1	Stainless Steel 304 with 40 MPa Internal Pressure	43
4.2.2	Aluminium 2014-T6 with 65 MPa Internal Pressure	46
4.2.3	Titanium (Ti-6Al-4v) with 140 MPa Internal Pressure	48
4.2.4	Validation of Non-linear Finite Element Analysis with Analytical Solution	51
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS		
5.1	Conclusion	55
5.2	Recommendations	55
REFERENCES		56

LIST OF FIGURES

Figure 1.1 : Tubular expansion process.	1
Figure 1.2 : Operation process of casing repairing.	2
Figure 2.1 : Stress diagram.	16
Figure 2.2 : Thick wall cylinder.	16
Figure 2.3 : Typical stress-strain curve.	18
Figure 2.4 : Bilinear stress-strain curve.	18
Figure 3.1 : Research methodology flowchart.	20
Figure 3.2 : Selection of PLANE82 in ANSYS software.	22
Figure 3.3 : Selection of axisymmetric as element behavior.	23
Figure 3.4 : Material Model.	24
Figure 3.5 : 3D Modeling.	24
Figure 3.6 : Axisymmetric model.	25
Figure 3.7 : Meshing.	26
Figure 3.8 : Constraints.	27
Figure 3.9 : Applying internal pressure.	27
Figure 3.10: Solving the simulation.	28
Figure 3.11: 3D stress diagram.	29
Figure 3.12: Axisymmetric stress diagram.	29
Figure 3.13: Computing tangent modulus and yield stress values.	30
Figure 4.1 : Deformed and undeformed steel expandable tubular (3D).	33
Figure 4.2 : Deformed and undeformed steel expandable tubular (Axisymmetric).	34
Figure 4.3 : Change in radius of steel expandable tubular.	34
Figure 4.4 : Radial stress, S_x of steel expandable tubular.	35
Figure 4.5 : Hoop stress, S_z of steel expandable tubular.	35
Figure 4.6 : Axial stress, S_y of steel expandable tubular.	36
Figure 4.7 : Change in radius of aluminium expandable tubular.	37
Figure 4.8 : Radial stress, S_x of aluminium expandable tubular.	37
Figure 4.9 : Hoop stress, S_z of aluminium expandable tubular.	38
Figure 4.10: Axial stress, S_y of aluminium expandable tubular.	38

Figure 4.11: Change in radius of titanium expandable tubular.	39
Figure 4.12: Radial stress, S_x of titanium expandable tubular.	40
Figure 4.13: Hoop stress, S_z of titanium expandable tubular.	40
Figure 4.14: Axial stress, S_y of titanium expandable tubular.	41
Figure 4.15: Steel bilinear stress-strain curve.	43
Figure 4.16: Change in radius of steel expandable tubular (non-linear).	44
Figure 4.17: Radial stress, S_x of steel expandable tubular (non-linear).	44
Figure 4.18: Hoop stress, S_z of steel expandable tubular (non-linear).	45
Figure 4.19: Axial stress, S_y of steel expandable tubular (non-linear).	45
Figure 4.20: Aluminium bilinear stress-strain curve.	46
Figure 4.21: Change in radius of aluminium expandable tubular (non-linear).	46
Figure 4.22: Radial stress, S_x of aluminium expandable tubular (non-linear).	47
Figure 4.23: Hoop stress, S_z of aluminium expandable tubular (non-linear).	47
Figure 4.24: Axial stress, S_y of aluminium expandable tubular (non-linear).	48
Figure 4.25: Titanium bilinear stress-strain curve.	49
Figure 4.26: Change in radius of titanium expandable tubular (non-linear).	49
Figure 4.27: Radial stress, S_x of titanium expandable tubular (non-linear).	50
Figure 4.28: Hoop stress, S_z of titanium expandable tubular (non-linear).	50
Figure 4.29: Axial stress, S_y of titanium expandable tubular (non-linear).	51

LIST OF TABLES

Table 3.1: Percentage error for different meshing size.	21
Table 3.2: Design parameter for SET [1].	21
Table 3.3: Mechanical properties of materials (SI Units) [4].	23
Table 3.4: Tangent modulus for the three selected materials.	30
Table 3.5: Project activities.	31
Table 3.6: Project milestone.	31
Table 4.1: Results obtained from linear finite element analysis using ANSYS.	41
Table 4.2: Results obtained from analytical solution using the Lamé's Equations.	42
Table 4.3: Comparison between linear analysis with theoretical values (in %).	42
Table 4.4: Results obtained from non-linear finite element analysis using ANSYS.	51
Table 4.5: Results obtained from analytical solution using the Lamé's Equations.	52
Table 4.6: Comparison between non-linear analysis with theoretical values (in %).	52