Journal of Advanced Research in Mechanical Engineering and Technology
Volume 5, Issue 3&4 - 2018, Pg. No. 1-3
Peer Reviewed Journal

Research Article

Design Development and Analysis of Various Component of Four Wheel Drive

AD Anjikar[1], Manthan Pachpor[2], Devesh Mate[3], Ankit Bhagat[4]

[1,2,3,4]Department of Mechanical Engineering, Priyadarshini Bhagwati College of Engineering, RTMNU University, Nagpur.

DOI: https://doi.org/10.24321/2454.8650.201803

Abstract

This paper concentrates on explaining the Design and Analysis aspects of making a Go Kart for Students Kart Design. This report explains objectives, assumptions and calculations made in designing of Go Kart.

Introduction

Go-kart is a simply four-wheeled, small engine, without roof, single sealed racing kart. They were initially created in 1950s. Art Ingles is generally accepted to be the father of karting.

A Go-kart by definition has no suspension and no differential they are usually raised on scaled down track but are some time driven as a entertainment or in sporting event.

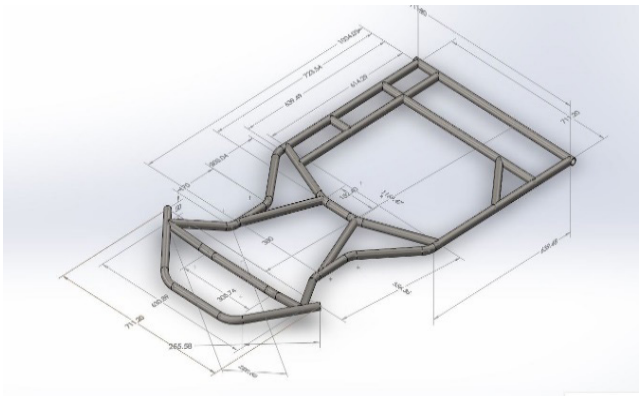
Frame Design

The design section of this report is divided into three major topics.

- The design objectives.
- Material selection.
- The Frame Finite element Analysis.

Components Dimensions

Components	Dimensions
Tie Rod	13 inch x φ0.47inch
King-Pin	3 inch x 0.314 inch φ
Bracket	2.4 inch x 2inch x 0.35 inch
Pit-man arm Bolt	8 mm φ
Steering shaft	20inch x 0.787inch φ
Steering wheel	12 inch φ



Corresponding Author: AD Anjikar, Department of Mechanical Engineering, Priyadarshini Bhagwati College of Engineering, RTMNU University, Nagpur.

E-mail Id: akshayanjikar@gmail.com

Orcid Id: https://orcid.org/0000-0003-2564-4550

How to cite this article: Anjikar AD, Pachpor M, Mate D et al. Design Development and Analysis of Various Component of Four Wheel Drive. *J Adv Res Mech Engi Tech* 2018; 5(3&4): 1-3.

Copyright (c) 2018 Journal of Advanced Research in Mechanical Engineering and Technology (ISSN: 2454-8650)

Design Components:

- Chassis

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

- Engine

Engine Technology	Single cylinder 4stroke air cooled SI Engine
Maximum Power	11 Hp
Gross Torque	11N-m
Bore*Stroke	52.4*57.8
Displacement	124.7cc

- Steering

Mechanical linkage

Wheels and Tyres

Front :-10*4.5*5

Rear :-11*7.1*5

- Brakes

Hydraulic disc brake Rear

Transmission	Multiplate clutch
Mass Of The Vehicle	150kg approx. (including driver)
Ground Clearance	2 Inch from bottom most part

Material selection:

1-inch diameter tube with a wall of thickness of 2mm is used. The required Properties were satisfied for the material Dimensions taken.

The various physical properties of the material are as follows.

Sr. No.	Properties	Values
1	Ultimate Tensile Strength	664.996Mpa
2	Yield Tensile Strength	610.528Mpa
3	Yield Bulk Modulus	140Gpa
4	Shear Modulus	80 Gpa
5	Modulus Of Elasticity	200 Gpa
6	Poisson's Ratio	0.3
7	%of Elongation	29.5 %

The chemical composition of the material is as:

The above mentioned properties satisfy the technical requirements of material which should be use in a frame.

Carbon	C	0.234%
Silicon	Si	0.253%
Manganese	Mn	0.536%
Phosphorus	P	0.013%
Chromium	Cr	0.926%
Molybdenum	Mo	0.178%
Aluminum	Al	0.015%
Titanium	Ti	0.005%

The Finite Element Analysis

Material of the tubes is AISI 4130 with properties:

Syt = 610.528MPa

Sut = 664.996MPa

The following tests were used to check the design by using ANSYS 15.0

1. Front impact test
2. Side impact test
3. Rear impact test

Front impact test:

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

- Mass of the vehicle with driver 170 Kg
- Velocity of vehicle is 16 m/s
- Consider impact time is 0.13 sec

$WD = ½ mv^2$

$WD = 1/2 *170*16^2$

WD = 21760 J

Calculating front impact force:

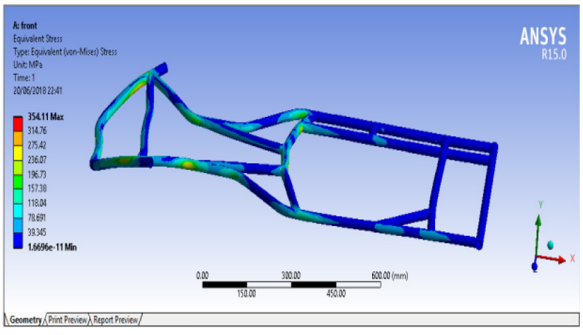
WD = (F* Displacement)

WD = F *(t*v)

21760 = F*0.13*16

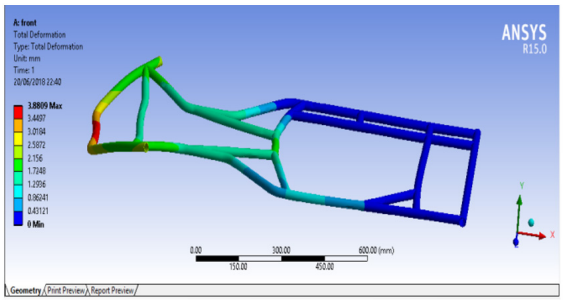
F = 10461.538 N

Front Equivalent Stress



ISSN: 2454-8650
DOI: https://doi.org/10.24321/2454.8650.201803

Front Deformation Stress



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:

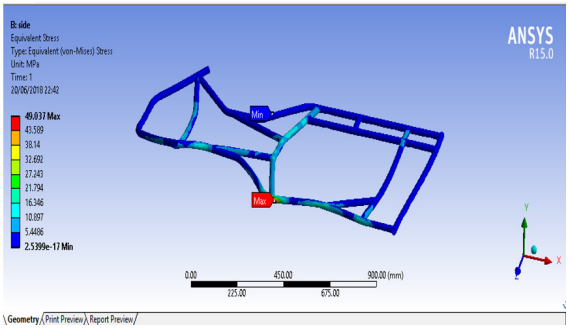
WD = (F* Displacement)

= F *(t*v)

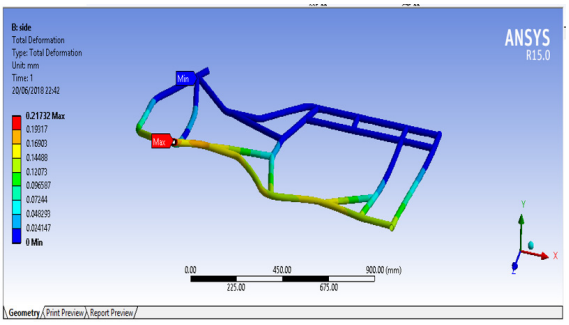
21760 = F*0.3*16^2

F = 4533.33 N

Side Equivalent Stress



Side Total Deformation



Test	Total Force Applied (N)	Max. Deformation (Mm)	Safety Factor Min.
Front Impact	10461.53	3.889	1087
Side Impact	4533.33	2	1.9
Rear Impact	11538	17.53	1.82

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:

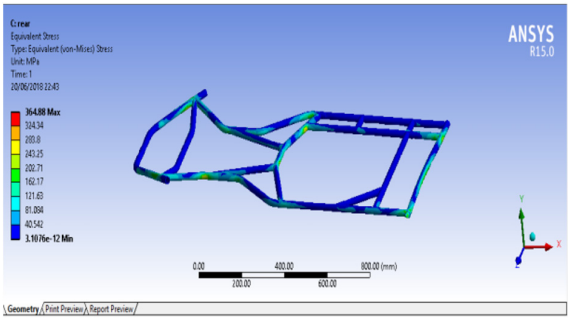
WD = (F*Displacement)

WD = F *(t*v)

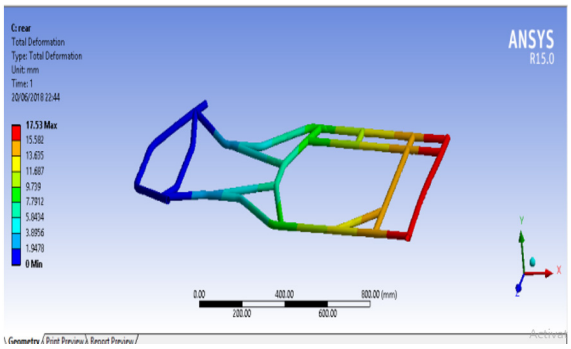
21760 = F*0.13*16

F=11538N

Rear Equivalent Stress



Rear Total Defoemation



Conclusion

In this way Design and Analysis of Go-Kart Chassis with is done. The Kart is manufactured according to the specification mentioned by the Student Kart Design in their rule book.

Referecnces

1. Automobile Engineering, By Kripal Singh
2. Machine Design, By R.S.Khurmi
3. Machine Design, By Shigley
4. Race car vehicle dynamics, By Milliken & Milliken
5. Vehicle Dynamics, By Thomas Gillespi.

Date of Submission: 2018-11-29

Date of Acceptance: 2018-12-14