WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Design and Analysis of Go Kart Chassis

[1]Dushyant Panchal, [2]Ankit Sharma

[1]Scholar, Department of Mechanical Engineering, Arya Institute of Engineering and Technology, Jaipur, India.
[2]Project Guide, Department of Mechanical Engineering, Arya Institute of Engineering and Technology, Jaipur, India

ABSTRACT

This chassis is designed for the purpose of go-kart and the go-kart is a self-propelled vehicle which is used for as sportvehicle. This is a four wheeled vehicle without any suspension and differential. The main objective of the chassis design is to make a kart which is light weight, easily driven, durable as well as cost friendly. The principle of theGo-kart chassis is used to make sure that the chassis is extremely rigid and provides safety for the driver in case of an accident. The main motive of our design is driver safety. The chassis has been designed in such a way that it can carry up to 95th percentile male. Along with that vehicle reliability is not compromised in term of speed. Chassis is of a tubular cross section pipe, fabricated assembly of AISI 1020 grade which is low tensile carbon steel and a few other grades like AISI 1018. In this kart, we have used AISI 1020 class tube with 1 inch diameter and 2 mm wall thickness. Front, rear and side impact test is also simulated for the design to ensure the safety of the driver. Frame gussets are also added to the design in strategic locations in order to brace weak members or members that can experience high loading. Front and rear bumpers are also added in the chassis design to protect the vehicle in terms of front or rear impact.

Keywords— Chassisdesign,Ansys,Von Misses Stress, Impact Test.

1. Introduction

Chassis is a major component of a vehicle system. It consists of internal framework that supports man-made object. It is the underpart of the vehicle which consists of frame and running gear like engine, transmission system, suspension system etc. The automotive chassis is tasked with keeping all components together while driving and transferring vertical and lateral loads, caused by acceleration, on the chassis through suspension and wheels. The key to good chassis design is that further the mass is away from the neutral axis the more rigid it is.Chassis in one of the main components of the vehicle as the total weight of the vehicle should be beard by it. Due to this, chassis should have strength and stability to bear the required load.

This chassis is designed for the purpose of go-kart and the go-kart is a self-propelled vehicle which is used for as sport vehicle. This is a four wheeled vehicle without any suspension and differential. The main objective of the chassis design is to make a kart which is light weight, easily driven, durable as well as cost friendly. The principle of the Go-kart chassis is used to make sure that the chassis is extremely rigid and provides safety for the driver in case of an accident. The main motive of our design is driver safety.

This project is aimed to be model and perform the dynamic analysis of the go-kart chassis which is constructed with the circular cross section beams. Modelling and analysis are performed on ANSYS software. The chassis is designed in such a way that it requires less pipes and ability to withstand optimum loads applied on it.

2. Go-kart Chassis

2.1Types of Go-kart Chassis -

- Caged
- Open
- Offset
- Straight chassis

2.2 Chassis

Chassis is a frame made of hollow pipes and different materials are used of various cross-section. It should have high torsional rigidity and high degree of flexibility because the vehicle should be stable and should have high strength. High degree of flexibility will give enough strength to withhold or grub the different load applied on the vehicle as well as its different accessories. While designing the chassis different criteria and factors that should be considered are its safe ride, structural strength due to applied load and ergonomics. Selection of frame material While designing any chassis, strength and light weight are the basic consideration. So, material used in chassis is one of its important criteria. AISI 1020 is one of the suitable material for go-

kart chassis and it is used for medium carbon steel and having its high tensile strength and high machinability and offers good balance of toughness and ductility. The design of chassis was done in SOLIDWORKS software.

The chassis has the ability to carry and support the power train, power unit, running system, etc. the go-kart chassis has been classified into different types such as open, caged, straight, and offset.

- Open karts do not have chassis.
- Caged kart chassis surrounds the driver and have a roll cage which is mostly used in dirt tracks.
- Straight chassis is the commonly used and driver sits at the centre. This kind is used in sprintracing.

