DESIGN & ANALYSIS OF EFFORTLESS CENTER STAND FOR TWO-WHEELER

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Abstract : Conventionally two-wheeler stands on two parts, aspect stand and center stand, each bears static loading. The aspect stand is definitely deployed permitting the scooter to lean to the left aspect.while The use of center stand needs lots of human effort and rider has to pull 50% of vehicles weight so it's difficult to apply. So they go for side stand, but the use of side stand affects the life of tyre and battery since it the electrolyte remains in constant touch with the electrode. During this project an automatic center stand is intended that consists of a pneumatic cylinder hopped-up by a mechanical device and controlled by a key operated switch. The purpose of the pneumatic cylinder is to lower the center stand legs and raise the vehicle. This sort of automatic center stand will not only increase the life of components but will also reduce the human effort to virtually zero. It can be used as an anti-theft mechanism.

Keywords: Pneumatic cylinder, Key operated switch, Static loading, Center stand, Anti-theft Mechanism.

1. INTRODUCTION

Conventional method of applying a middle stand needs heap of human efforts. Applying two-wheeler center stand may be a painful task, particularly for women's and recent folks. Hence, they're going for aspect stand; however it consumes additional parking lot. The automated center stand reduces human effort. A center stand aspect stand may be a try of legs or a bracket that flips straight down and lifts the rear wheel off the bottom once in use. Center stand will be mounted to the chain stays right behind rock bottom bracket or to the rear dropouts. Any two-wheeler feature center stand additionally to aspect stands. The centre stand is advantageous as a result of it takes most of the motorcycle's weight off its tyres for long run parking, and it permits the user to perform maintenance like chain changes while not the requirement for a two-wheeler, however square measure omitted on most superior sport two-wheelers to avoid wasting weight and increase ground clearance. A middle stand may be a device on a bicycle or two-wheeler that enables the two-wheeler to be unbroken upright while not leaning against another object or the help of someone. A middle stand is typically a fabricated from metal that comes down from the frame and makes contact with the bottom. It's usually set within the middle of the two-wheeler or towards the rear. Some moving two-wheelers have two: one at the rear, and a second within the front. Modification in our project of machine-driven center stand is use of mechanical mechanism for operational center stand by connecting battery and switches. Currently a day's inserting a middle stand whereas parking on the uneven road is tough and risky, to beat his downside we have a tendency to square measure victimization some mechanical arrangement and therefore the whole system is motivated by mechanical mechanism operational through switches.

1.1. PROBLEM STATEMENT

Two wheelers are in use since a long time now and it's not attending to reduce any time in future. It's determined that for a few folks mounting the vehicle on the middle stand is difficult and needs a lot of strength. A lot this just in case of significant two wheelers just like the cruise kind, that has a higher engine capability creating the vehicle heavier and bulky. Thus the proposed system aims at providing a user friendly approach by minimizing the human effort needed for the task.

1.2. OBJECTIVE

1. Minimizing human efforts to lift the heavy vehicles.
2. For easy handling of old peoples.
3. To increase the life of vehicle components.

2. LITERATURE SURVEY

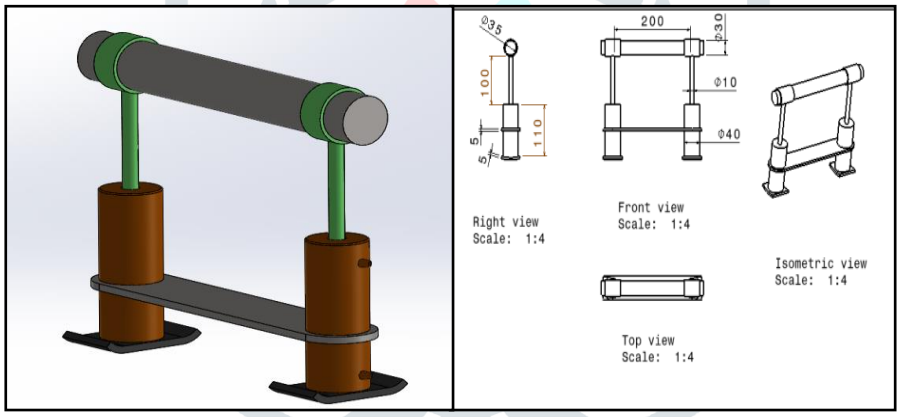
Ankitkumar K. Shriwas et. Al. [1] This writing shows ordinarily two segments are utilized for standing the bike, side stand and focus stand. The two parts experience static stacking. Plan of both side and focus stand is with the end goal that a huge pressure is created in it, which makes originator select solid material as steel. Other plan issues in regards to with the inside stand is, its activity. To work focus stand rider needs to get down from bicycle and needs to pull against the switch which is troublesome at some point. In present work, another plan of focus stand is proposed, which has similar less worry than traditional focus remain just as it is anything but difficult to work. In present work, systematic and FEM based examination is embraced for count reason and sand throwing is received for assembling reason. First standing gadget is structured and afterward it is introduced to the cruiser. Aakarsh B S et. al. [2] This writing talks about the side stand is effortlessly sent permitting the bike to shelter the left side. The errand of mounting bikes on the middle stand can be testing. To work focus stand, rider needs to get down from bicycle and needs to pull against the switch which is troublesome at some point. Rider needs to lift least half of weight of bike to draw in the inside stand. It turns out to be progressively troublesome if there should a rise an occurrence of overwhelming bikes like the

