DESIGN AND ANALYSIS OF GO KART CHASSIS

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Abstract

This paper concentrates on explaining the design and engineering aspects of making a go kart for students kart design .This paper aims to design analysis of a go kart chassis. The main intension is to do design and static analysis of go kart chassis. The maximum deflection is obtain by analysis. The go kart chassis are different from the chassis of ordinary vehicle

The paper highlight the material use and structural formation of the chassis. The strength of material, rigidity of structure and energy absorption of chassis discussed. The modeling and analysis are perform using 3d software such as solid works and ansys. The loads are applied to determine the changes occur in chassis.

Key Words: Design of chassis , anyss, the reaction on the chassis

I. INTRODUCTION:

A Go-Kart is a very basic 4 wheel vehicle without suspension and differential having very less ground clearance. All the basic and main parts are same as the actual vehicle, but rather than bodyworks bumpers are provided to secured it from the accidents.

Go –Karting is now very trending competition for the interested ones in automobile sector and also for those who are love to drive.

Objective: Following are the objectives of the paper.

1. To determine the optimum material for the chassis.
2. To manufacture and fabricate the appropriate chassis.
3. To rectify the maximum stress areas.

II. CHASSIS

The chassis of go-kart is a skeleton frame made up of pipes and other materials of various cross sections. The chassis of go-kart must consist of stability, torsional rigidity, as well as it should have relatively high degree of flexibility as there is no suspension. It can also adequate strength to sustain load of operator and other accessories. The chassis is design by convenience and safety for operator. The chassis was designed for a safe ride and the load is applied on it without compromising the structural strength.

A. Be aware that you want a strong but light frame. We suggest 2.7mm thick tubing, either square or round (or both) depending on preference. The bending operation of the material used should be easier. By adding filler material to the notched area during welding operation strength of frame can be increase. Circular cross-section is employed for the chassis development as it helps to overcome difficulties as increment in dimension, rise in the overall weight and decrease in performance due to reduction in acceleration. Circular section is always a preferred over other cross section become it resist the twisting effects. Circular section is selected for torsional rigidity.

III. Chassis Dimensions

Chassis Seamless tube AISI 4130

Wheelbase 1092.2 mm =43 inches

Overall length of vehicle 1803.4 mm= 71 inches

Track Width :-Front :-1041.4mm=41 inches

Rear :-1054.1mm=41.5 inches

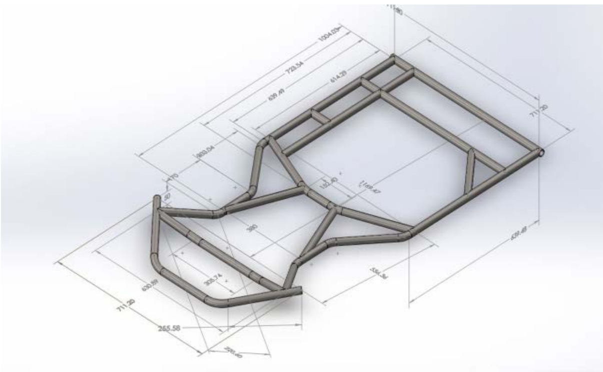

Figure I. Chassis

IV. Material and Methodology

The selection of material was a tedious task for us as it had many constraints of weight, structural resilience towards various types of forces, torsional rigidity, factor of safety under application of various loads and also market availability with pricing and cost constraints.

The roll cage that was designed by the design team was analyzed after application of various loads as calculated by the legitimate procedures and mathematical calculations based on physical theories The amount of carbon in steel is important to determine the strength, hardness, and providing desired strength, endurance, safety and reliability of the vehicle. The material used for chassis are various grades of steel or aluminum alloys. The main component of steel is carbon which increases the hardness of material of chassis. Aluminum alloy is expensive than steel so mainly steel is used to constructs the chassis. The chassis is made up of AISI-4130 which is a medium carbon steel.

