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"DESIGN AND ANALYSIS OF SEMI OPERATED STACKER MACHINE DESIGN USING ANSYS SOFTWARE"

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ABSTRACT

In this project, we studied the manufacturing process and functional activities of electric operated stacker machine 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, we propose to apply some new techniques to help mechatronics become better and have a more efficient and effective manufacturing system. In this work an attempt is made to design of semi automatic stacker. Semi automatic stackers are robust in construction and are smooth in operations. Semi automatic stackers 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 semi automatic stacker. This system has a significant importance in the equipment and material handling system.

KEYWORDS : *Stacker, manufacturing, Mechatronics, lifting, static analysis, Semi automated*

I. INTRODUCTION

Material handling (MH) involves "short-distance movement that usually takes place within the confines of a building such as a plant or a warehouse and between a building and a transportation agency."[1]It can be used to create "time and place utility" through the handling, storage, and control of material, as distinct from manufacturing (i.e., fabrication and assembly operations), which creates "form utility" by changing the shape, form, and makeup of material.

It is often said that MH only adds to the cost of a product, it does not add to the value of a product. Although MH does not provide a product with form utility, the time and place utility provided by MH can add real value to a product, i.e., the value of a product can increase after MH has taken place; for example:

The value (to the customer) added by the overnight delivery of a package (e.g., Federal Express) is greater than or equal to the additional cost of the service as compared to regular mail service—otherwise regular mail would have been used.

The value added by having parts stored next to a bottleneck machine is the savings associated with the increase in machine utilization minus the cost of storing the parts at the machine.

Electric Pallet Stacker is a thin, highly-versatile lift that compliments nearly any primarily indoor application. Balanced similar to a traditional forklift and without base legs, the Counter-Balanced Electric Stacker can fit into tight spaces.

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Extremely durable and budget friendly, the Toyota Counter-Balanced Stacker can help increase both your uptime and your bottom line.

Figure 1

II. COMPONENTS OF STACKER

2.1 Pulley

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable, supporting shell is referred to as a "block."

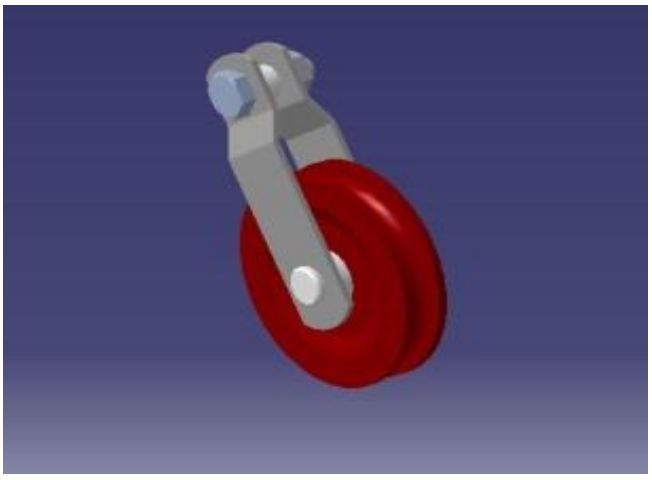

Figure 2

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2.2 Hook

A hook is a tool consisting of a length of material that contains a portion that is curved or indented, so that this portion can be used to hold another object.

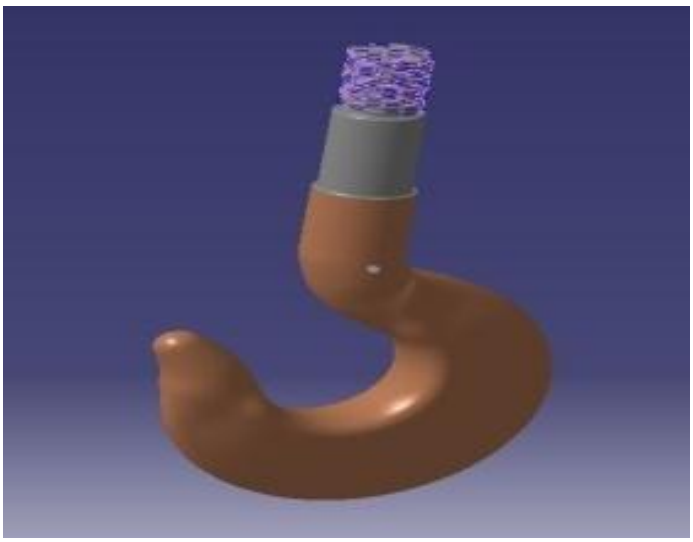

Figure 3

2.3 Wire rope

Wire rope is rope made from wire. It consists of several strands of metal wire laid (twisted) into a helix.

