Development of Mini Racing Go-kart Vehicle

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ABSTRACT

A Go-kart is a small four wheeled vehicle. