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Testing, Design & Analysis of Go-kart Chassis

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Abstract: ***Go-kart is a very small four wheeler vehicle and it is use for racing competition and it is very fan vehicle and also only for single seated .A Go-Kart is a small vehicle without suspension or differential. There are many motorsports in the world. Bikes, Cars, Formula one are examples of them. The go-kart chassis are different from chassis of ordinary cars on the road. This paper aims to do modeling the static analysis of go-kart chassis consisting of circular beams. Modeling and analysis are performed using 3-D modeling software i.e. CREO 3.0 &static analysis in ANSYS Workbench 16.2***
Keyword: Go kart, AISI 4130, CREO 3.0, Ansys workbench 16.2, Chassi

I. INTRODUCTION

The Go-Kart is a vehicle which is compact, simple, lightweight and easy to operate. Go-karts have 4 wheels and a small engine. Go-Kart vehicles are characterized by the absence of differential and suspensions systems . chassis is most important part of the go kart . In this paper we are analysis,Design and testing of go-kart chassis and there are three type of testing of chassis (1) practically on road (2) test by machine (3) virtually test by using software.

Fig:- 1 Go-kart

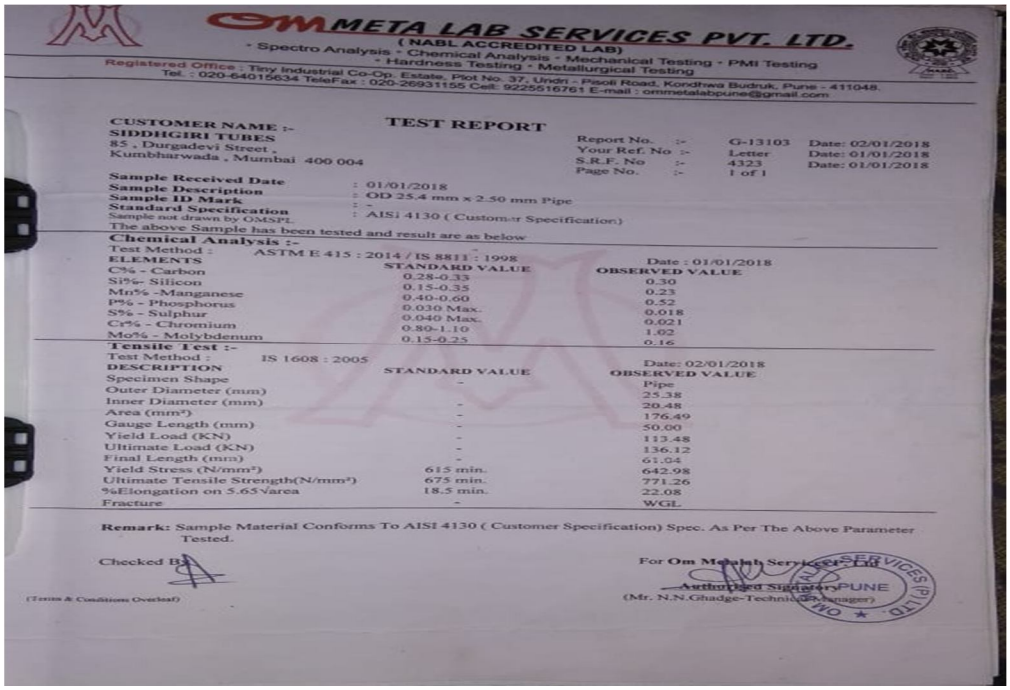
II. MATERIAL SELECTION

The selection of material was a difficult task for us as it had many constraints of weight, structural resilience towards various types of forces, torsional rigidity, a factor of safety 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 chassis is made up of AISI-4130 which is a medium carbon steel. This material was selected due to its good Combination of all of the typical traits of Steel –, ductility high tensile strength, lightweight, better weld ability and comparative ease of machining.

