Published by :
http://www.ijert.org

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

Design and Fabrication of An Indian Army Vehicle

A Car for Warfare in Civil Area

Amritpal Singh[1]
Mechanical Engineer
SolidWorks Mechanical Design Associate

Rajinder Kumar[2]
Retired Group instructor
Industrial Training Institute Talwara

***Abstract*— The function of this car is to provide convenience to the soldiers in the civil war zone. Unlike other Army Vehicle, this car has broad tires which works well on road. The car has four forward gears and four reverse gears. So after firing on the target the driver has no need to waste the time in turning the vehicle. The differential is moving; between the forward and the reverse gear drive shafts. Hence provide convenience on the gear shifting. The car has chassis less construction, the body is directly mounted on the frame .the car body is made up of fiber glass, after designing a wireframe model in CATIA V5. The parts used in the car has been taken from the junkyard then flushed, cleaned, greased or oiled, fitted, painted and then assembled in the vehicle (modified if needed).**

Keywords*— Army Vehicle, Car, Fibre Glass Body ,moving differential, two seater, 350cc engine car.

I. INTRODUCTION (*Heading 1*)

Indian defense is currently at fourth position in the whole world, above are China, Russia and USA. Being a patriotic Engineer and a responsible citizen, I accept my country as my privilege. We should consider every aspect of the possibility of the warzone and should act accordingly. This car is specially designed and fabricated for defense norms and on the basis of civil warzone conditions. The body of the car is made up of fiberglass hence it is light weight and has 350cc Royale Enfield engine. Which results the vehicle to be fuel efficient. The vehicle is fully stable and the Authors wants to reflect this stability and strength from the name of the vehicle. Hence named as "Stallion".

II. OBJECTIVES

A. The Aim of the project is to Provide a low budget army vehicle for the civil area warfare.

Following are the main objectives of the projects.

- Making a moving differential.
- Making a fiberglass body from the wireframe model through clay modeling.
- Making a low weight, low budget, fuel efficient two seater car.
- Improved strength and stability.

III. PROBLEM DEFINITION

India was never been in war in the civil warzone, or in other words in metro cities where destruction of property should be minimized. I aspect if this happens the problem will be the destruction of the private property. So by using such a anti-tank vehicle which is using tires instead of chain will save the roads as much as possible. Another is that the car has broad tires hence results in maximum traction as compared to jeep which are narrow tires, resulting in lower traction.

IV. METHODOLOGY

To solve the problem mentioned above we have used the methodology. We have firstly manually draw sketches of the vehicle and then use them as blue prints in CATIA. Then converts the blueprints into wireframe model. On the other hand we bought some required suspension parts, transmission parts, tires, seat etc.

The complete list of parts is as following:-

Parts	Model Company	Specification
Engine	Royale Enfield 350cc	Old
Drive shaft		Manually
Driven shaft		Manually
Differential	Maruti 800	Old
Steering column	Maruti 800	Old
Steering wheel	Cielo	Old
Transmission	Enfield	Old
Steering rack	Lancer	Old
Wheel hub	Lancer	Old
Alloy wheel	Lancer	Old
Seats 2	Safari	Old
Seat cover	Safari	New
Tire	Lancer	Old
Lock set	Maruti 800	New
Horn	Maruti 800	New
Spark plug		New
HT Coil	Enfield	New
Transmission shafts 2	Maruti 800	Old
Rear transmission assembly	Maruti 800	Old
ABC pedals	Maruti 800	Old
Brake oil	Maruti 800	Old
Clutch wire	Enfield	New
Acceleration wire	Enfield	New
Hand brake	Maruti 800	New
Hand brake lever	Maruti 800	Old
Shockers	Maruti 800	Old
Leaf springs	Maruti 800	Old
Dampers	Maruti 800	Old
Idler arm		Manually
Pitman arm 2	Maruti 800	Old
Wind shield	Tata sumo	Old
Dash board	Tata sumo	Old
Speedo meter	Enfield	New
Speedo meter wire	Enfield	New
Battery		New
Wiring and harness		Manually
Head lights	Maruti 800	Old
Head lamps	Maruti 800	New
Indicators	Maruti 800	New
Drive chain	Enfield	New
Fuel pump	Maruti 800	New
Fuel tank	Maruti 800	Old
Self-motor	Maruti 800	Old

