

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

Fixture for Mounting the Rocket Engine in Cryogenic Rocket Engine Test Facility

A.Pravin¹, G.Shiva Shankar¹, J. Yoshuva¹, M.Ramakrishnan¹, K.Robonston Jayasingh², S. Sheik Sulaiman², I.Neethi manickam², P.Ganesh Paramasivan³

Final year students, Department of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

Professor, Department of Mechanical Engineering, Francis Xavier Engineering College, Tirunelveli, Tamil Nadu, India

Scientist/Engineer 'SF' ICET, ISRO Propulsion Complex, Mahendragiri, Tirunelveli, Tamilnadu, India

ABSTRACT: Mounting fixture is required to mount the cryogenic rocket engine in the static test bed. Basic design and configuration of the mounting fixture has to be carried out in this work. The mounting fixture of the cryogenic rocket engine will be design and analyze through the software.

KEY WORDS: test stand, mounting fixture, cryogenic test bed

I. INTRODUCTION

Integrated Cryogenic engine and stage test facility (ICET) is to facilitate testing of integrated engine and stage under nominal and off nominal condition. Engine Test bay is meant for testing CE25 engine producing 250KN thrust with $\pm 4^\circ$. Engine loading frame is the main load carrying structure that holds the engine during static testing. The engine loading frame configuration conceived by ICET-SMS. This report gives the details about the design, analysis and optimization studies carried using ANSYS software

II. OBJECTIVES

A Mounting fixture is a holding or support device for rocket engine. Its used in the mounting the rocket test bed. Fixtures are used to securely locate (position in a specific location or orientation) and support the engine, ensuring that all parts produced using the fixture will maintain conformity and interchangeability. Using a fixture improves the economy of production by allowing smooth operation and quick transition from part to part, reducing the requirement for skilled labor by simplifying how engine are mounted, and increasing conformity across a production run. Engine loading frame is the main load carrying structure that holds the engine.

III. METHODOLOGY

The following fixture is 2D design is drawn by AutoCAD and 3D design is drawn by solid works. This fixture is suitable for the mild steel and stainless steel. When the mounting fixture consists of 3 section. Center of the section is carried over the load of cryogenic engine. That provides the thrust force 250KN. The mounting fixture ends are support to the loading frame. In our project is comparison of analysis to the mild steel and stainless steel. Then, we are choose the suitable material. Analysis, Analysis and optimization studies carried using ANSYS software. Engine loading frame is the main load carrying structure that holds the engine during static testing. The engine loading frame configuration conceived by ICET-SMS, first we are choosing geometry drawing for ANSYS. Then select the material

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

stainless steel and mild steel, then mesh the whole element of loading frame and mounting fixture and to give the support of three ends and to give stress 250KN acting on center of the triangular section, finally to get the result, the result based on deflection of the beam ,Equivalent stress and frequency

