Design and Analysis of Two Wheel Drive Forklift for Industrial Warehouses

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***Abstract*:- In today life there is wide of fork lifts variety of forklifts from the large heavy loadings trucks to the one that works among narrow aisles forklifts have becomes one of basics transportation tools we use in our lives with all the forklifts in existence we find that there are some improvement that can be to bring forklifts to the better performance.**
Segway is a self-balancing transportation device with two wheel can operate in any level pedestrian environment.
Existing forklifts design has its limitation in rotation and structures has potential safety risk our new design as 90 degrees rotating forks attached to truck body on both ends
.also it has a scissor lift under the operator cabin which improves the stability fork ;there is a total of 8 parts in the new design
Once the design is conceived, we calculate the mass properties of parts and subassemblies to ensure the stability of the fork lift results show that truck is safe to use its center of gravity remains in the safety triangle and we use this to get the maximum loading capacity then we run stress analysis important parts and subassemblies using finite elements Method (FEM) and their results show that the new design is safe to use under working condition.

1 INTRODUCTION

The product varieties in different shapes and different packaging of goods for loading and unloading has always been a heavy process during transportation by fork lifts were naturally inverted and became the solution to this problem they save time and space, if cargo's are being organized properly for the use of forklifts with right attachment would be a best way to load and unload which would be make the whole process less time consuming the less labors intensive in addition forklifts optimize the use of storage space by eliminating the need for many people to handle the loading and unloading operation and enabling the stacks up to good the stacking the height of goods can be up 4-5m some even can be height as 10, which brings up the utilization of warehouse by least 40% now most of the transportation operation are using fork lifts.

Mechanization reduces the human efforts and manpower, but need to be closer and complex human supervision. If consistency and close supervision is not provided, there might be costly process error will occur. So, automation process will eliminate the error and human interface by taking full control over the operations of the mechanize equipment and provides a consistency through the process control system and strong the instrumentation built in the system.

1.2 Objectives

In this project we investigate a forklift design that is new and different from existing design. The new design offers two features:

1. The forklift attached to the frame body end.
2. The other feature is that the new lifting mechanism by lead screw where it is easy to lift and more compact compare to the existing design.

The remainder of this thesis describes about more features and details. And also we do analysis and calculation work on the model to make sure it is stable and safe under different working condition.

1.3 Basic system of a forklift

Usually a fully functional forklift would consists of the following major system.

1. The power system,
2. Driving system,
3. Control system,
4. Loading system

But in our design we only concerned with the loading system, since we are not going to focus on the power, driving and control system only we will give a basic information in the following two sections the power system will be included in the driving system.

2. DESIGN OF EQUIPMENT AND DRAWING COMPONENTS

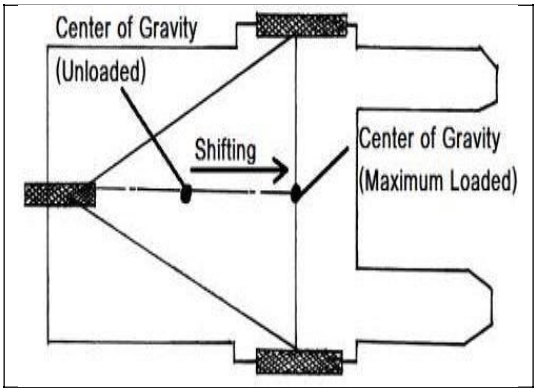
Fabrication of Segway- prototype is consists of the following components to full fill the requirements of complete operation of the machine.

1. DC motor
2. Battery
3. Bearing
4. Plat form
5. Handle
6. Rectifier
7. Step down transformer
8. Control unit

3. WORKING PRINCIPLE

The wheel shaft is connected with arrangement of a motor. This motor is used to run the vehicle. Battery is connected to the motor. The motor is connected to the worm gear to increase the torque and is directly coupled to the wheel by means of a bearing block which runs the vehicle. Motor is controlled by the control unit. This vehicle causes no pollution. In front of the Segway the forklift arrangement is mounted. The lead screw is used lift the fork and used to move up and down.