Figure 4

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2.4 AC Motor

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field.

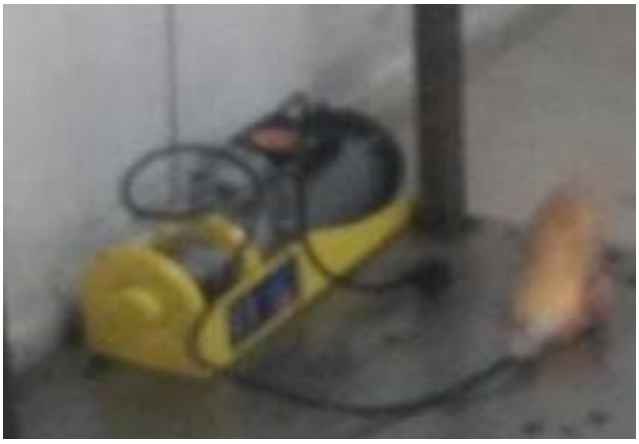

Figure 5

III. EXPERIMENTAL SETUP

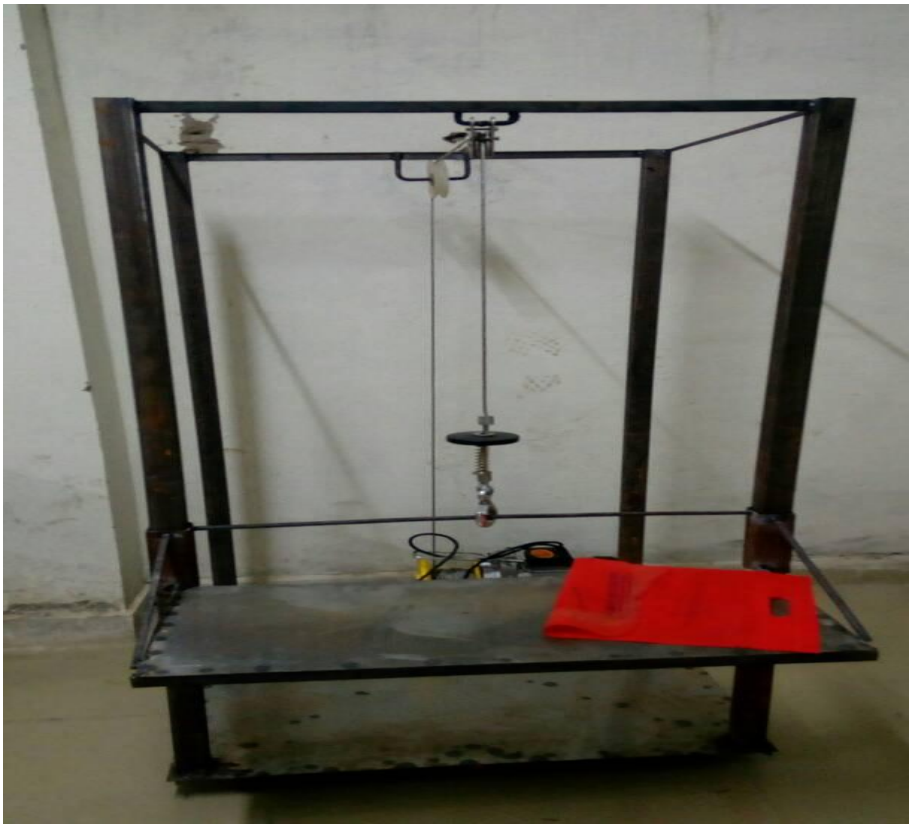

Figure 6

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IV. STACKER SPECIFICATIONS

Table.1 Motor Power Calculation for lifting

Dimensions	Unit	Remark
Capacity	Kg	100
Max fork height	mm	1500
Lowered fork height	mm	85
Fork fixed width	mm	550
Fork width	mm	85
Fork length	mm	1100
Overall length	mm	1050
Overall height	mm	1980
Overall width	mm	650
Weight of unit	Kg	37

Power = Force = mass x acceleration.

