



IJRTSM

INTERNATIONAL JOURNAL OF RECENT TECHNOLOGY SCIENCE & MANAGEMENT

“DESIGN & SIMULATION ON MANUAL OPERATED STACKER BY USING DIFFERENT MATERIALS”

Rakesh Singh¹, Yogesh Kumar Mishra²

¹ M.Tech. Scholar, Department of Mechanical Engineering, NIIST, Bhopal, MP, India

² Assistant Professor, Department of Mechanical Engineering, NIIST, Bhopal, MP, India

ABSTRACT

In this thesis, study has been carried out on the manufacturing process and functional activities of Manual operated pallet truck and came across with the various problems and handling in the current system. After thorough studies, careful static analysis and reviews of the various manufacturing systems and technologies. Manual Pallet Truck are robust in construction and are smooth in operations. Manual Pallet Truck are able to work efficiently for pallets on high rack, smooth control of precise lifting and lowering. By this project man power effort and time can reduce. We design and analyze of carriage fork. Our aim is design and develops a model of Manual Pallet Truck. This system has a significant importance in the equipment and material handling. 2 D and 3D modeling has done by Solid work 2021 software and simulation has done by ANSYS 19.2 software.

Key Words: Manual Pallet Truck, manufacturing, pallet, lifting, static analysis, ANSYS.

I. INTRODUCTION

Material Handling is the development, stockpiling, control and security of materials, merchandise and items all through the way toward assembling, circulation measure including their utilization and removal. MH is the workmanship and study of moving, putting away, ensuring, and controlling material. Materials taking care of is the development and capacity of materials at the most reduced conceivable expense using legitimate techniques and hardware. Materials taking care of is the workmanship and study of passing on, hoisting, situating, moving, bundling and putting away of materials:

The worth (to the client) added by the short-term conveyance of a bundle (e.g., Federal Express) is more prominent than or equivalent to the extra expense of the help when contrasted with ordinary mail administration—in any case normal mail would have been utilized.

The worth added by having parts put away close to a bottleneck machine is the investment funds related with the increment in machine use less the expense of putting away the parts at the machine.

Electric Pallet Stacker is a flimsy, profoundly adaptable lift that praises almost any basically indoor application. Adjusted like a customary forklift and without base legs, the Counter-Balanced Electric Stacker can find a way into restricted spaces. Very strong and spending amicable, the Toyota Counter-Balanced Stacker can help increment both your uptime and your main concern.



Fig.1 Stacker

II. MODELING & SIMULATIONS

Stacker modeling has done on SOLODWORK ver 5R 20 software and simulation has performed on ANSYS software package. SOLODWORK model IGES file save and then import into ANSYS software for simulation purpose.