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

Flywheel		Manually
Air filter		Manually
Alternator	Maruti 800	Old
Exhaust	Cielo	Old
Exhaust pipe	Enfield	New

We assembled the parts according to our design requirements. As all the parts are from junkyard so we need to re consider these parts before assembling them. Another thing which was necessary is the testing of each part and its repair, modification or the replacement of the parts accordingly. The specification of the vehicle is as following:→

Vehicle specification:

Front wheel track	59 inch
Rear wheel track	63 inch
Overall length	129 inch
Overall height	35 inch
Ground clearance	7inch
Turning radius	4.8mm
Wheel base	70inch
Total weight	547.36kg

As the ground clearence is too low and become 4 inch laden hence we have measured 10 local speed breakers and set the ground clearence accordingly.

V. INNOVATIVENESS AND TECHNOLOGIES

1. Retractable hard-top:

The stallion's retractable hard top can be opened and closed in few seconds. Due to its low weight, as its body is made up of fiberglass. Also fiber glass has its advantage over other body materials in stiffness.

We have used the approach of clay modeling to fabricate the fiber glass body. First of all we prepared te wireframe model and then create a cuboid of clay compound of the size 60*130*36 inch, and made a lift around it. For making a body design on it. We made a list of coordinates that we need to project on the blank of clay. After projecting these points we made lines joining these coordinates and then by joining these lines we made surface. Hence we shaped the outer surface of the body.
Next we extracted this surface by using fiberglass mold and finally made the car body out of these molds. The fiberglass body is then buffed, sanded, painted and polished. We used fixtures to mount the body on the frame.

2. Separate reverse gear modification:

One of the main challenge that we faced is the design and making of the gear box with four reverse as well as four forward gears. The gear shifting is connected to the royal Enfield engine which derives a sprocket and the transmission of power to the tires is by the differential which has gear on it.

So we prepared an assembly containing a moving differential between the reverse and forward gear drives.

3. 350cc engine 12 hp , single piston:

Now why we tell this vehicle is light weight and fuel efficient. One of the reason for its light weight is the light weight engine used which has single cylinder in it. On the other hand its fuel efficiency is quite based upon the engine which is 350cc Royale Enfield Engine, and it uses Petrol as its working medium. The engine has good torque and carrying capacity, and gives good efficiency.

4. Modified flywheel for single cylinder:

Here we are using a single cylinder engine hence we need a flywheel accordingly. The maruti 800 has 3 cylinders but our requirement of the single cylinder according to the bore and length of stroke. So we turned the flywheel on lathe of maruti 800 to the desired mass. Hence it coordinates well with the engine.

5. Shaft coupling:

Another challenge that we faced is the coupling of the engine crank shaft with the modified maruti 800 flywheel by using high carbon steel blank we turned the coupling between the two parts.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016

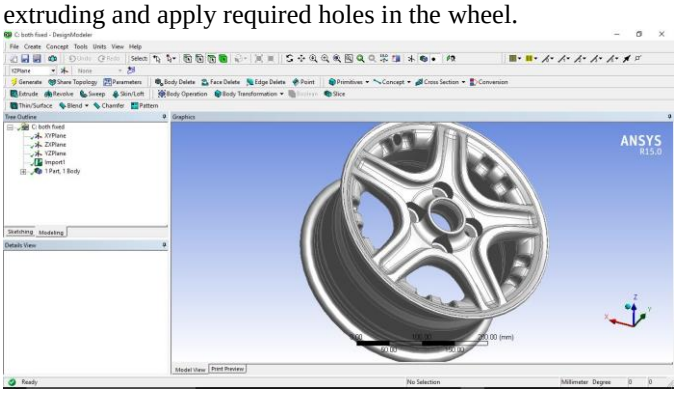
VI. ANALYSIS

1. *Alloy Wheel:*

The modelling is done in CATIA using reverse engineering.