= 100 x 9.81

= 981 N

Work done = Force x Lifting Height

= 981 x0.300

= 294.3 Nm

Power = Work done / Time Taken

=294.3/ 1

= 294.3 W

Safety Factor = 1.2

Total Power Required = 294.3x 1.2

=353 W

=0.47 hp (1 HP = 746 Watt)

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Table 2. Stainless Steel Mechanical properties

Material Field Variable	Value	Units
Density	8000	Kg/m^3
Young's modulus	2E+05	Mpa
Tensile Strength	520	Mpa
Yield Strength	240	Mpa
Poisson Ratio	0.027-0.30	
Shear modulus	76923	Mpa
Bulk Modulus	1.6667E+05	Mpa
Strength Coefficient	920	Mpa
Strength exponent	-0.106	
Ductility Coefficient	0.213	
Ductility Exponent	-0.47	
Cycle Strength Coefficient	1000	Mpa
Cyclic Strain Hardening Exponent	0.2	
Tensile Yield Strength	250	Mpa
Compressive Yield Strength	250	Mpa
Tensile Ultimate Strength	460	Mpa
Compressive Ultimate Strength	0	Mpa

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V. COMPUTATIONAL STUDY

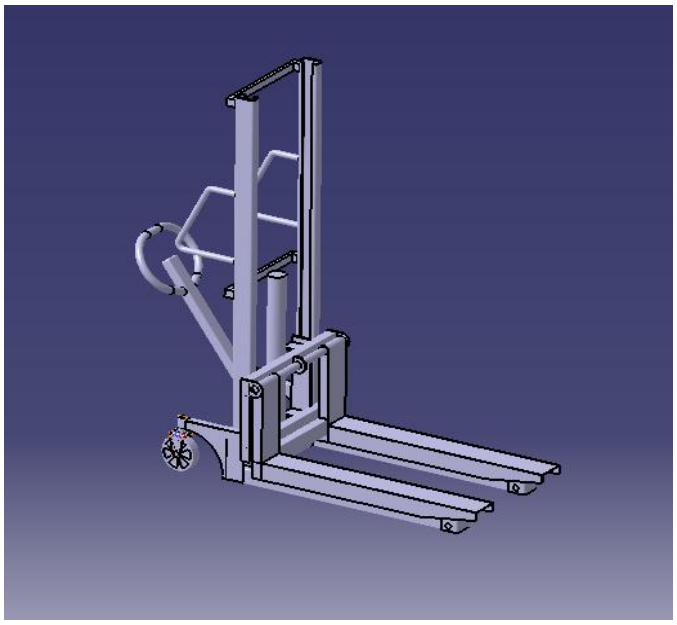

Figure 7

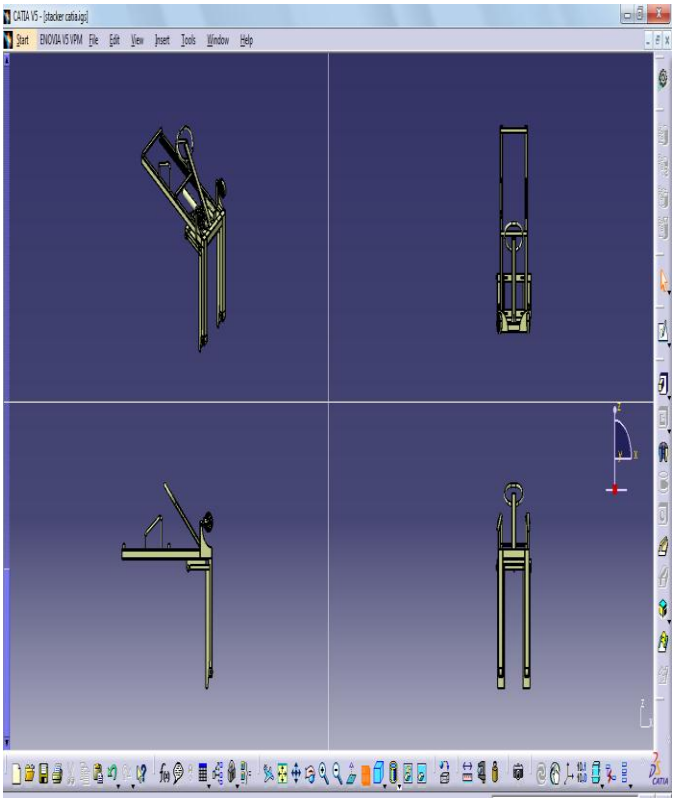

Figure 8

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Simulation & Analysis

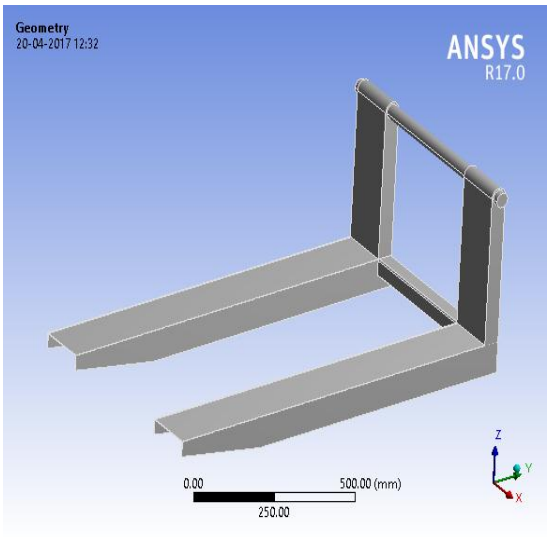

Figure 9

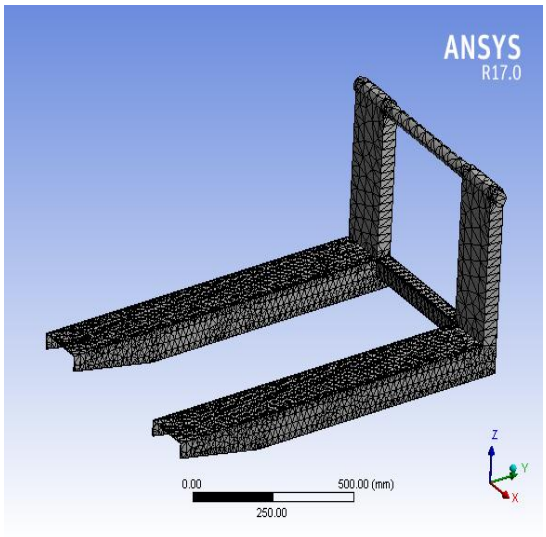

Figure 10

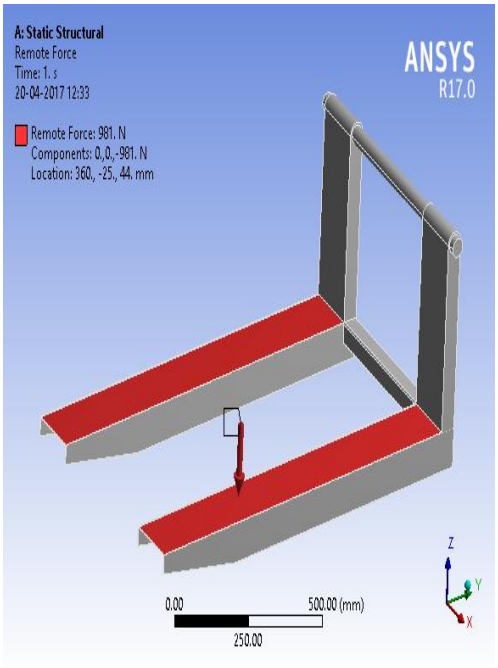

Figure 11

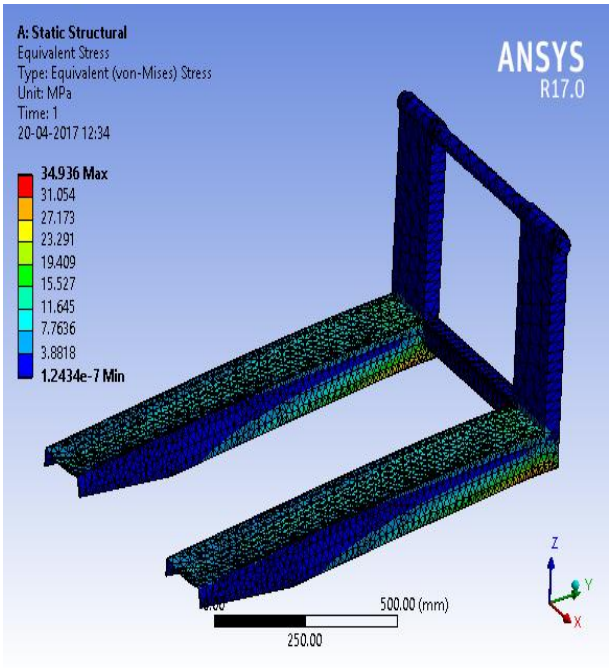

Figure 12

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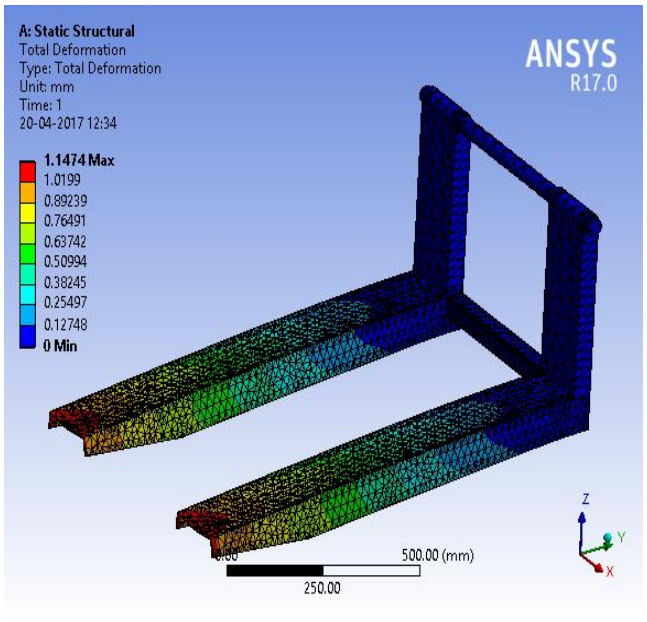
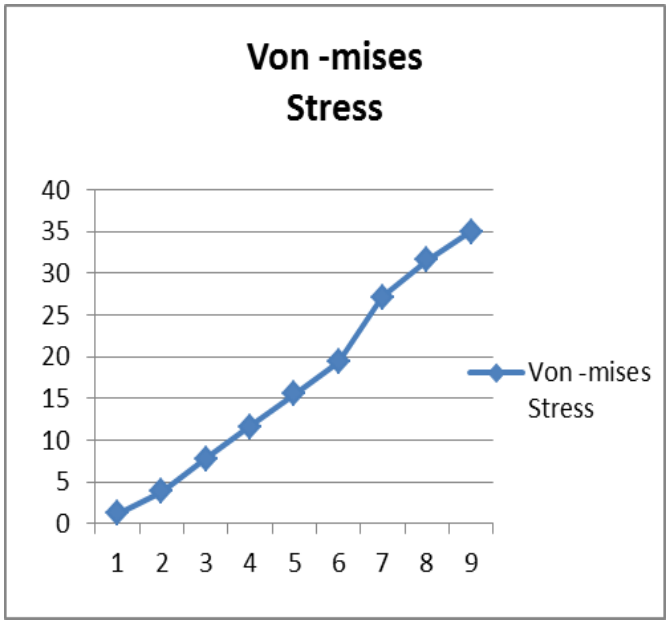
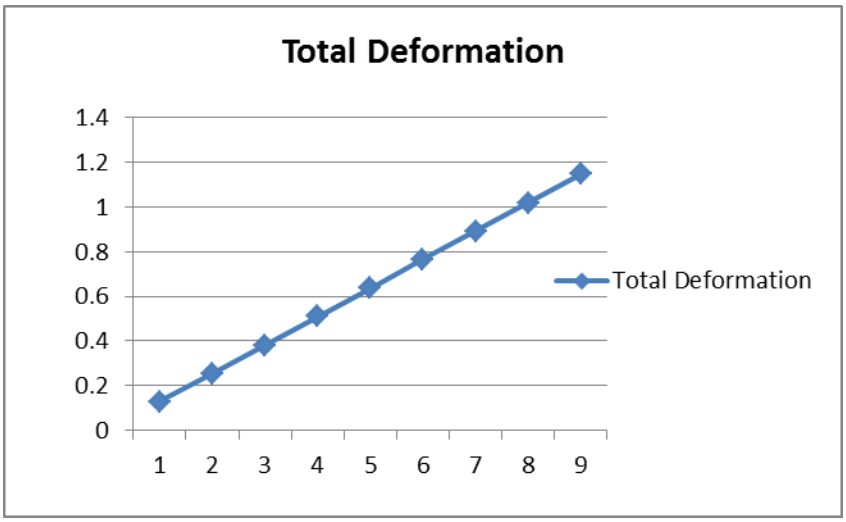


Figure 13



Graph 1



Graph 2

VI. Result & Discussion

Semi automatic Stackers are robust in construction and are smooth in operations. Semi automatic stackers are able to work efficiently for pallets on high rack. 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 and power pack box with different load. This system has a significant importance on the equipment and material handling system. Considered 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 semiautomatic stacker 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

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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 our model of stacker we find out maximum value of stresses 34.93 Mpa value of deformation is very less 0.27mm. These values of stacker find out for stainless steel materials. So we can say that our design is safe and we have optimize weight of stacker machine by new design implementation.

VII. CONCLUSION

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 semi automatic stacker can be use for the appropriate need of improved industry.

VIII. FUTURE SCOPE

For further research work can be extended by using different materials and in future we can do work on stacker machine with composite materials and optimize weight, cost parameter.

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