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Finite Element Analysis of LPG cylinder using Creo 2.0 Software

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***Abstract*-Computer aided investigations are carried using creo2.0 to verify the maximum stress and its location on the section of LPG cylinder of IS3196. To predict detailed stress 3D model has been chosen with the help of Creo2.0 software. After selecting the loading and boundary conditions and appropriate finite elements, nonlinear 2D FE models were generated and simulated in non- uniform and non – homogeneous conditions. The results obtained for the cylindrical section for IS3196 is compared with TZM Molybdenum alloy. The results obtained for the materials are then compared and suitable conclusions are made.**

Keywords: LPG (Liquefied Petroleum gas) cylinder, Detailed stress, IS3196, Creo2.0, TZM (Titanium Zirconium Molybdenum) Molybdenum alloy.

I. INTRODUCTION

The pressure cylinder models assume that both the ends of cylinder to be capped. To simplify modelling, section of cylinder is taken on which pressure condition is applied and results obtained is then compared with TZM Molybdenum [1]

Stress analysis of LPG gas cylinder IS3196 by FEM (Finite Element Method): The cylinder is subjected to internal pressure of 2.5 MPa. The material used is low carbon steel having material properties as shown in table below [2].

TABLE1. PROPERTIES OF LOW CABON STEEL

Young's Modulus	2.e+005MPa
Poisson's Ratio	0.3
Density	7.85e-006kg/mm^3
Tensile yield Strength	240MPa
Tensile Ultimate Strength	420 MPa

Results obtained for above material are compared with the TZM Molybdenum whose properties are shown in table below [3].

Organization: This paper is organized as follows: Section I explains the introduction; Section II contain the methodology; In section III result analysis and discussion and conclusion with future scope is given in Section IV. In last the references are given.

TABLE2. PROPERTIES OF TZM MOLYBDENUM

Density	10.22g/cm^3
Young's Modulus	320 GPa
Tensile strength	1150

II. METHODOLOGY

FE analysis Procedure **[4]:** Following steps are taken to create the model;

- Model
  - Model is created using Creo2.0 software.
- Mesh
  - Auto generated in software.
- Analysis setting
  - Static structure.
- Loads
  - Pressure of 2.5 MPa is given on inner surface of cylinder.
- Boundary condition
  - Edges of the cylindrical section are kept fixed.
- Solution
  - Displacement.
  - Maximum Shear Stress.
  - Von Mises Stress.
- Material Data
  - Low Carbon Steel.
  - TZM Molybdenum