Royal Enfield or if the rider is old. In this paper, a mechanized focus stand is structured and created which utilizes a direct actuator fuelled by a battery to bring down the stand and lift the vehicle and park it on the stand. This stand limits human endeavours to just about zero. Likewise, oneself adjusting system was immovably settled which lifts the cruiser upstanding on lopsided surfaces. Therefore, it has gotten conceivable to introduce this mechanized focus remain in large scale manufacturing bike. Karan Dutt et. al. [3] This paper predominantly discusses PNEUMATICS working and segments. The primary accentuation is given on its different segments' working and working. Pneumatics is an area of innovation that manages the examination and utilization of pressurized gas to create mechanical movement. Pneumatic frameworks are utilized broadly in industry, and processing plants are generally plumbed with compacted air or packed dormant gases. This is on the grounds that a midway found and electrically fuelled blower that powers chambers and other pneumatic gadgets through solenoid valves can frequently give thought process power in a less expensive, more secure, progressively adaptable, and more dependable route than an enormous number of electric engines and actuators. G. McLatchey et. al. [4] This writing shows the supporting legs of legged robots structure some portion of different shut kinematic chains in which opposing powers can represent an issue. In this paper, strategies for consistence and power control are investigated to determine this. A 'settled circle' topology of non-direct control for pneumatic chambers is sketched out and its presentation in real usage is accounted for. The control circle was straightforward enough to be executed on low preparing speed microcontrollers without PWM (in a Bang-Bang style). Control input comprised of picking the ideal Control Mode, giving an objective for that Control Mode and picking a Compliance Factor (somewhere in the range of 0 and 100%). Ashish jyoti1 et. al. [5] This writing examines most present day bicycles accompany both a side stand and a middle stand. The side stand is effortlessly conveyed permitting the bicycles to shelter the left side. The bicycles must be raised up onto the middle stand. The challenges face with these stands should be ventured upon and the vehicle should be lifted physically. Except if on firm, levelled ground, the side remain on a bicycle or any bicycle can't be believed whose wheels can't be secured by setting a brake leaving it in gear. In this paper, a robotized focus stand is plan and advancement which utilizes a straight actuator controlled by a battery to bring down the stand and lift the vehicle and parks it on the stand. This stand limits human endeavours to very nearly zero. What's more, oneself adjusting component was solidly.

3. DESIGN & MATERIAL PARAMETERS

1. Design of model

Figures shows the Cad model and drafting of fire fighting robot Figs. 1 (a) shows the Cad image. (b) The image obtained by applying drafting command on Cad Model



(a) (b)

Figure 1. (a) CAD Model (b) Drafting of CAD Model

2. Components Used

1. Pneumatic cylinder
2. Compressor
3. Pneumatic valve
4. Key Operated Switch
5. Frame and supporting member
6. Hoses and pipes

3. Calculation

1) Total mass of the vehicle = 110 kg
2) Total mass of person sitting on it = (2*60) =120 kg
3) Total mass of the system = 230 kg