The most important consideration of designing a fork lifts is the safety, while the fork lifts is during the loading and moving stability system consists of 3 point of contacts ,2 front wheel drives and supporting the real wheel contact axle arranged on safely mounted.



THREE POINT ON CONTACT FRAME

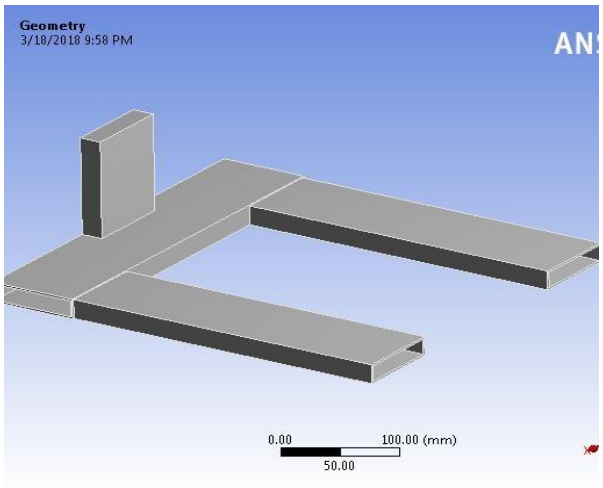
4. FEM/FEA ANALYSIS

In pervious chapter ‘ we have already presented the design idea and dimension and mass property of these important components .these results idea us to study the design to ensure that it will meet the functional requirements including the stress analysis we are going to discuss in this chapter we will still use the analysis tool offered solid works to verify our design the tool we are going to use here based on infinite element method and we are using it to do the stress analysis that is needed finite element method is a numerical method that consists of finite elements modeling (FEM) analysis (FEA)what it does is that it a complex shape in to lot of smaller elements when the engineering design problems are too complicated to find a closed form solution of their governing equilibrium equation instead it converts the equilibrium equation continuum in to integral in order word finite elements method analysis a whole design at element level. They are two components in the lifting fork system that needed to be analysis and other one is supporting frame and separately analysis leads screw if it is safe to use.

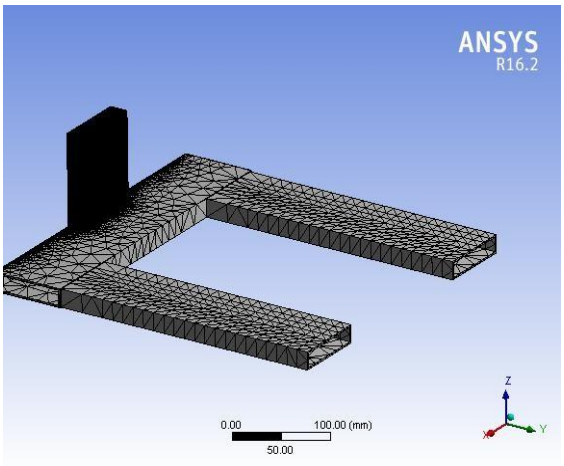
The isometric view and engineering drawing of each of these individual parts. All parts dimensions are introduced here as well.

4.1 LIFT

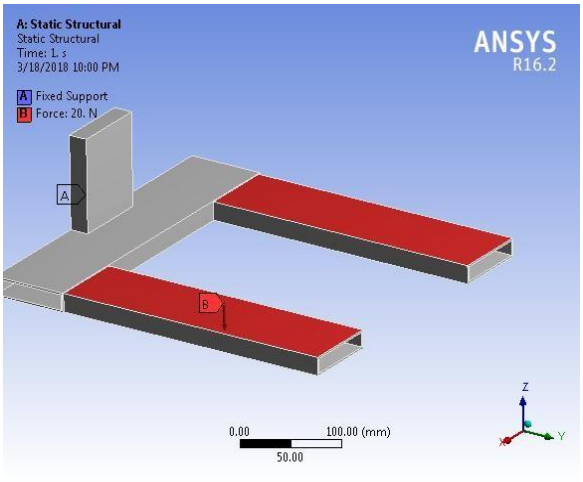
Lift loading parts are responsible for picking up the load and carry it during the transportation