A. Properties Of Chassis Material

Table.1

Sr. no	properties	AISI 4130
1	brinell hardness (bhn)	200 to 300
2	elongation at break (%)	18 to 26
3	shear strength (mpa)	350 to 640
4	tensile strength (mpa)	440 to 980
5	resilience (mj/m3)	120 to 180
6	fatigue strength (mpa)	320 to 660
7	thermal expansion (micrometer/mk)	13
8	strength to weight (bending points)	19 to 29
9	thermal shock resistance points	16 to 31
10	Carbon (%)	0.28 to 0.33
11	chromium (%)	0.8 to 1.1



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TEST REPORT

CUSTOMER NAME :-
SIDDHGIRI TUBES
85 , Durgadevi Street ,
Kumbharwada , Mumbai 400 004

Report No. :- G-13103 Date: 02/01/2018
Your Ref. No :- Letter Date: 01/01/2018
S.R.F. No :- 4323 Date: 01/01/2018
Page No. :- 1 of 1

Sample Received Date : 01/01/2018
Sample Description : OD 25.4 mm x 2.50 mm Pipe
Sample ID Mark : -
Standard Specification : AISi 4130 (Customer Specification)
Sample not drawn by OMSPL
The above Sample has been tested and result are as below

Chemical Analysis :-
Test Method : ASTM E 415 : 2014 / IS 8811 : 1998 Date : 01/01/2018

ELEMENTS	STANDARD VALUE	OBSERVED VALUE
C% - Carbon	0.28-0.33	0.30
Si%- Silicon	0.15-0.35	0.23
Mn% -Manganese	0.40-0.60	0.52
P% - Phosphorus	0.030 Max.	0.018
S% - Sulphur	0.040 Max.	0.021
Cr% - Chromium	0.80-1.10	1.02
Mo% - Molybdenum	0.15-0.25	0.16

Tensile Test :-
Test Method : IS 1608 : 2005 Date: 02/01/2018

DESCRIPTION	STANDARD VALUE	OBSERVED VALUE
Specimen Shape	-	Pipe
Outer Diameter (mm)	-	25.38
Inner Diameter (mm)	-	20.48
Area (mm²)	-	176.49
Gauge Length (mm)	-	50.00
Yield Load (KN)	-	113.48
Ultimate Load (KN)	-	136.12
Final Length (mm)	-	61.04
Yield Stress (N/mm²)	615 min.	642.98
Ultimate Tensile Strength(N/mm²)	675 min.	771.26
%Elongation on 5.65√area	18.5 min.	22.08
Fracture	-	WGL

Remark: Sample Material Conforms To AISI 4130 (Customer Specification) Spec. As Per The Above Parameter Tested.

Checked By

For Om Metalab Services Pvt. Ltd.

Authorised Signatory

(Mr. N.N.Ghadge-Technical Manager)

(Terms & Conditions Overleaf)

Fig. 2

III. DESIGN OF GEOMETRY OF CHASSIS

TABLE.2

Sr.no	Chassis material	Specifications
1.	Type (seam or seamless)	seamless
2.	Total length	1651 mm
3.	Total width	1143 mm
4.	Od & id	25.38 mm & 20.48 mm
5.	Chassis material	Aisi 4130
6.	weight	8.0569 kg

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IV. 2D & 3D MODELLING

A. *2-D model of chassis created by PTC CREO Parametric 3.0*

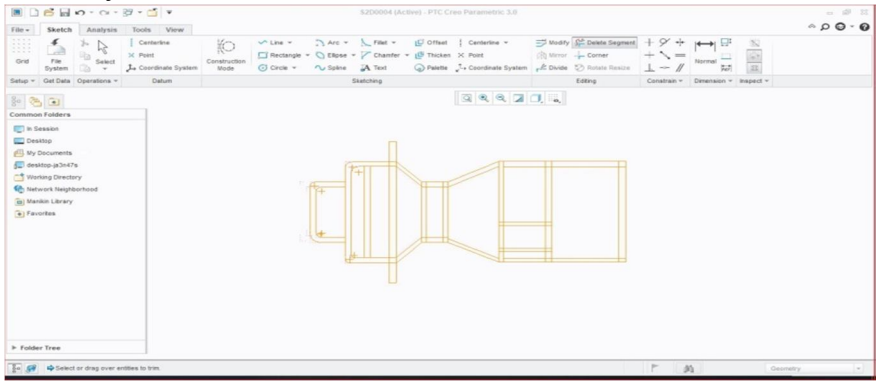

Fig.3 (2D model of chassis)