Vertical force acting on the middle bar (shown in fig 2.) = 2300 N

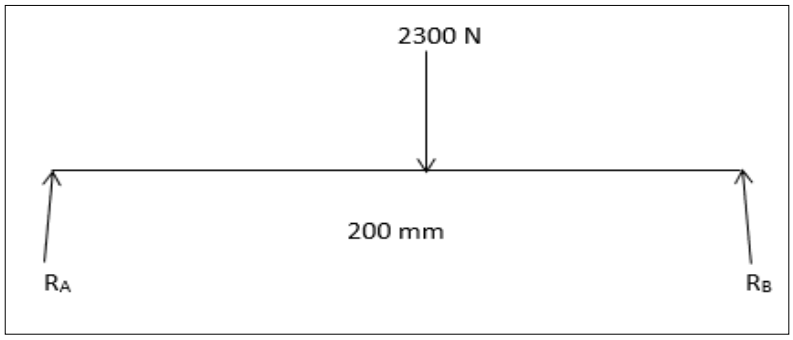


Figure 2. Design of bar

Ra + Rb = 2300 N
Ra = Rb = 1150 N
& (Ra *200) - (2300*100) = 0
Ra = 1150 N. &. Similarly Rb = 1150 N (shown in Fig 3).

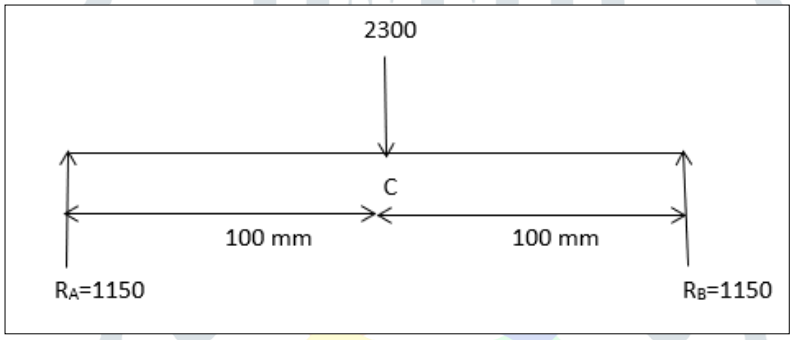


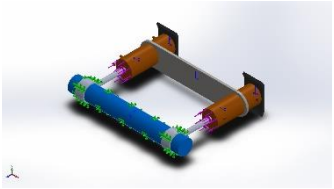
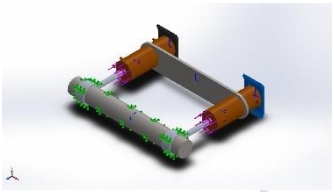
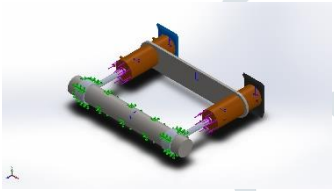
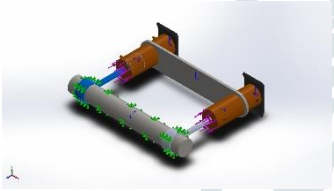
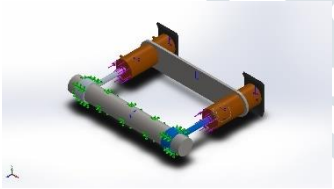
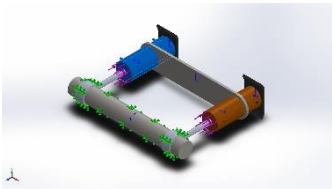
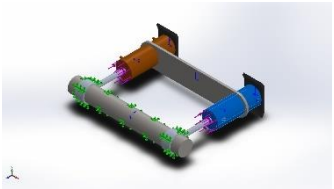
Figure 3. BMD: Design of bar against bending failure

BMa = (2300*100) - (1150*200) = 0 N-mm
BMc = (1150 *100) = 115000N-mm; BMb = 0
Maximum bending moment occurs at the center of bar, at pt C
According to flexural formula:-
M/I = 6/Y (1)
Where, M = maximum value of bending moment (N-mm)
I = moment of inertia of circular bar (mm^4)
y = distance of neutral fibre from extreme or (mm) i.e. circumference
6 =Induced bending stress (N/mm^2)
For 30 mm dia. of solid circular rod, Y = 15 mm
I = π\64 *d ^4 = 39760.8 mm^4 (2)
As, M/I = 6/Y
Therefore, 6= MY/I = 115000*15/29760.8 = 43.38 N/mm^2 (3)
Therefore, 6induced = 43.38 N/mm^2 < 6syt of M.S
Our design is safe.