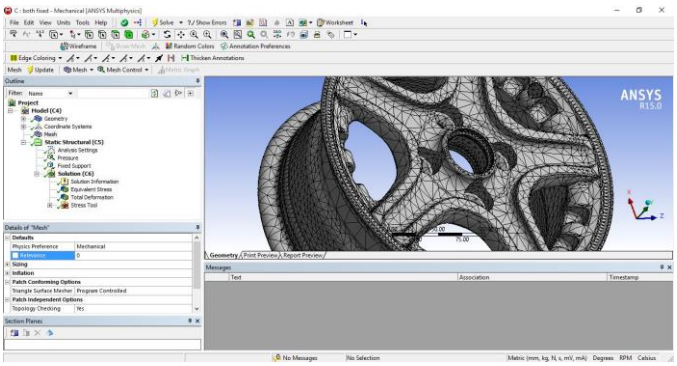
1.1. Modelling:

We prepared a sketch and then by applying shaft command made a schematic rim, after this we made the cutting, extruding and apply required holes in the wheel.



1.2. Meshing:

We meshed the model in tetrahedron mesh with 10 nodes and the elements were 208273 & have 347677 number of nodes.

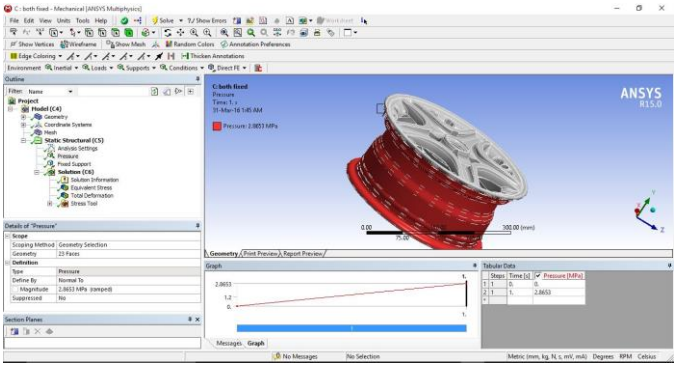


1.3. Boundary condition:

We fixed the wheel from its bolt holes and then apply cylindrical support to it.

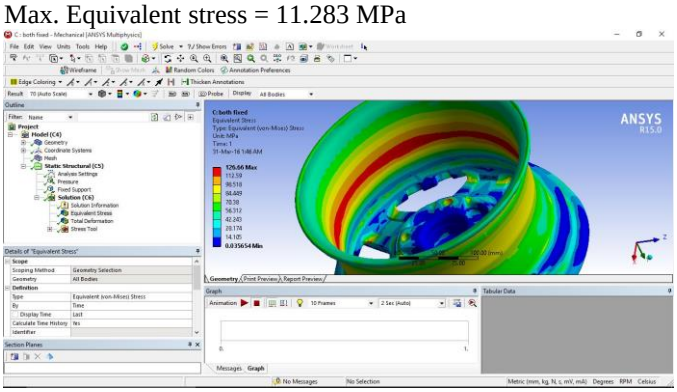
1.4. Loading condition:

The application of 200kPa of pressure is applied on the inner circumference area of the rim.



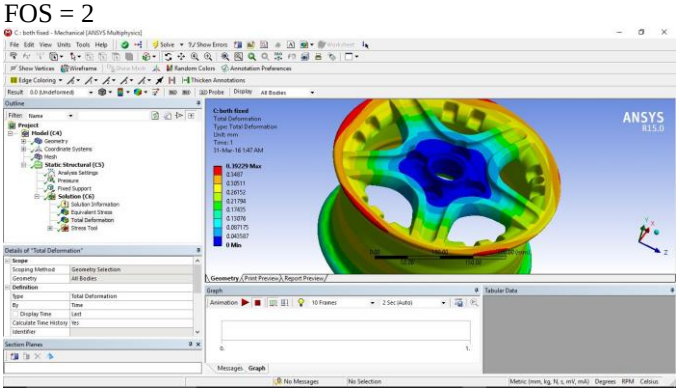
1.5. Results:

Max. Equivalent stress = 11.283 MPa



Max. Deformation = 0.033487 mm

FOS = 2



2. *Flywheel:*

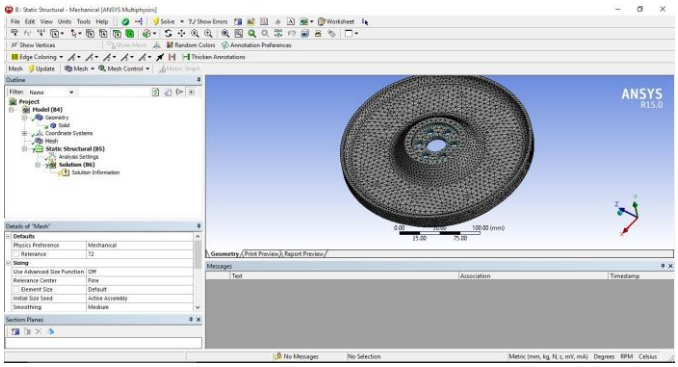
2.1. Modelling:

The modelling is done in CATIA using reverse engineering. We prepared a sketch and then by applying shaft command made the rim. After this we made some extrusion, holes in the rim.

2.2. Meshing:

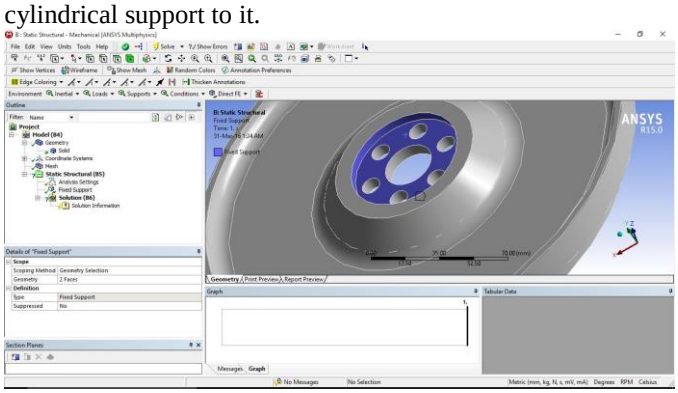
We meshed the model in tetrahedron mesh with 12 nodes and the elements were 185473 and have 286524 no of nodes.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 5 Issue 04, April-2016



2.3. Boundary condition:

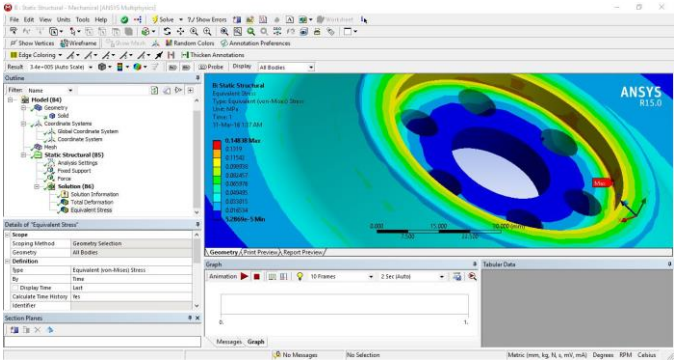
We fixed the flywheel from its 6 bolt holes and then apply cylindrical support to it.



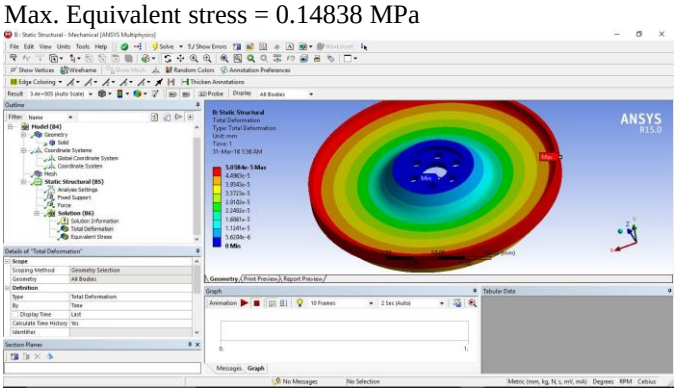
2.4. Loading condition:

The application of 20N force is applied on the circumference of the rim.

2.5. Result:



Max. Equivalent stress = 0.14838 MPa



Max. Deformation = 5*10^-5 mm

REFERENCES

[1] P. Meghashyam, S. Girivardhan Naidu and N. Sayed Baba (2013), "Design and Analysis of wheel Rim using CATIA and ANSYS", " International journal of Application or Innovation Engineering and Management (IJAIEM), Volume 2, Issue 8, ISSN 2319-4847.