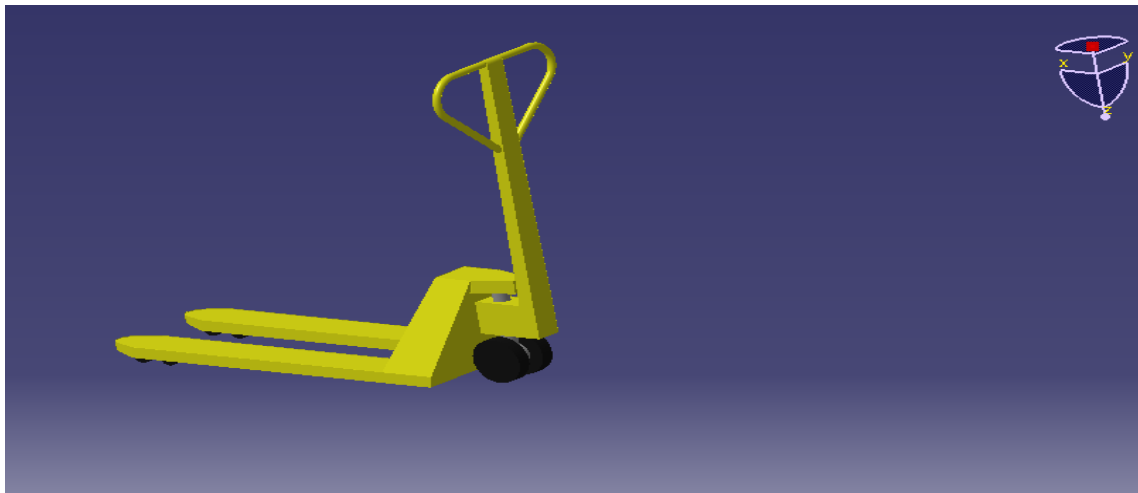


Fig.2 SOLODWORK Model of stacker

2.1 Structure Steel Materials

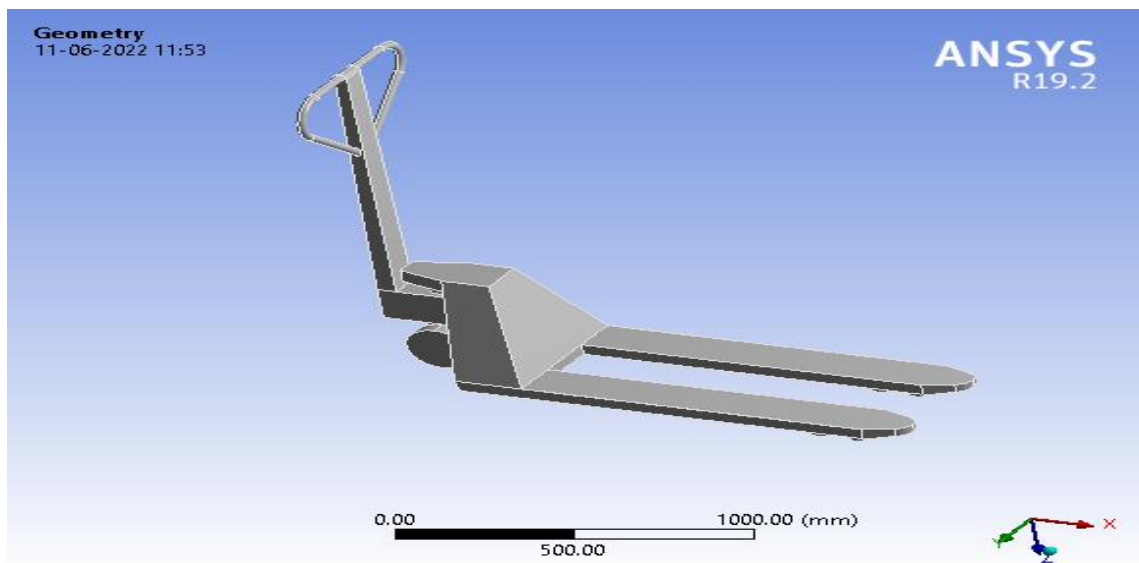


Fig.3 Import Geometry