Cylinder Selection:
As, P= F/A (4)
Total acting force = 2300 N, so on each cylinder acting force = 1150 N
For, 2s* 100 Pneumatic cylinder and 10 mm piston rod diameter, induced pressure is calculated as,
P = 1150/ [π/4 * (2s) ^2] = 2.35 N/mm^2 (5)
Hence, the maximum working pressure for the cylinder is 3 bar, we have to supply compressed air with a pressure of 3 bar, to lift the system with 2 peoples seated on it.

Table 1 shows the 3D modelling performed

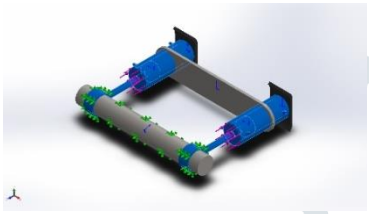
Table 1. Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties
Boss-Extrude1 	**Solid Body**	**Mass:2.05219 kg Volume:0.00025977 m^3 Density:7900 kg/m^3 Weight:20.1114 N**
Cut-Extrude1 	**Solid Body**	**Mass:0.0899475 kg Volume:1.13858e-05 m^3 Density:7900 kg/m^3 Weight:0.881485 N**
Cut-Extrude1 	**Solid Body**	**Mass:0.0899475 kg Volume:1.13858e-05 m^3 Density:7900 kg/m^3 Weight:0.881485 N**
Cut-Extrude1 	**Solid Body**	**Mass:0.0638111 kg Volume:2.36337e-05 m^3 Density:2700 kg/m^3 Weight:0.625349 N**
Cut-Extrude1 	**Solid Body**	**Mass:0.0638111 kg Volume:2.36337e-05 m^3 Density:2700 kg/m^3 Weight:0.625349 N**
Cut-Extrude3 	**Solid Body**	**Mass:0.190962 kg Volume:7.07267e-05 m^3 Density:2700 kg/m^3 Weight:1.87143 N**
Cut-Extrude3 	**Solid Body**	**Mass:0.190962 kg Volume:7.07267e-05 m^3 Density:2700 kg/m^3 Weight:1.87143 N**

4. Material specifications

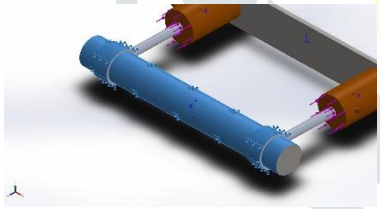
Table 2 shows the standard materials and mechanical properties consider for the system .According to that AISI 1020 (M.S.) and AISI 1060 (Al. alloy) perfectly suits the system and can withstand the load.

Table 2. Material Properties

Model Reference	Properties	Components
	**Name:** AISI 1020 **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 3.51571e+08 N/m^2 **Tensile strength:** 4.20507e+08 N/m^2 **Elastic modulus:** 2e+11 N/m^2 **Poisson's ratio:** 0.29 **Mass density:** 7900 kg/m^3 **Shear modulus:** 7.7e+10 N/m^2 **Thermal expansion coefficient:** 1.5e-05 /Kelvin	**Connecting Plate-1, Connecting Rod-1, Curved Plate-3, Curved Plate-4**
	**Name:** 1060 Alloy **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 2.75742e+07 N/m^2 **Tensile strength:** 6.89356e+07 N/m^2 **Elastic modulus:** 6.9e+10 N/m^2 **Poisson's ratio:** 0.33 **Mass density:** 2700 kg/m^3 **Shear modulus:** 2.7e+10 N/m^2 **Thermal expansion coefficient:** 2.4e-05 /Kelvin	**Piston-1, Piston-2, cylinder-1, cylinder-2**

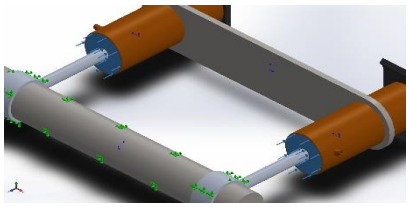
5. Loads & Fixtures

Table 3. Loads & Fixtures

Fixture name	Fixture Image	Fixture Details
Fixed-1		[1] Entities: [2] **3 face(s)** [3] Type: [4] **Fixed Geometry**

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	**-0.0544853**	**0.196251**	**4599.99**	**4599.99**

Load name	Load Image	Load Details
Force-1		[1] Entities: [2] **2 face(s)** [3] Type: [4] **Apply normal force** [5] Value: [6] **2300 N**

4. EXPERIMENTAL STUDY

Figure shows the stress Results of center stand. The following analysis results are taken by adopting a proper methodology.