B. *3-D Model of Chassis Created by PTC CREO Parametric 3.0*

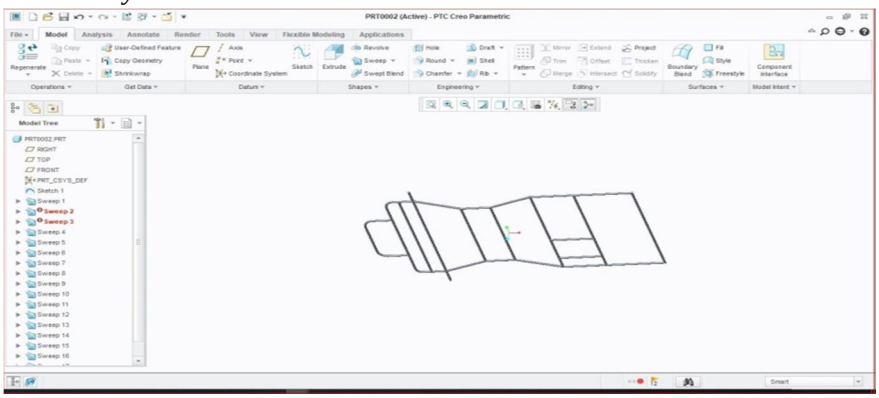

Fig. 4 (3D model of chassis)

V. ANALYSIS OF CHASSIS ON ANSYS WORKBENCH 16.2

A. *Front Impact*

For the front impact, engine and driver load was given at respective points. The kingpin mounting points and rear wheels position kept fixed. Front impact was calculated for an optimum speed of 65 kmph. From impulse momentum equation, 5g force has been calculated. The loads were applied only at front end of the chassis because application of forces at one end, while constraining the other, results in a more conservative approach of analysis. Time of impact considered is 0.2 seconds as per industrial standards

F x t = m x (Vi - Vf)

Fx0.5 =130x(18.05-0)

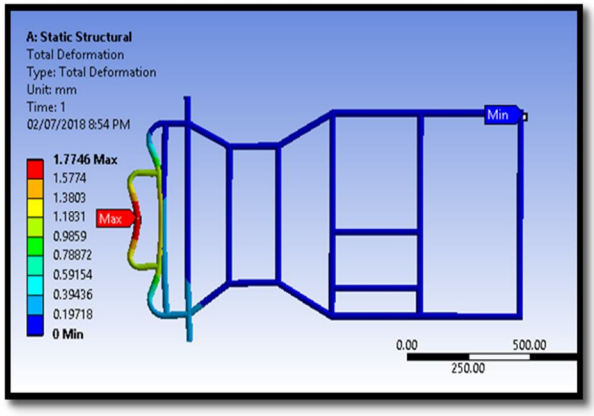

Fig . 5 (total deformation)

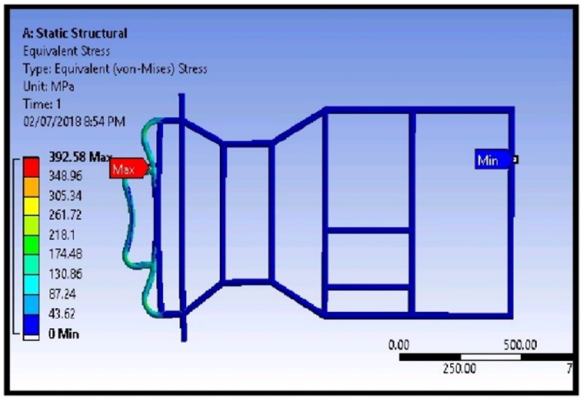

Fig.6 (Equivalent stress)

B. Rear Impact

Considering the worst case collision for rear impact, force is calculated as similar to front impact for speed of 65 kmph. The value of 5g force has been calculated. Load was applied at rear end of the chassis while constraining front end and king pin mounting points. Time of impact considered is 0.5 seconds as per industrial standards. F x t = m x (Vi-Vf)

Fx0.5= 130x(18.05-0) = F= 4.69 KN

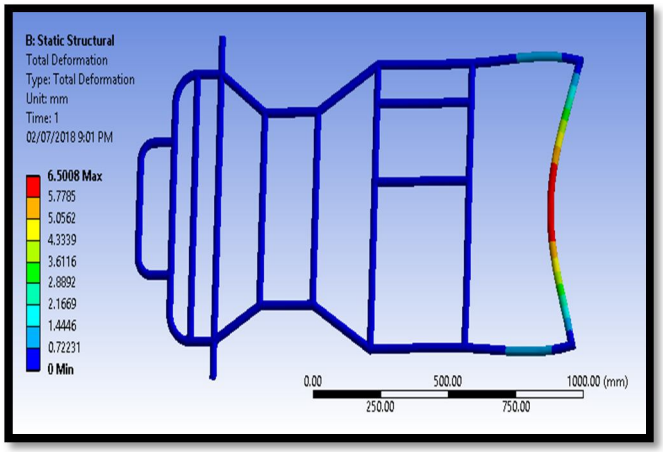

Fig.7 (total deformation)