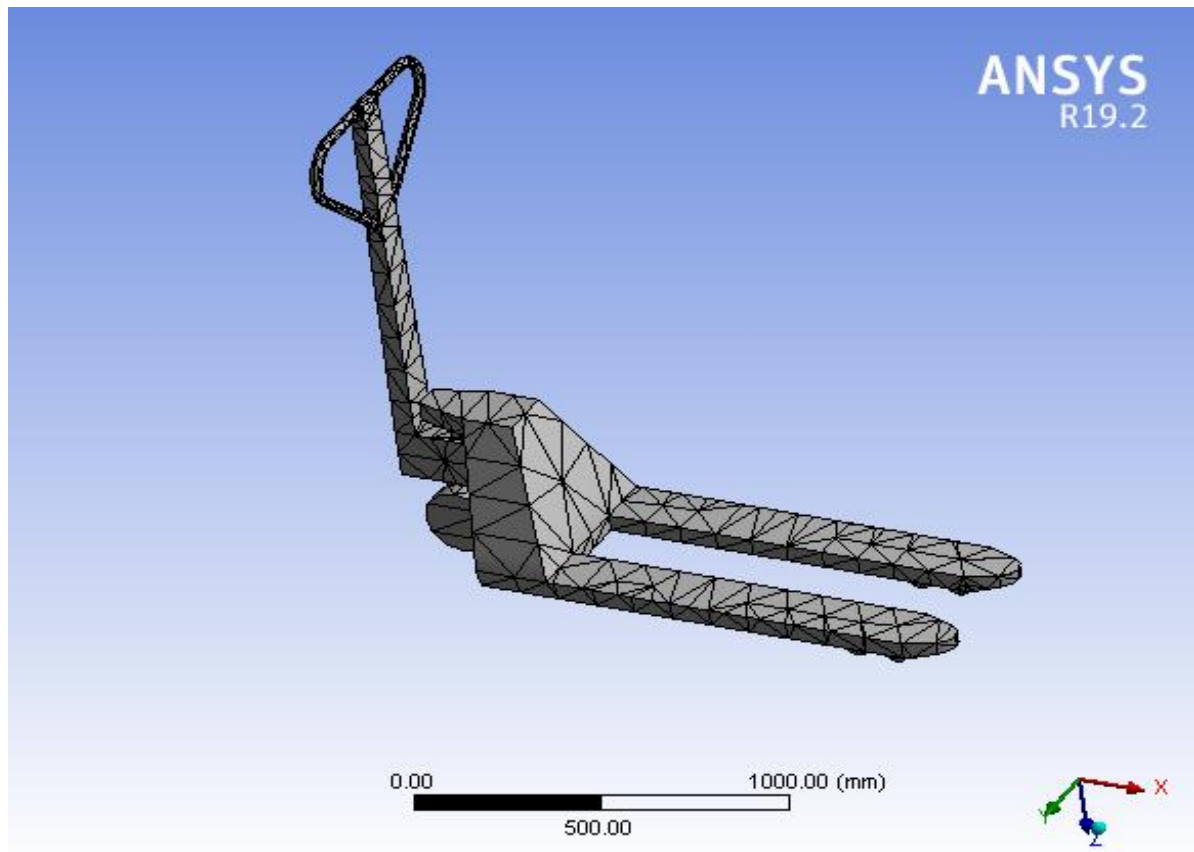


Fig.4 Mesh

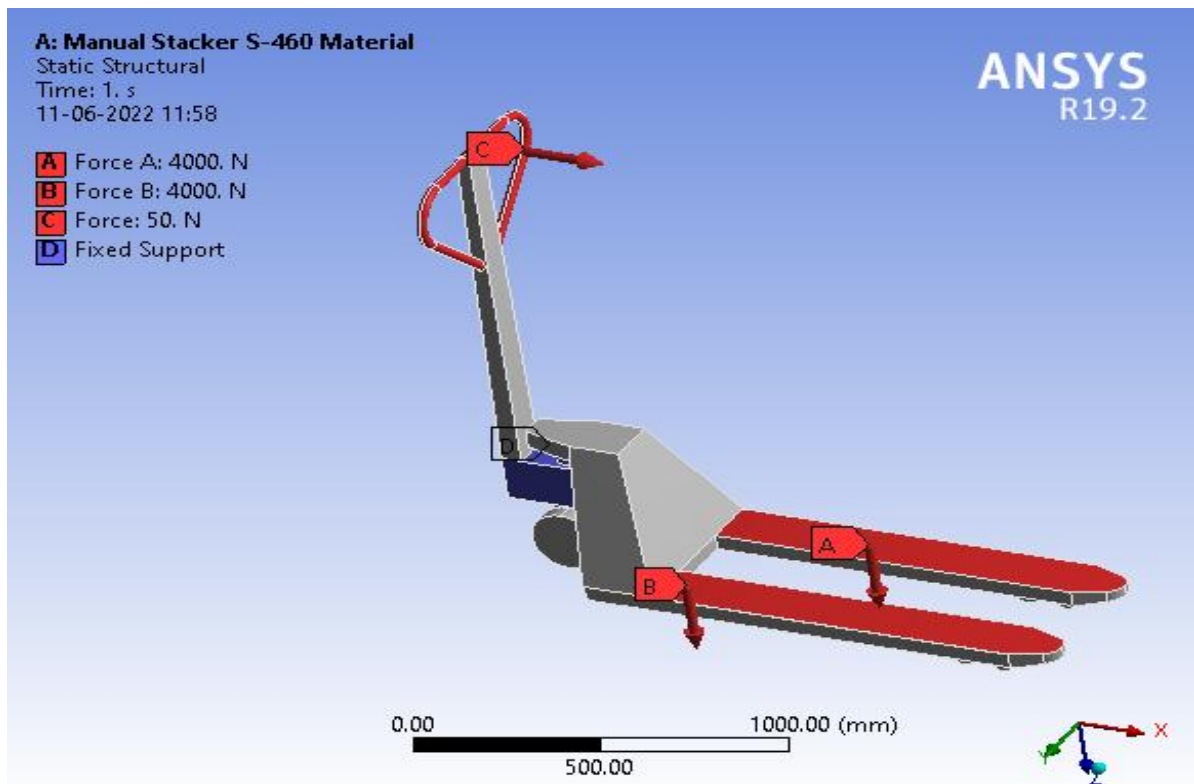


Fig. 5 Static structural S-460 material

2.1 Static Structural