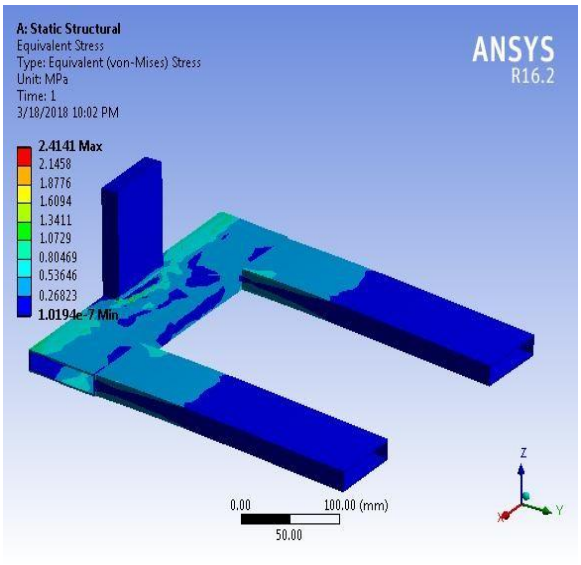
IMPORTED GEOMETRY MESHING



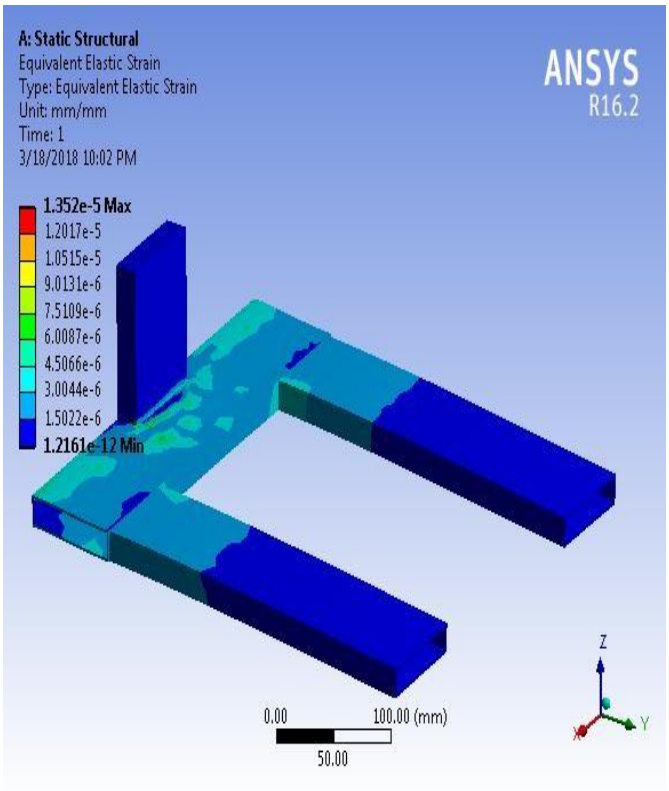
BOUNDARY CONDITION



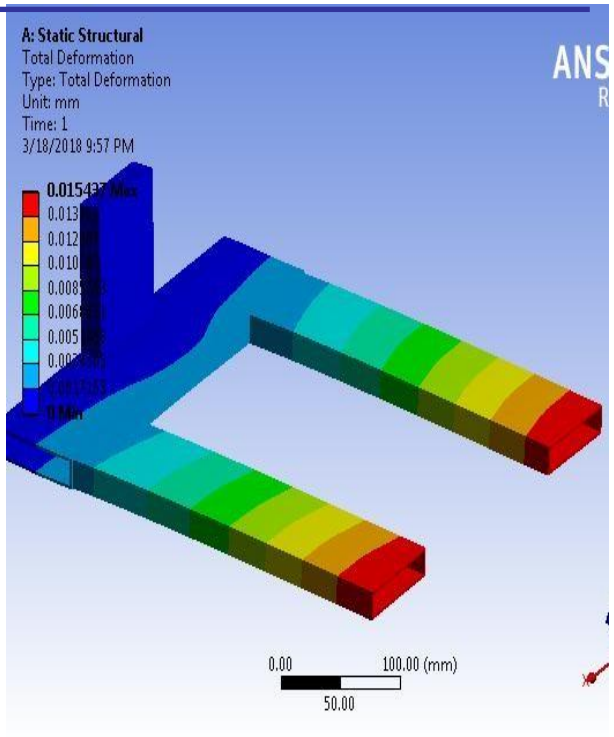
STRESS



STRAIN



TOTAL DEFORMATION

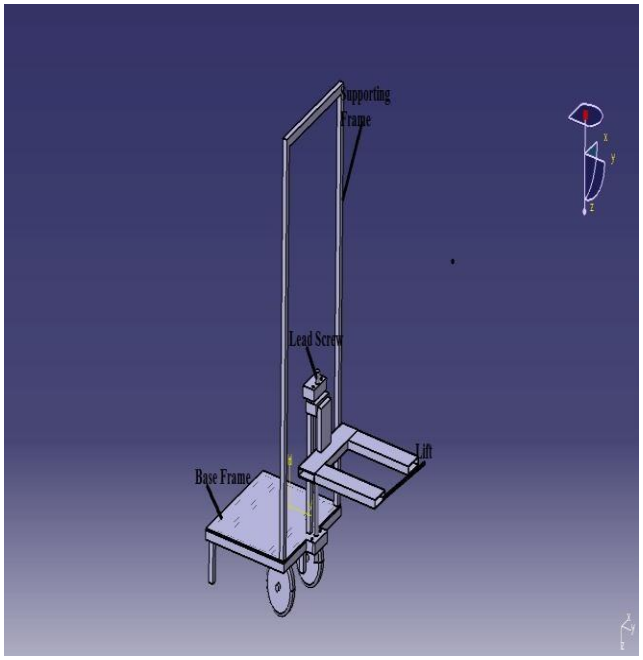


TABULATION

Length [mm]	[A] Total Deformation 2 [mm]
0.	2.508e-003
12.5	2.7468e-003
25.	3.0491e-003
31.25	3.2197e-003
37.5	3.4009e-003
43.75	3.5925e-003
50.	3.7928e-003
56.25	4.0024e-003
62.5	4.2198e-003
68.75	4.4442e-003
75.	4.6741e-003
81.25	4.9114e-003
87.5	5.1544e-003
93.75	5.4028e-003
100.	5.656e-003
106.25	5.9142e-003
112.5	6.1765e-003
118.75	6.4431e-003
125.	6.7132e-003
131.25	6.9876e-003
137.5	7.2647e-003
143.75	7.5453e-003
150.	7.8289e-003
156.25	8.1146e-003
162.5	8.4023e-003

168.75	8.6916e-003
175.	8.9826e-003
181.25	9.2765e-003
187.5	9.5714e-003
193.75	9.8673e-003
200.	1.0164e-002
206.25	1.0463e-002
212.5	1.0761e-002
218.75	1.1061e-002
225.	1.136e-002
231.25	1.1661e-002
237.5	1.1962e-002
243.75	1.2262e-002
250.	1.2563e-002
256.25	1.2864e-002
262.5	1.3165e-002
268.75	1.3466e-002
275.	1.3766e-002
281.25	1.4067e-002
287.5	1.4367e-002
293.75	1.4667e-002
300.	1.4967e-002

5. DRAWING FOR FABRICATION OF SEGWAY PROTOTYPE



6. CONCLUSION

The project carried out by us made an impressing task in the field of production and manufacturing industries. It is very useful for having the scrap collecting vehicle, because they need not take any risk for park the vehicle.
This project will reduce the cost involved in the concern. Project has been designed to perform the entire requirement task at the shortest time available.

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