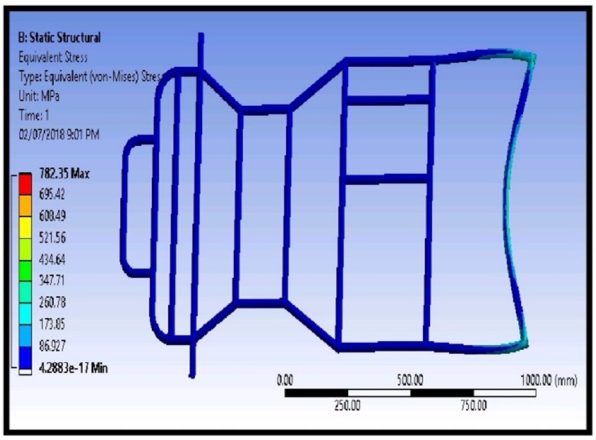

Fig .8 (equivalent stress)

C. Side Impact

The most probable condition of an impact from the side would be with the vehicle already in motion. So it was assumed that neither the vehicle would be a fixed object. For the side impact the velocity of vehicle is taken 65 kmph and time of impact considered is 0.5 seconds as per industrial standards. Impact force was applied by constraining left side of chassis and applying load equivalent to 2.5g force on the right side. F x t = m x (Vi-Vf)

Fx0.5=130x(18.05-0)*0.5

F=2.346 KN

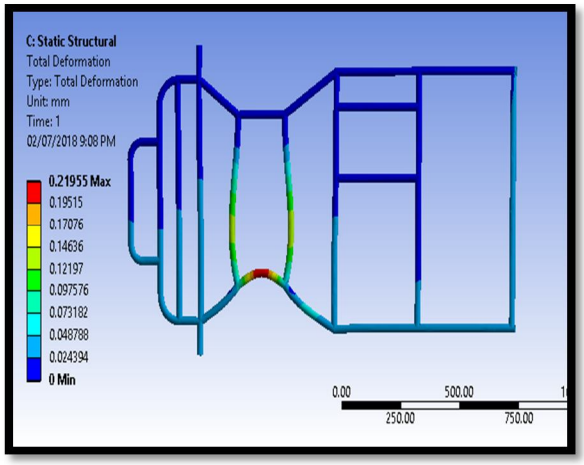

Fig. 8(Total Deformation)

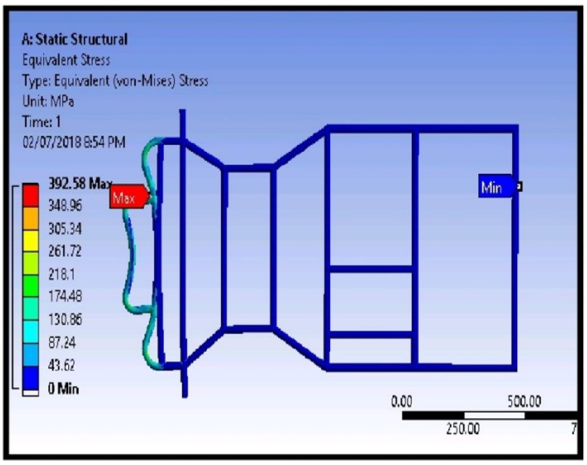

Fig.9 (Equivalent Stress)

VI. CONCLUSIONS

AISI 4130 is a better material in terms of reliability, hardeanabilty, strength, and better performance as campare to AISI 1018. It is used for large scale production in industries. we are making this chassis with help of CAD Software in the form of 2D and 3D model and successfully analysis was carried out on the chassis of CAD modal using ANSYS WORKBENCH 16.2 to determine equivalent stress and total deformation and also we test the chassis on road practically but deformation and stress cannot determine.

Chassis is most important part of the go kart without it we cannot make a go-kart and also chassis should be very high in quality and also used very good material. Only one drawback of AISI 4130 material is, it get very fast corrosion during contact of water.

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VII. ACKNOWLEDGMENT

Though perseverance and enthusiasm combined with effort in right direction can bring forth the thing called success, but the realization of the reality that the path toward success is full of myriads ,temptations, impediments and pitfalls often proves to be disheartening in such situation. It the able guidance of knowledgeable persons that steers one through difficulties and help them achieve success.