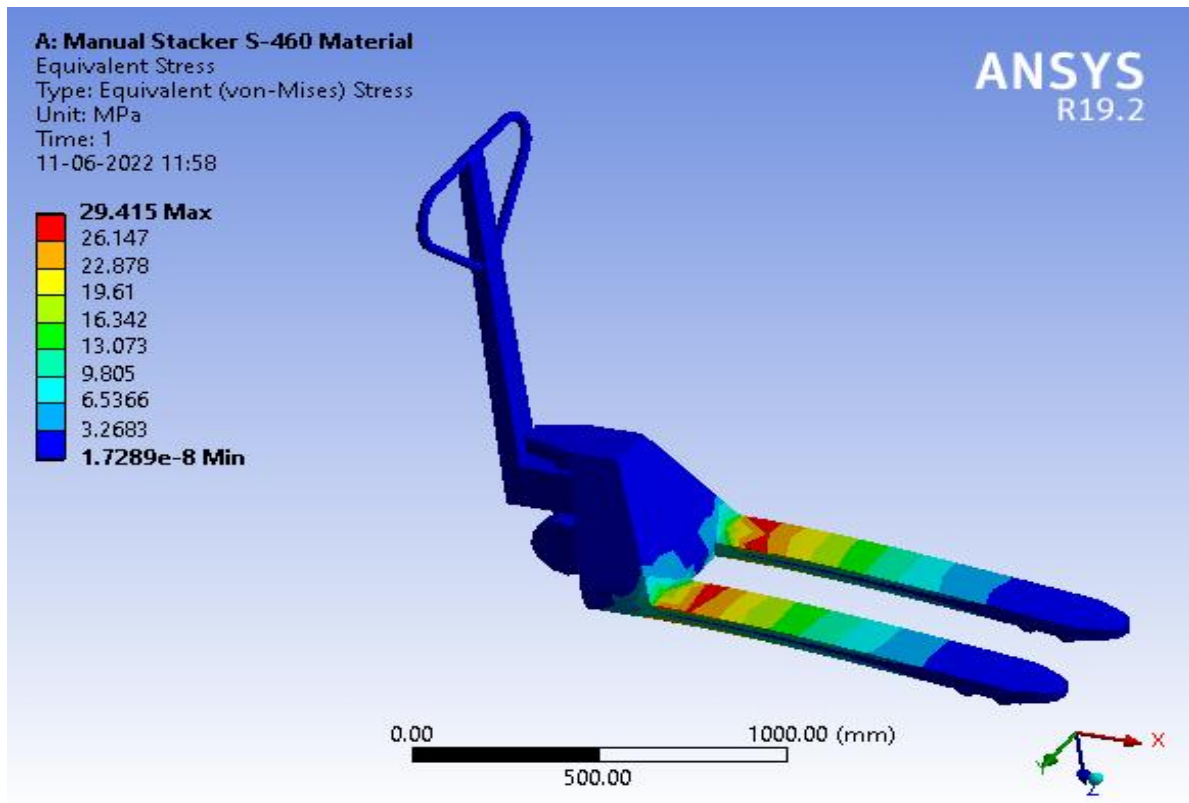


Fig. 6 Equivalent Stress S-460 material

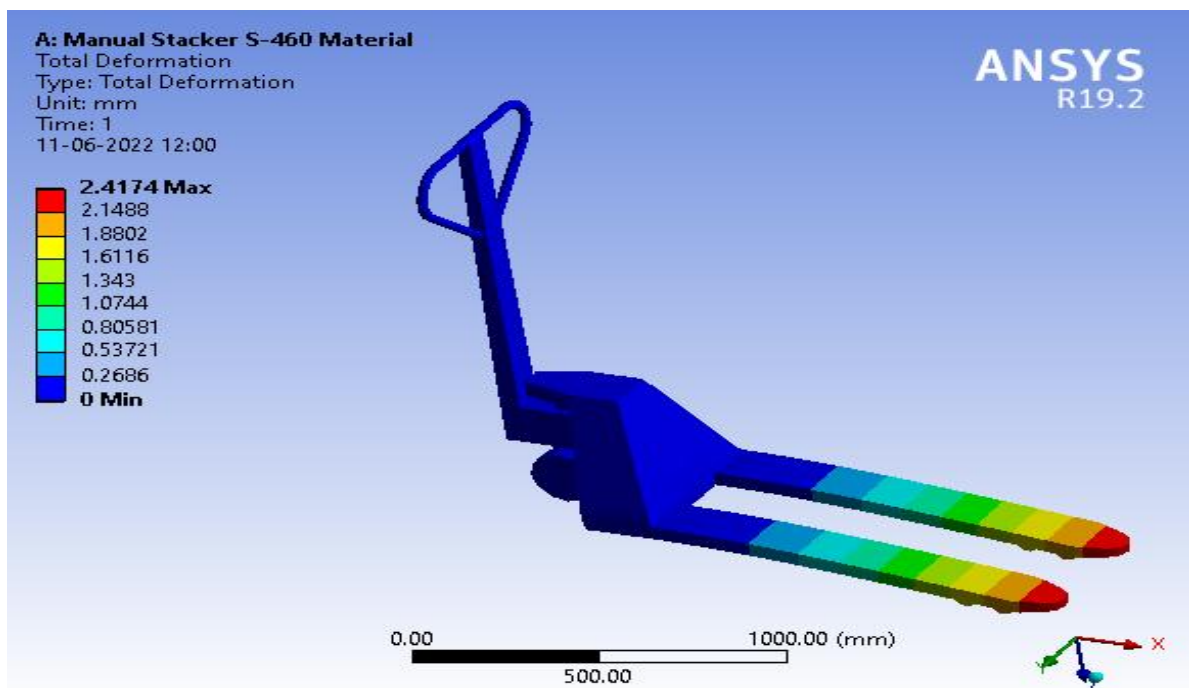


Fig. 7 Deformation S-460 material .