PARAMETERS	VALUE
Vehicle length	1568mm
Vehicle width	1388mm
Roll cage material	AISI 1020
Tube dimensions	OD- 25.4mm ID- 21.4mm

Table 1. Chassis Dimensions

Open chassis has been used for this go-kart and also for analysis process.

MATERIAL AND METHODOLOGY

The carbon content in the steel is very important to determine the hardness, strength, machining and weldability characteristics. Material selection for the chassis plays a vital role in building up of entire vehicle in providing reliability, safety and endurance. The steel which has carbon increases the hardness of the material. Another material like Aluminium alloy is expensive than steel, in that case steel is the most preferable material for fabricating the chassis.

MATERIAL USED AND ITS COMPOSITION

The chassis material is considered depending upon the various factors such as maximum load capacity, absorption force capacity, strength, rigidity. The material selected for the chassis building is AISI 1020. AISI 1020 is a mild/low carbon steel.

Tables:

Composition	Content (%)
Iron (Fe)	99.1 -99.5
Manganese (Mn)	0.3 – 0.6
Carbon (C)	0.18 -.0.23
Sulphur (S)	0 -0.05
Phosphorus (P)	0 -0.04

Table 2 AISI 1020 Chemical Composition

Properties	Specification (Units)
Base metal price	1.6% relative
Density	7.8 gm/cm3(490Ib/ft3)
Elastic (Young's, Tensile) Modulus	210 GPa (30x10E6 psi))
Elongation at break	18 -28 %
Specific Heat Capacity	450J/Kg-k
Tensile Strength	UTS 420 – 450 MPa (61 to 65x103 psi) Proof 230 – 370 MPa (33 to 54x103 psi)

Table 3 AISI 1020 Material Properties

MODELING OF CHASSIS

The modeling of the chassis is done in SOLIDWORKS software, designed according to the requirements. Then the design is imported into the ANSYS for further analysis.

Figure:

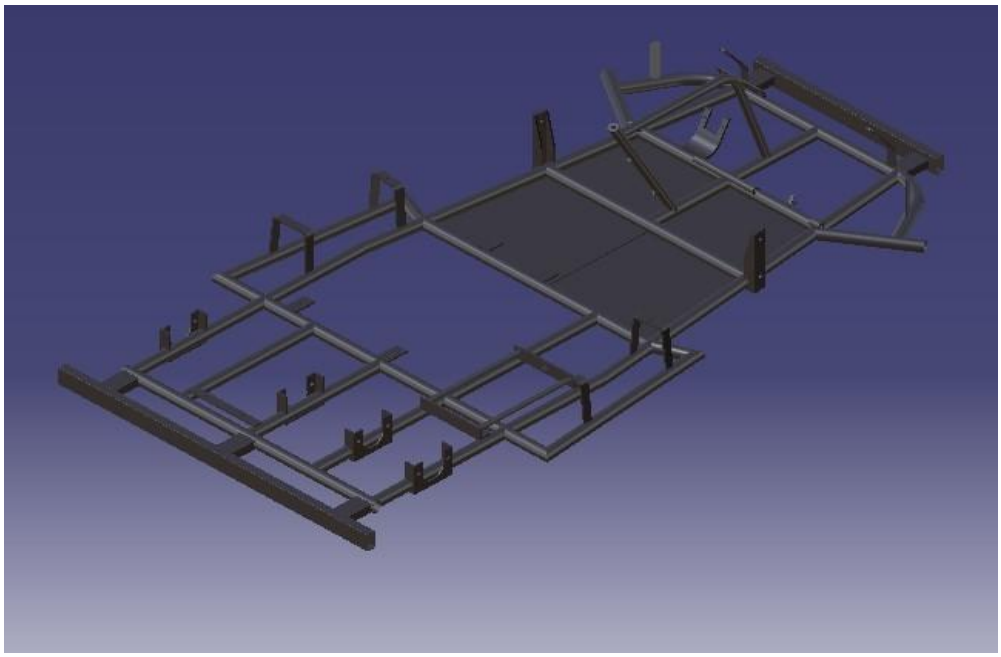

Fig.1 Design of chassis in SOLIDWORKS

ANALYSIS OF CHASSIS

The analysis of the chassis designed in SOLIDWORKS is analyzed using ANSYS software. With help of analysis, one can know the strength of the design and the load carrying capacity, stresses induced in the structure, torsional rigidity and also overall dynamic loads applied. Different loads are applied on each side of the chassis i.e on the front bumper, rear bumper and side bumper.

Figure:

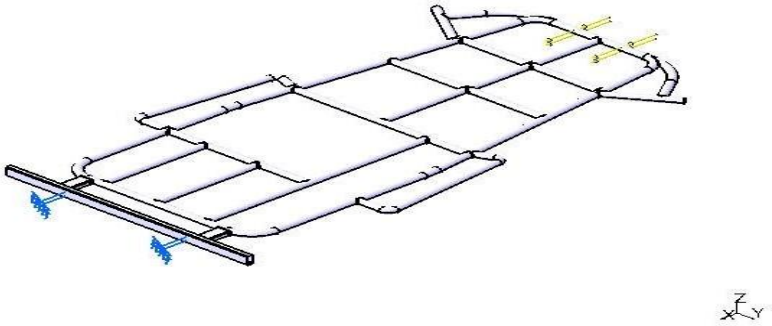

Fig.2 Front Impact Analysis

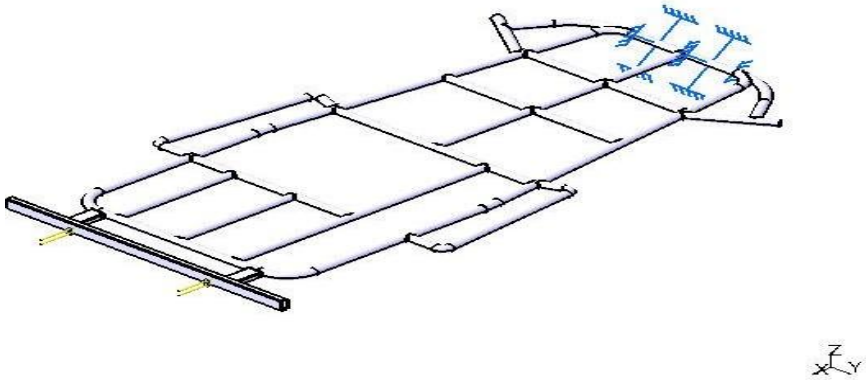

Fig.3 Rear Impact Analysis

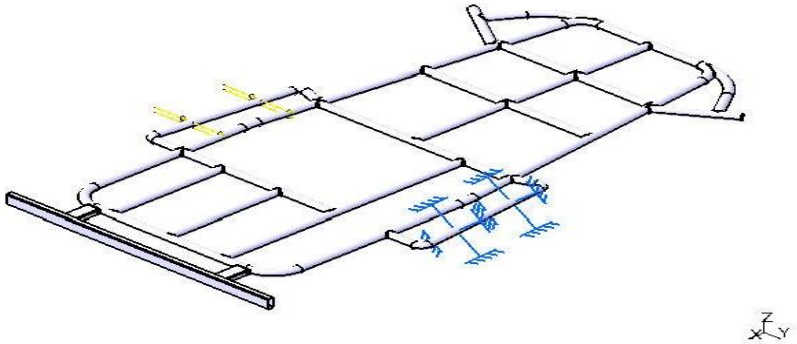

Fig.4 Left side Impact Analysis

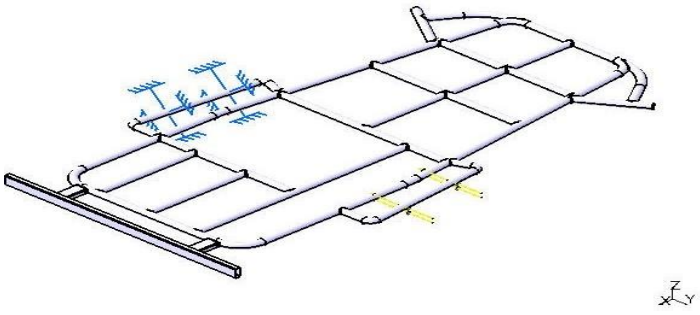

Fig.5 Right side Impact Analysis

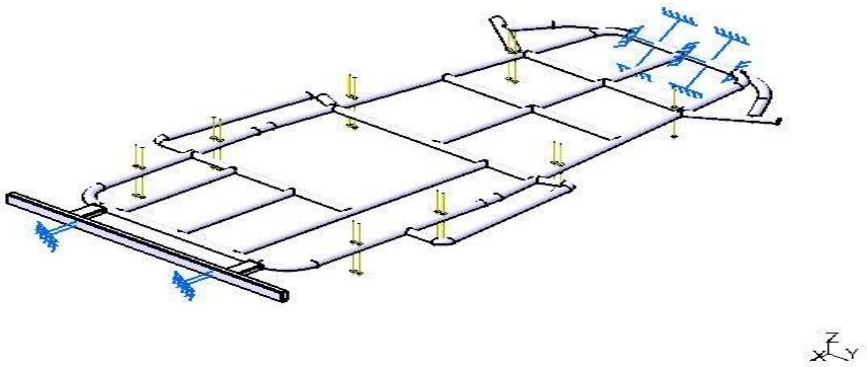

Fig.6 Static Analysis

Torsional load is also applied on the bumpers to test its rigidity level using ANSYS.

CONCLUSION

The designing of the chassis for Go-Kart helps in identifying the strength and weakness of the build and design. With the help of the analyses, it will be easy to modify the chassis to rectify the weak points and to strengthen it with slight modifications. It will be able to carry all the components such as power train, power unit, wheels, tyres and also it must have the capacity to carry a human weighing more than 70kg. And it is estimated that the overall weight is approximately 200 kg.

REFERENCE

- GKDC Rulebook 2015
- ISK Rulebook 2015
- Automotive Mechanics by Crouse Angeline Theory of machine by R.S. Khurmi
- DIY Gokarts Forum <http://www.diygokarts.com/>
- N. R. Patil et. al "Static Analysis Of Go-Kart Chassis Frame By Analytical And Solidworks Simulation", International Journal Of Scientific Engineering And Technology (ISSN: 2277-1581), Volume No.3 Issue No.5, Pp : 661-663 1 May2014.
- Sathish Kumar And Vignesh, "Design And Analysis Of An Electric Kart", International JournalOf Research In Engineering And Technology EISSN: 2319-1163 | PISSN:2321-7308
- Wegert Et. Al ,"Development And Assembly Of A Go-Kart Sized Fuel Cell Research Vehicle", F2008-Sc- 037, University of Applied Sciences Bingen,Germany.
- A.FaiezaEt.Al, "DesignAndFabricationOfAStudentCompetitionBasedRacingCar",Department Of Mechanical And Manufacturing Engineering, University, Putra Malaysia, 43400 UpmSerdang,Selangor, Malaysia, Accepted 6 May, 2009.
- Prabhudatta Das, "Design And Fabrication Of A Go-Kart Vehicle With Improved Suspension And Dynamics", Bits Pilani K K Birla, GoaCampus.
- Chaitanya Sharma, "Design And Fabrication Of Environment Friendly Kart", India International Journal Of Engineering Research And Applications ISSN: 2248-9622 International Conference On Emerging Trends In Mechanical And Electrical Engineering (13th-14th March2014)
- Chassis design by Herb Adams
- F.O.V.D. by Thomas D Gillespie