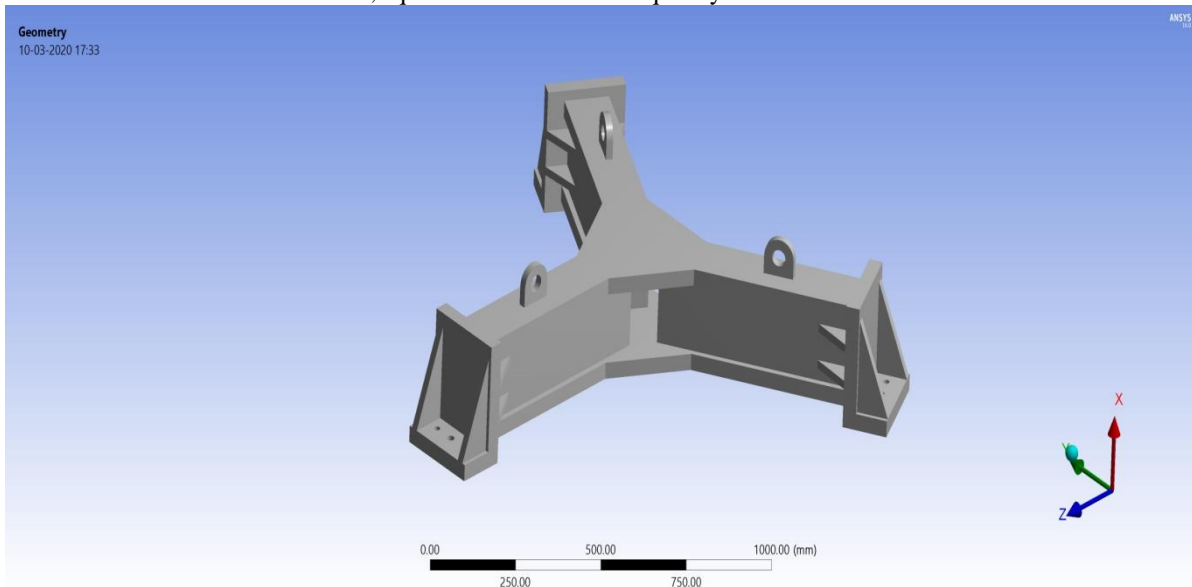


Figure 1.Mounting fixture

IV. MATERIALS USED

S.NO	PART &PART NO.	QUANTITY
1.	Engine mounting fixture	1
2.	M22 screw	3
3.	M22 Nut	3
4.	M18 screw	6
5.	M18 Nut	6

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

V. ANALISIS

MESHING:

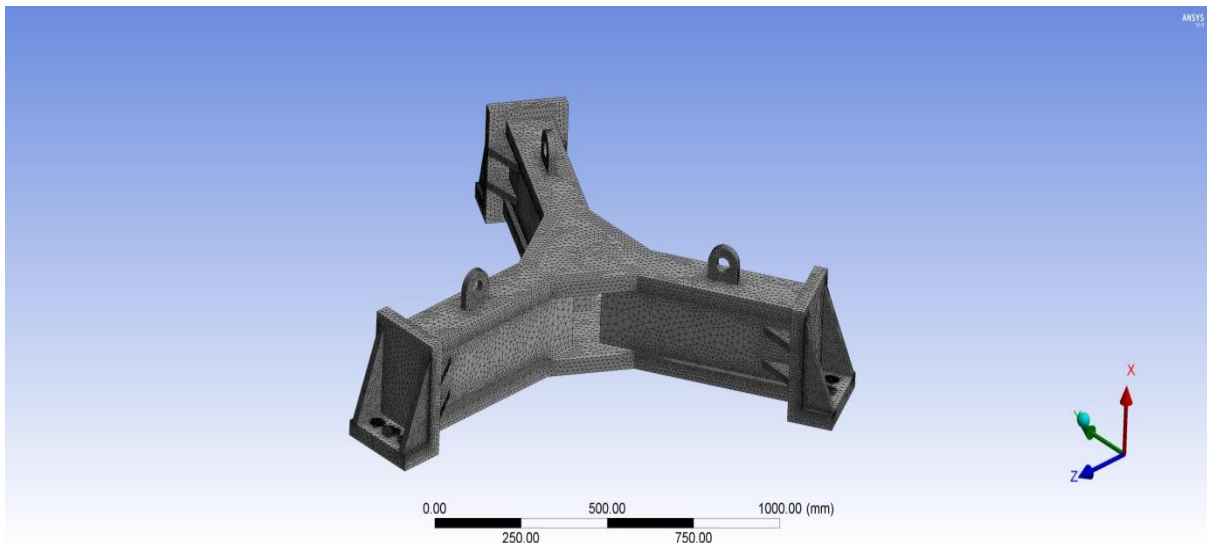


Figure.2 Meshed element

It has studied on finite element analysis subject. When the meshed element 0.5mm and rectangular elements. Finite element procedure reduces such unknowns to a finite number by dividing the solution region into small parts, edges, holes, and joints.

BOUNDARY CONDITIONS:

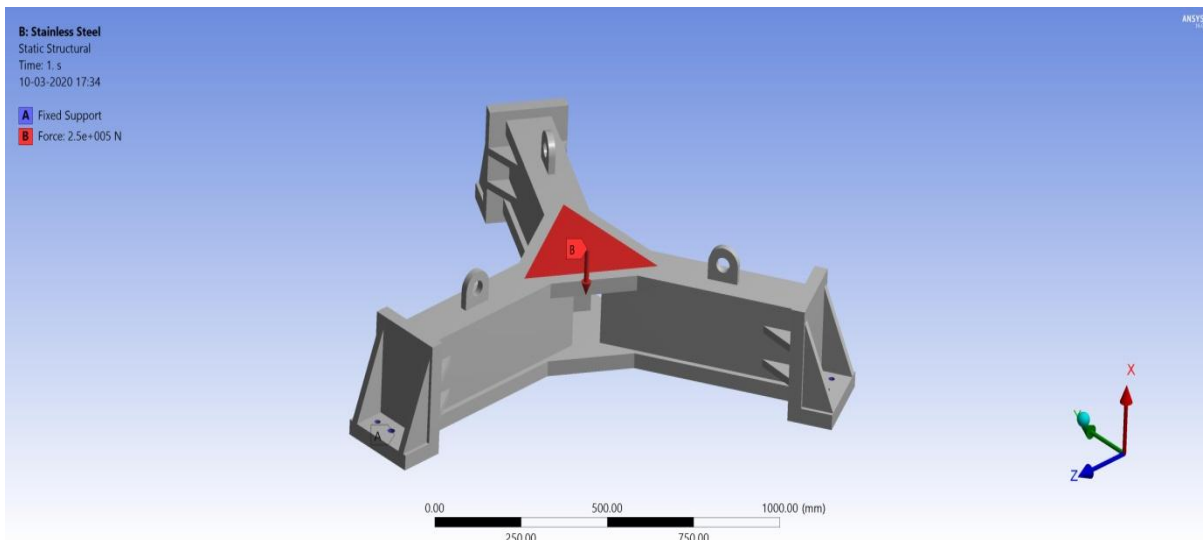


Figure.3 stress and support

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

Condition 1; Fixed support
Condition 2; Force =25

VI. RESULT

TOTAL DEFORMATION (MILD STEEL):

Max deformation =0.16188 mm

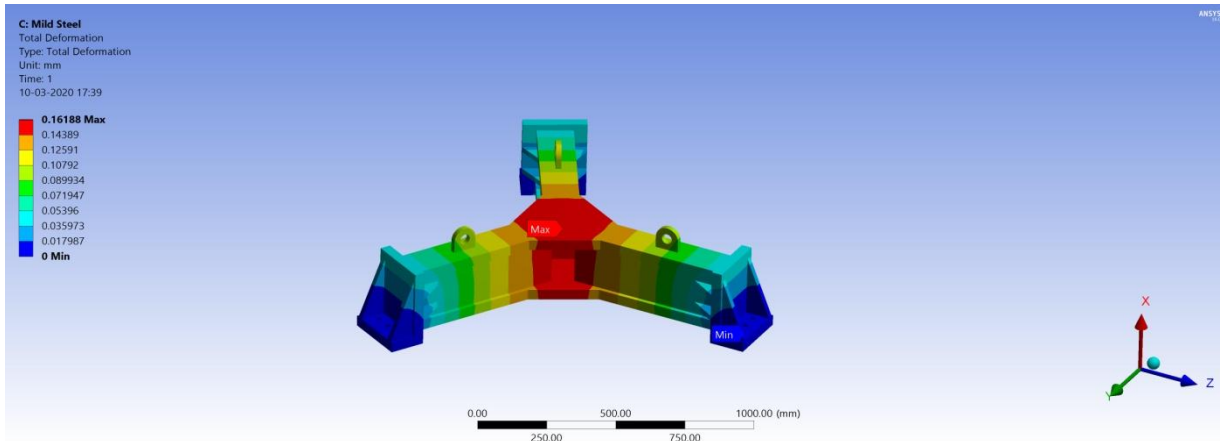


Figure.4 Total deformation (Mild steel)

TOTAL DEFORMATION(STAINLESS STEEL):