Property of material	AISI 1018	AISI 4130	AISI 1030
Tensile strength, ultimate	440MPa	560MPa	525MPa
Tensile strength, yield	370MPa	460MPa	440MPa
Modulus of elasticity	205GPa	190-210GPa	190-210GPa
Bulk modulus (typical for steel)	140GPa	140GPa	140GPa
Shear modulus (typical for steel)	80.0GPa	80.0GPa	80.0GPa
Poisson's ratio	0.290	0.27-0.30	0.27-0.30
Elongation at break (in 50 mm)	15.0%	21.50%	12%
Reduction of area	14.0%	59.6%	35%
Hardness, Brinell	126	217	149
Machinability (based on AISI 1212 steel. as 100 machinability)	70%	70%	70%

Figure no. II property of material

V. Finite Element Analysis (FEA)

Finite element analysis (FEA) is a computerized method for predicting how a product reacts to real-world forces, vibration, and other physical effects. Finite element analysis shows whether a product will break, wear out, or work the way it was designed. Here we divide the roll cage into small sizes known as element and collective elements on the model form a mesh.

The computer analyses the elements and shows us a collective result. The computer solves by the computational method provided. The material and structure of roll cage was finalized and then FEA was performed on it. It is tested whether the roll cage will be able to withstand torsion, impact.

he analysis was done in Ansys16.2

Material of the tubes is AISI 4130 with properties:

Syt = 610.528MPa

Sut = 664.996MPa

Following tests were performed on the chassis.

(i) Front impact (ii) Side impact (iii) Rear impact

I. Front impact test—In this test chassis is tested, when it strikes from Front.

- Mass of the vehicle with driver 150 Kg
- Velocity of vehicle is 20m/s
- Consider impact time is 0.13 sec

WD = ½ mv^2 = 1/2 *150*20^2

WD =30000.J

Calculating front impact force:

WD = (F* Displacement)

= F *(t*v)

30000 = F*0.13*20

F=11538 N

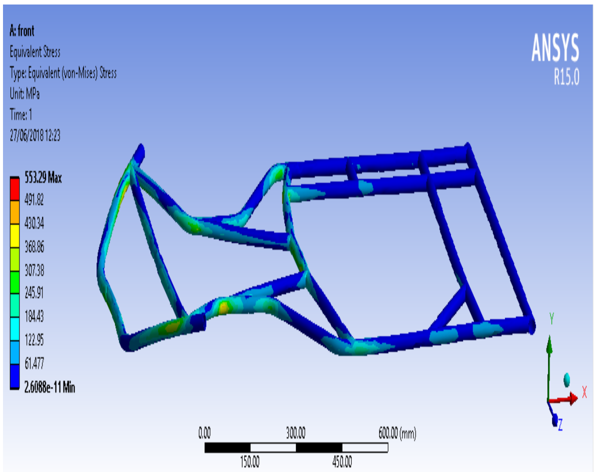

Figure III. Front Impact Stress

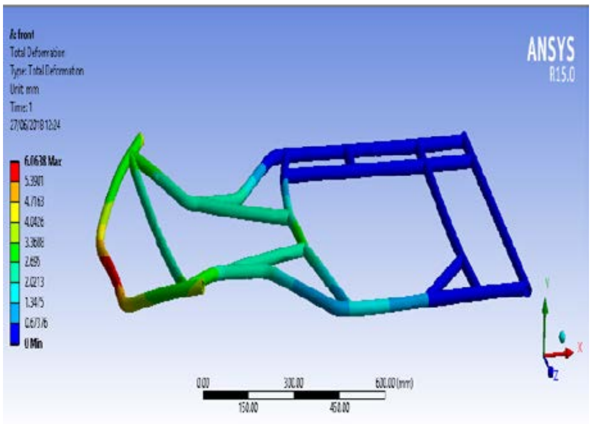

Figure IV. Front Impact Deformation

II. Side Impact Test—In this test chassis is tested, when it strikes from Side.

- Consider impact time is 0.3 sec

Calculating side impact force:

WD = (F* Displacement) = F *(t*v)