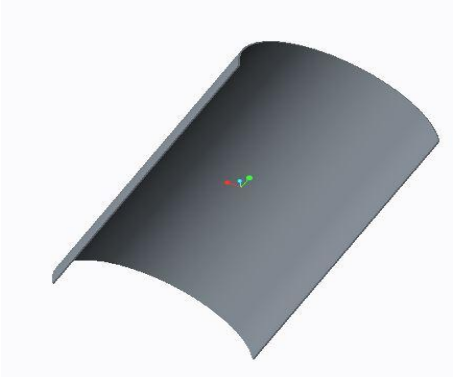

Fig.1. Creo 2.0 model

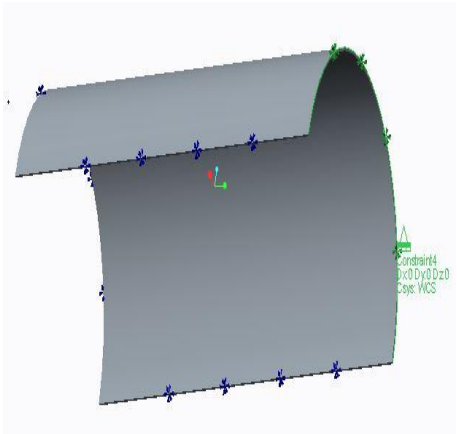

Fig. 2. Boundary condition at all edges of section

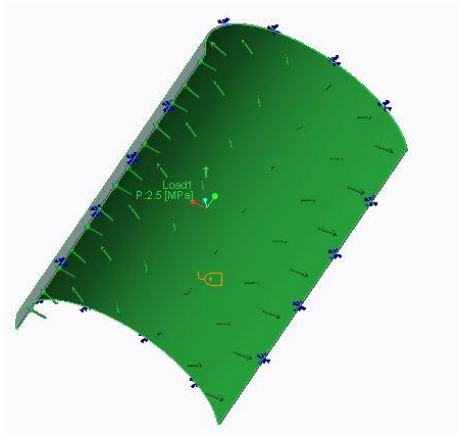

Fig.3. Pressure of 2.5 MPa is given on inner surface

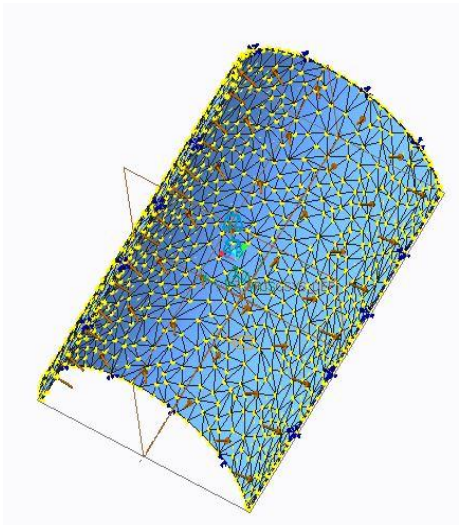

Fig.4. Mesh is generated with automatic mesh

III. RESULT ANALYSIS

For Low carbon steel

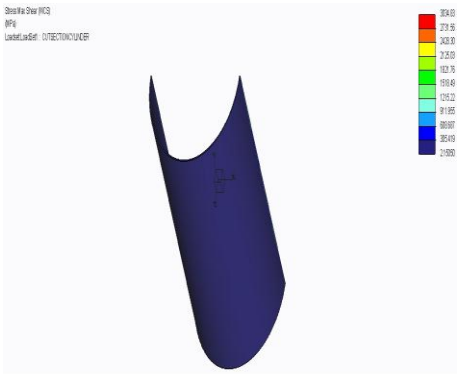

Fig.5. Maximum Shear Stress

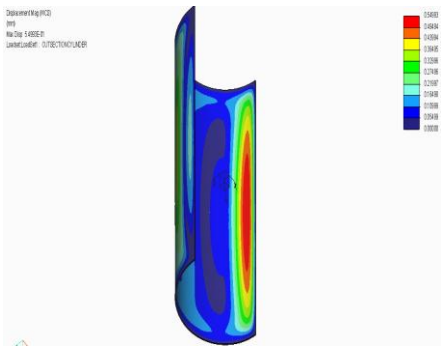

Fig.6. Displacement

Fig.7. Von Mises Stress

For TZM Molybdenum

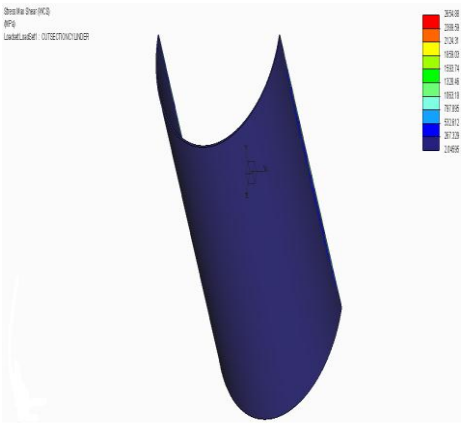

Fig.8. Maximum Shear Stress

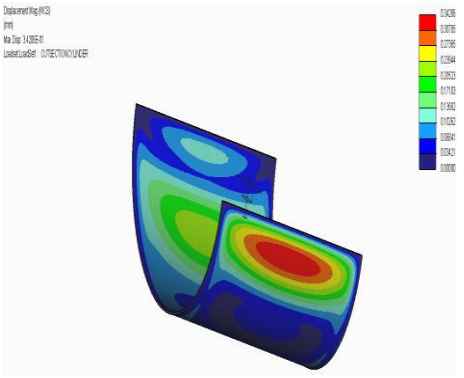

Fig.9. Displacement

Fig.10. Von Mises Stress

IV. RESULT DISCUSSION

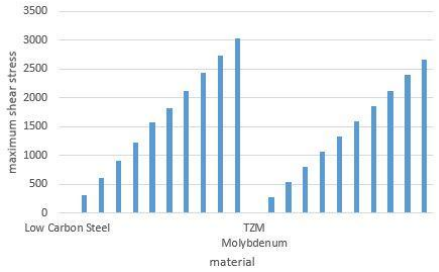

Fig.11. Comparison for Maximum shear stress

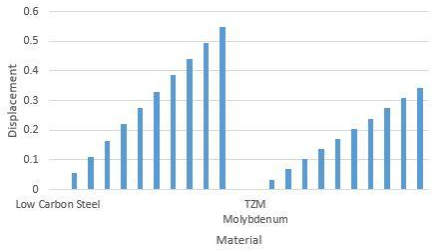

Fig.12. Comparison for Displacement

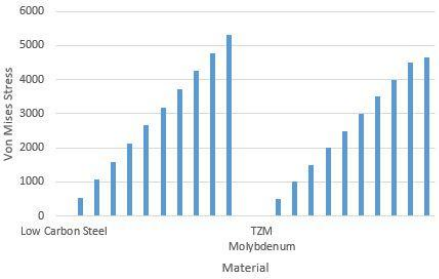

Fig.13. Comparison for Von mises stress

Maximum Shear Stress, Displacement and Von Mises Stress have been calculated for both the materials as shown in Fig. from 5-10. Magnitude of Maximum Shear Stress, Displacement and Von Mises Stress is less in TZM Molybdenum as compared to Low Carbon Steel for same pressure as shown in Fig. from 11-13.

CONCLUSION AND FUTURE SCOPE

FE analysis has been performed on section of LPG cylinder. On the basis of results obtained TZM Molybdenum as suitable replacement for low carbon steel as LPG gas cylinder material. In future, thermal analysis and fatigue analysis can be performed on both materials.

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