Table 4. Von Mises stress

Name	Type	Min	Max
Stress	**VON Mises Stress**	**2.589e-01 N/m^2** **Node: 4560**	**3.522e+07 N/m^2** **Node: 11925**

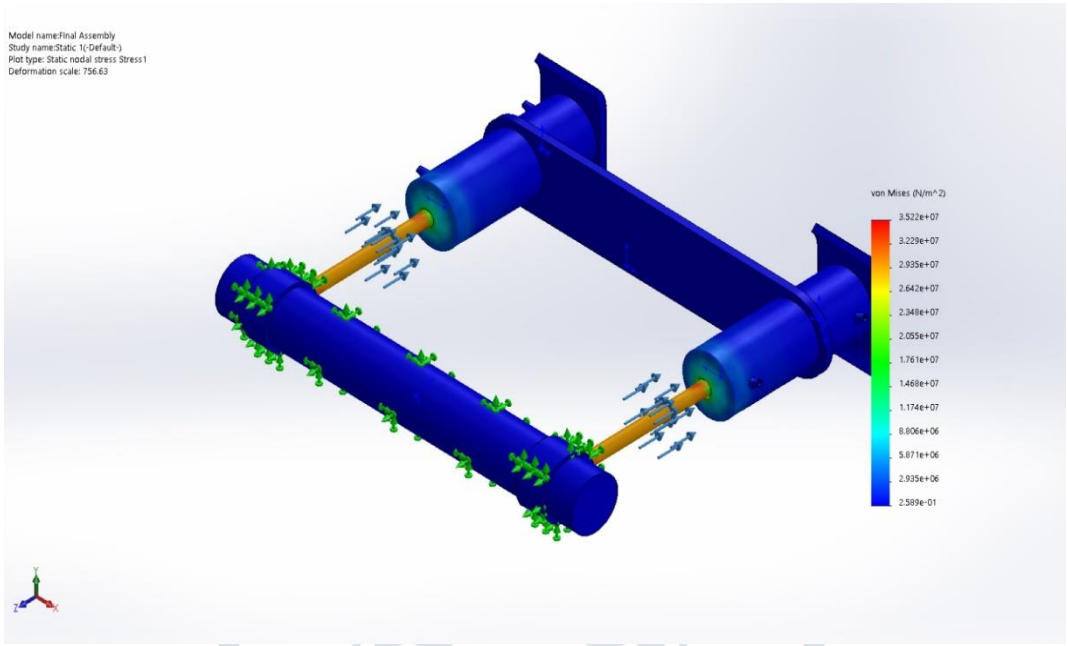


Figure 4. Final Assembly-Static Stress

Figure 4 predicts yielding of material under complex loading from the results of unaxial tensile stress the Von Mises theory should be considered. As shown in the above fig. 5 the maximum stress occurred is indicated by red colour i.e. 3.522e^+07 and the blue indicates minimum stress occurred i.e. 2.589^-01.

Table 5. Resultant Displacement

Name	Type	Min	Max
Displacement	**Resultant Displacement**	**0.000e+00 mm** **Node: 2375**	**3.569e-02 mm** **Node: 15827**