2.2 Carbon Fiber

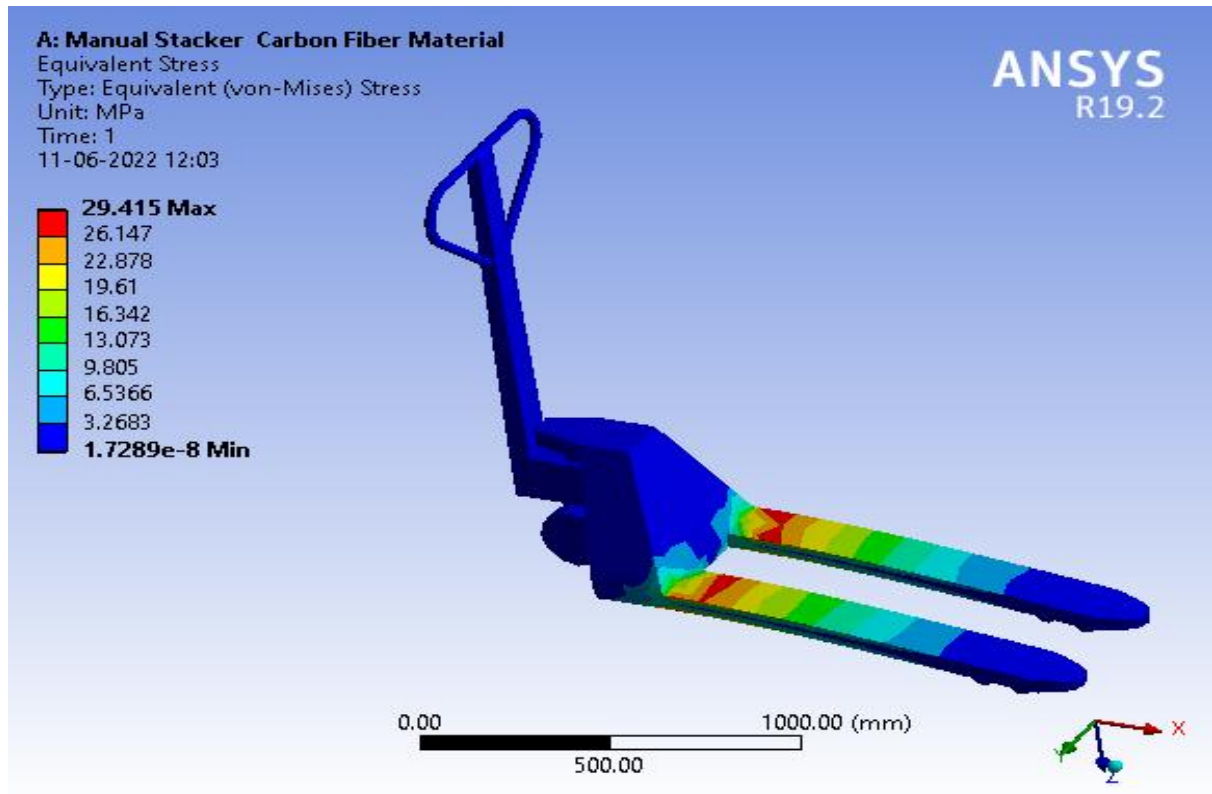


Fig. 8 Equivalent Stress Carbon fiber material

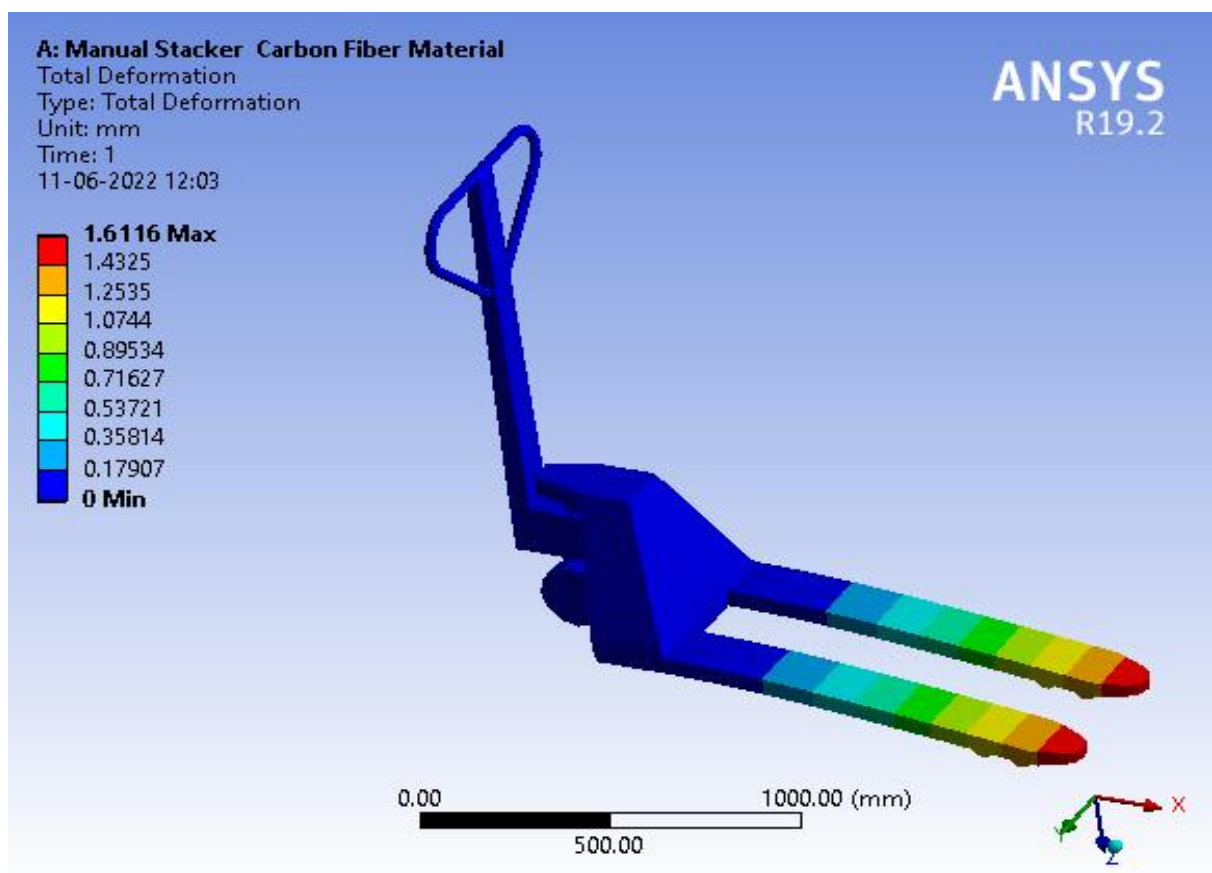


Fig.9 Total Deformation Carbon fiber material

2.3 Aluminium Alloy

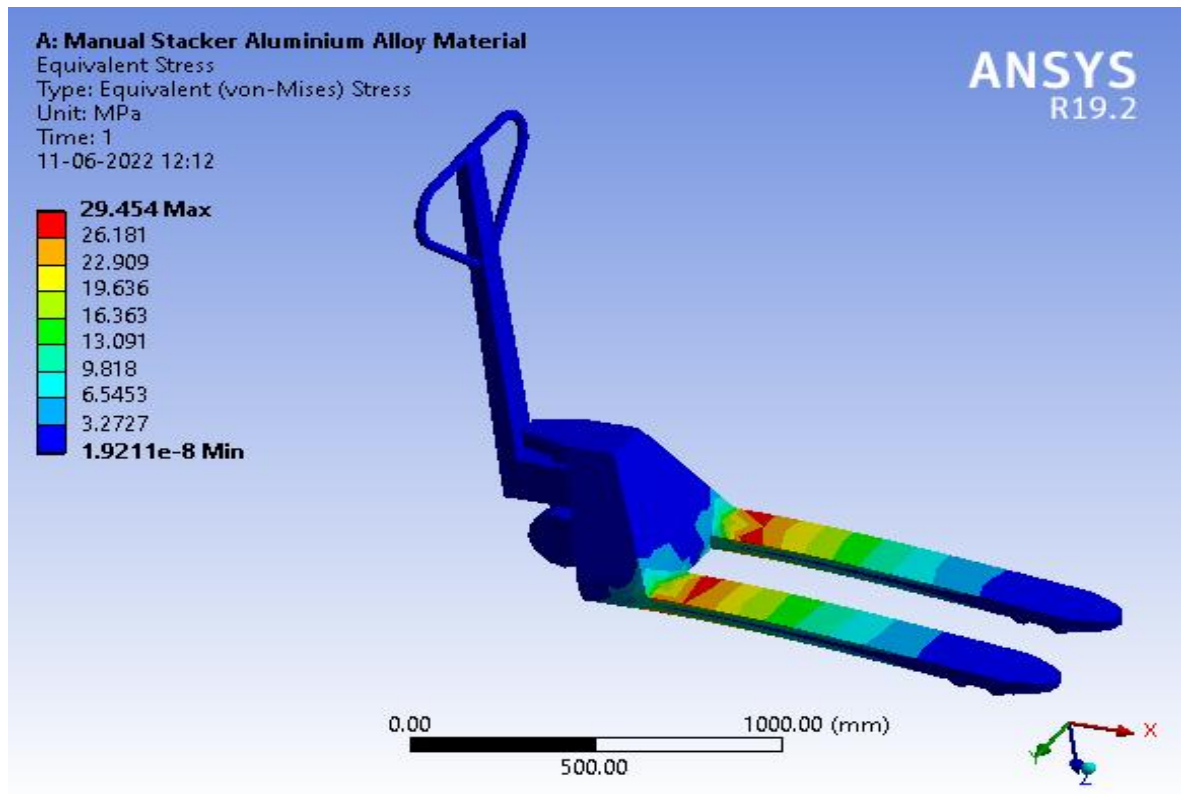


Fig. 10 Equivalent Stress Aluminum Alloy material

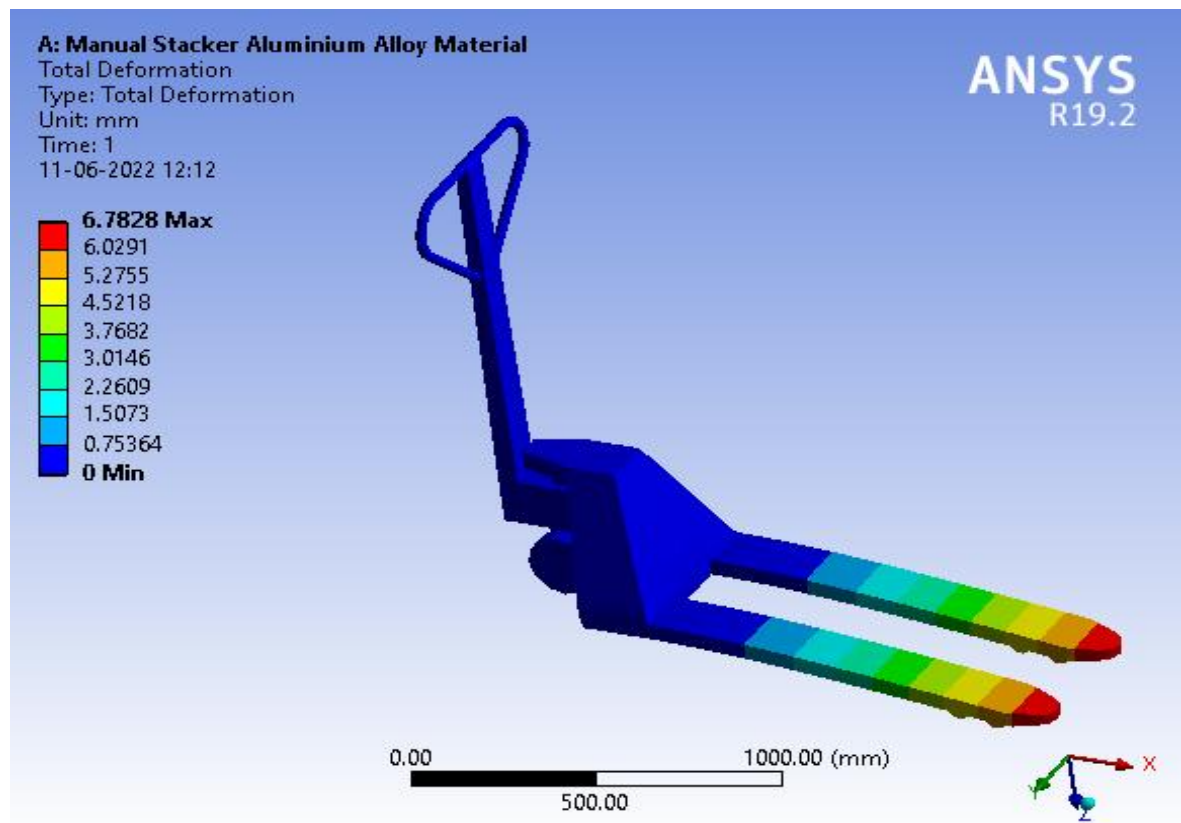


Fig. 11 Total Deformation Aluminum Alloy material

III. RESULTS & DISCUSSION

Manual Pallet Truck are robust in construction and are smooth in operations. Manual Pallet Truck are able to work efficiently. Smooth control of precise lifting and lowering. By this project man power effort can be reduce and time of work can reduce. And we designed and analyzed of carriage fork with different load. This system has a significant importance on the equipment and material handling system considering the aspects of noise and vibration. The objective of this work is to present an improved methodology, based on numerical and experimental analysis; to evaluate the life of the manual pallet truck system. It can be improving the industrial work. and also improve the material handling equipment system. In the last several years' material handling has become a new, complex, and rapidly evolving science. For moving material in and out of warehouse many types of equipment and system are in use, depending on the type of products and volume to be handled. The equipment issued, in loading and unloading operations, for movement of goods over short distances. The handling of material in warehouse is restricted to unitized forms, which require smaller size equipment. However, for bulk handling of material at logistics nodes such as fully automatic stacker can be used for the appropriate need of improved industry.