We highly obliged to express to deep sense of gratitude and grateful thanks to our project guide Prof. Dinesh yellure sir lecturer in Department of Mechanical engineering and Prof. Bhushan Mahajan the head of Mechanical engineering department for his valuable guidance and support which lead to the successful and timely completion of project work without it was very difficult task . We would also like to give my sincere thanks to Prof. B.R Choudhary Principal of J.D College of engineering and Management Nagpur for his valuable suggestions, constant encouragement and necessary help

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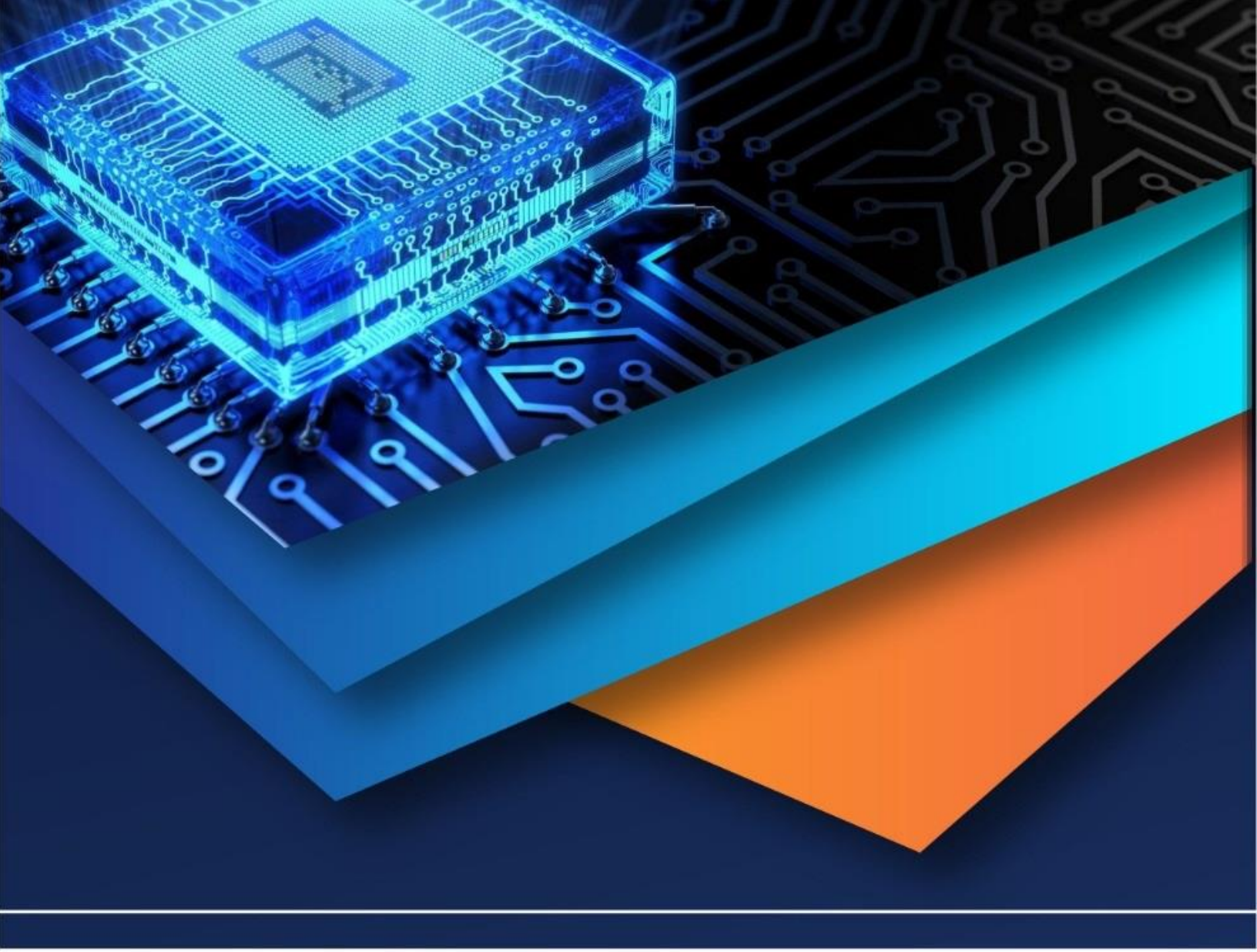

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