30000 = F*0.3*16

F=5000 N

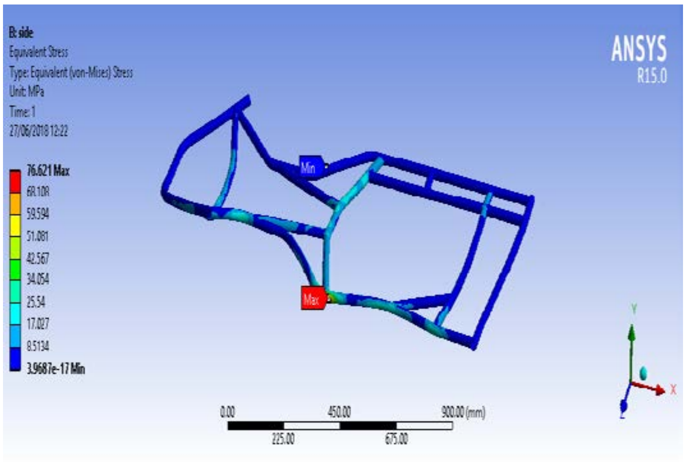

Figure V. Side Impact Stress

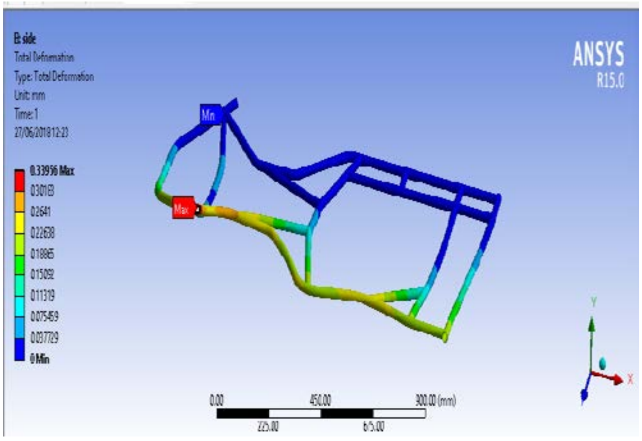

Figure VI. Side Impact Deformation

III. Rear impact test— In this test chassis is tested, when it strikes from Rear.

- Consider impact time is 0.13 sec

Calculating front impact force:

WD = (F* Displacement)

= F *(t*v)

21760 = F*0.13*16

F=11538N

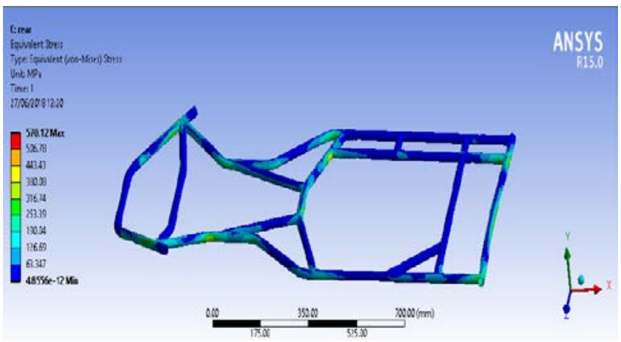

Figure VII. Rear Impact Stress

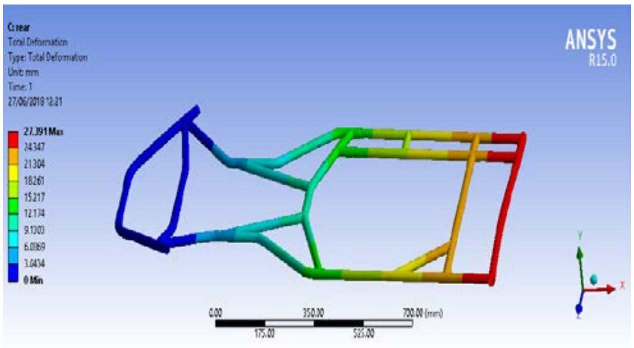

Figure VIII. Rear Impact Deformation

VI. CONCLUSION

In this way we design and analysis the chassis of Go-Kart with all the calculation is done. The Kart is design according to the specification used in standard go kart.

So a detailed study of various automotive systems is taken as per our approach. Thus, this report provides a clear insight in design and analysis of our vehicle.

VII. BIBLOGRAPHY

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