In this work we find value of vonmises stresses S-460, Aluminium Alloy, and Carbon fiber are respectively **29.41 MPa**, **29.5MPa** and **29.4 MPa**.

And total deformation for these materials likes S-460, Aluminium Alloy, and Carbon fiber are respectively **2.41mm**, **6.78 mm**, and **1.6 mm**.

Here we can see that we have used four different materials in all materials we will be selected composite material to other than because it is light weight and heavy duty its deformation and stresses range are considerable under 1000 kg loading condition.

In this work we find value of stresses S-460, Aluminium Alloy, and Carbon fiber are respectively **36.7 MPa**, **36.81 MPa** and **36.76 MPa**. and total deformation for these materials likes S-460, Aluminium Alloy, and Carbon fiber are respectively **3.02 mm**, **8.4 mm**, and **2.0 mm**. find out three different materials in all materials we will be selected composite material to other than because it is light weight and heavy duty its deformation and stresses range are considerable under 1000 kg loading condition.

IV. CONCLUSION

In this projects we can see that we have used three different materials in all materials we will be selected composite material to other than because it is light weight and heavy duty its deformation and stresses range are considerable under 1000 kg loading condition and its very light weight compare to other than materials here we have optimize the unit weight of Pallet Truck 30% and its simple in construction ,convenient lifting operating system and special design is available according to customers' requirements.

REFERENCES

- 1) K.VamsiKrishna,S. Porchilamban, Development and Structural Analysis of Masthead for a Twin Boom Stacker, International Journal of Engineering Development and Research, 2014, Volume 2, Issue 1.
- 2) Sivasubramanian A., Jagadish M., Sivaram C., Design and Modification of Semi-Automatic Stacker, Indian Journal of Applied Research, Volume : 4, Issue : 4, ISSN - 2249-555X, 2014.
- 3) Teus van Vianen, Jaap Ottjes, Gabriël Lodewijks, Simulation-based rescheduling of the stacker-reclaimer activity, Journal of Computational Science, 2014
- 4) Sen Chun Miao, Yong JiSun, Ting Wang, The Transient Dynamic Analysis of multi-stage Fork of Stacker, Journal of applied science and designing advancement, Vol.1, No.1 2014
- 5) Niraj Kumar Sahu, Ram PrakashBhatele, Stacker/Reclaimer Long Travel Drive Operation with Vfd-A Performance Study, International Journal of Science, Engineering and Technology Research (IJSETR), Volume 3, Issue 3, March2014

- 6) M. H. Tian, S. C. Hu, "Streamlining of the Hinge Point Position of Luffing Mechanism in Reach Stacker for Container", Advanced Materials Research, Vol. 694-697, pp. 142-147, May. 2013.
- 7) Yanjun Xiao, Diming Guo, Xinyu Liang and Yuming Guan, The Finite Element Analysis of Trolley Frame of Stacker-Reclaimer Running Mechanism Based on ANSYS, Research Journal of Applied Sciences, Engineering and Technology, 2013, 6(16): 3015-3017.
- 8) Oscar fenn Daniel, A. Hussainlal, Stress Analysis in Pulley of Stacker-Reclaimer by Using Fem Vs Analytical, IOSR Journal of Mechanical and Civil Engineering, Page 52-59, ISSN: 2278-1684.
- 9) Sarabjeet Singh, Yash Parikh, Finite Element Analysis of Stacker Mechanism utilized in Bearing Manufacturing, International Journal of Innovative Research in Advanced Engineering, Issue 2, Volume 2, 2015.
- 10) Syed Sajid Ahmad Syed Nisar, Prof. K. I. Ahmad Prof. M. Sohail Pervez "Plan and Optimization of Industrial Pallets for Handling Engine Blocks of Mahindra Scorpio" IJIRST– International Journal for Innovative Research in Science and Technology| Volume 3 | Issue 01 | June 2016.
- 11) P. Naveenkumar, N. Ashok, J. Dinesh Kumar "Plan and Analysis of Two Wheel Drive Forklift for Industrial Warehouses "Global Journal of Engineering Research and Technology (IJERT) ISSN: 2278-0181, 2018.
- 12) Anil A. Sequeira, Saif Mohammed, Avinash A. Kumar, Muhammed Sameer, Yousef A. Kareem, Krishnamurthy H. Sachidananda" Design and Fabrication of Battery Operated Forklift" Journal Européen des Systèmes Automatisés, 2019, 19pp. 569-57.