Max deformation =0.17381mm

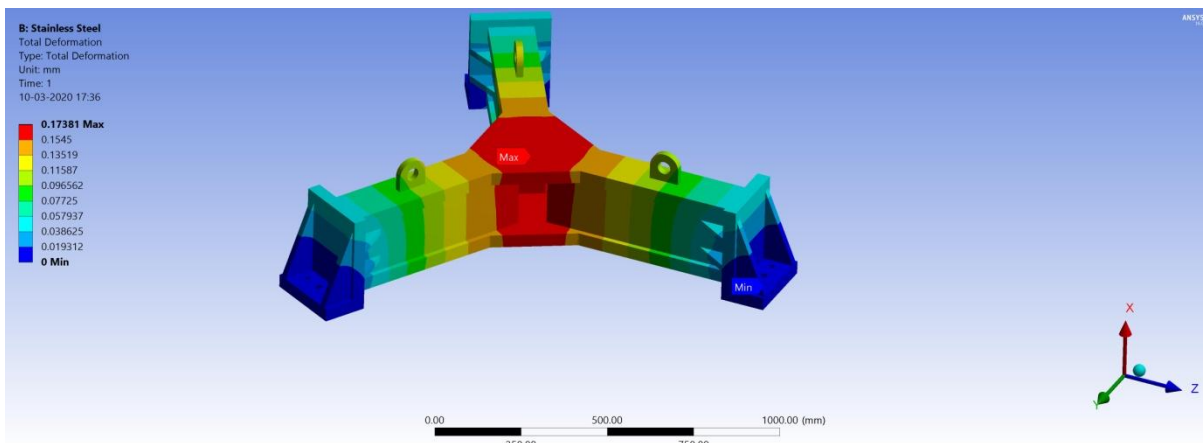


Figure.5 Total deformation (stainless steel)

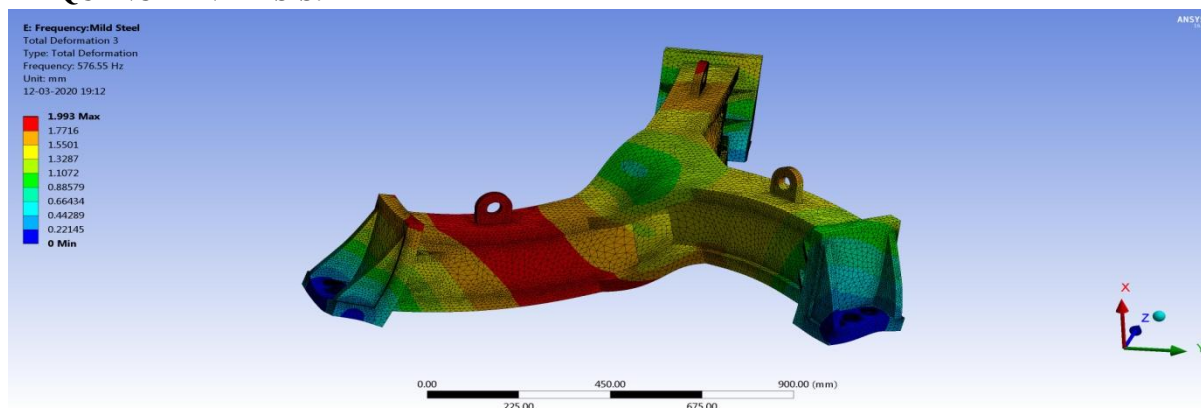
International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 9, Issue 2, February 2020

FREQUENCY ANALYSIS:



VII. CONCLUSION

In this study, a mounting fixture is required to mount the cryogenic rocket engine in the static test bed. Basic design and configuration of the mounting fixture has to be carried in this work. The mounting fixture of the cryogenic rocket engine will be design and analyze through the software. The mild steel is suitable for this design and fabrication process.

VIII. ACKNOWLEDGEMENT

I am thankful to and fortunate enough to get constant encouragement, support and guidance from teaching staffs which helped us in successfully completing our project work. Also, I would like to extend our sincere esteems to all staff in laboratory for their timely support.

REFERENCES

1. Indian standard GENERAL CONSTRUCTION STEEL-CODE OF PRACTICE(Third Revision) ICS 77.140.01
2. Indian standard CODE OF PRACTICE FOR DESIGN LOADS (OTHER THAN EARTHQUAKE) FOR BUILDINGS AND STRUCTURES PART 2 IMPOSED LOADS (second revision/sixth reprint JUNE 1998 UDC 624-042-3:006.76 IS:875(part2)-1987
3. Indian standard CODE OF PRACTICE FOR DESIGN LOADS (OTHER THAN EARTHQUAKE) FOR BUILDINGS AND STRUCTURES PART 2 IMPOSED LOADS (second revision/sixth reprint NOV 1998 UDC 624-042-41 IS:875(part 3)-1987
4. Indian standard CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES PART 1 GENERAL PROVISIONS AND BUILDINGS(Fifth Revision) ICS 91.120.25