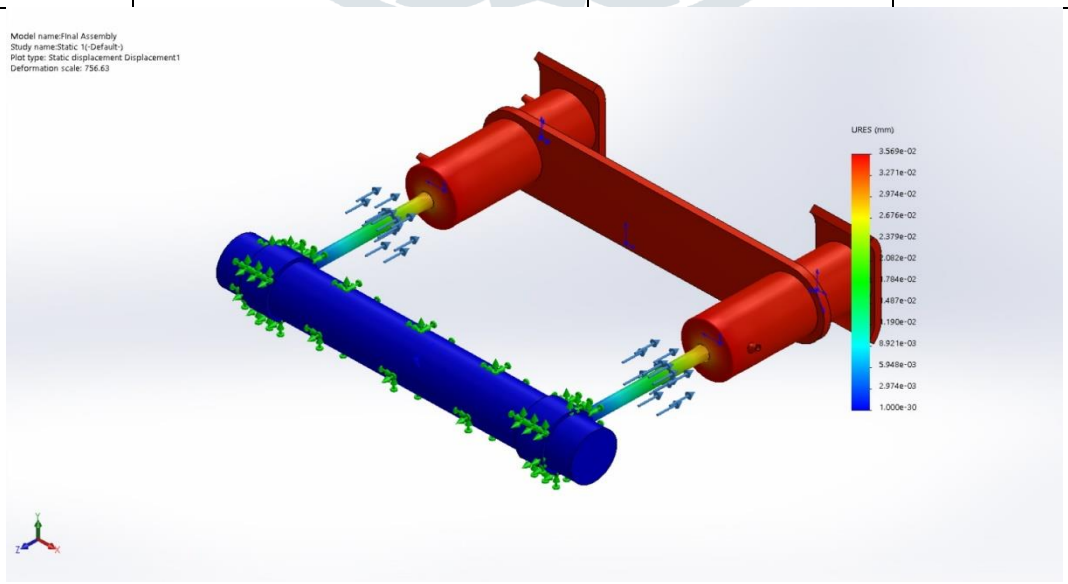


Figure 5. Final Assembly-Static Displacement

Figure 5 shows the static displacement analysis use to identify the dynamic loading. Since the load is applied slowly it's obvious the structure will deform slowly which means the inertia force will be small. If the dynamic loading takes place the structure will

vibrate and inertia force will be greater so it has to be taken in account. So thus the fig. 6 indicates that the maximum displacement occurs at the base of stand and the minimum displacement at the fix end.

Table 6. Equivalent strain

Name	Type	Min	Max
Strain	**Equivalent Strain**	**0.000e+00** **Element: 1118**	**4.053e-04** **Element: 11863**

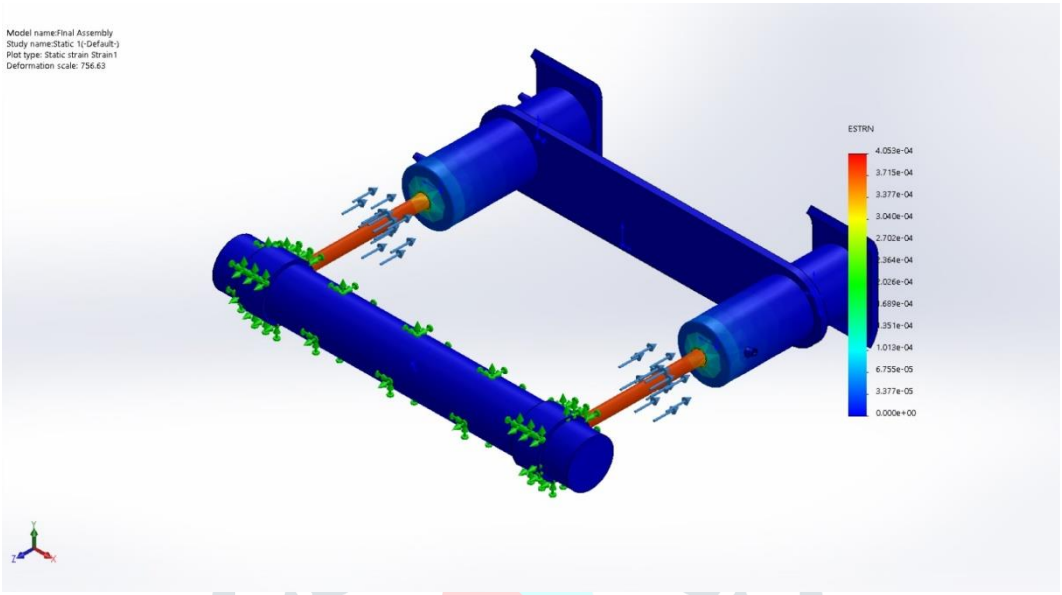


Figure 6. Final Assembly-Static Strain

In Figure 6 the static structural analysis determines the displacements, stresses, strains and forces in structure caused by loads that do not induce significant inertia and damping effects. Thus the red part in fig. 7 indicates the maximum deformation in response to applied force.

5. CONCLUSION

This project helps in reducing the painful task of applying the center stand (especially for ladies and old person) and also reduces the parking constraint. The equipment would provide best result just by actuating the center stand using linear actuator operated by compressor. Design and Analysis of standing device on the basis of ease of actuation point of view is successively done. And finally after the analysis we concluded that while the other traditional stand can lift around 1400 N load, our stand can lift 2300 N (2 persons seated) of load without failure

ACKNOWLEDGEMENTS

We remain immensely obliged to Prof. P.G.Rahate for providing us moral and technical support and guiding us. Also we would like to take this opportunity to thank and express our gratitude towards the Principal, H.O.D. & Teaching staff for their motivation and technical support for carrying out this work.

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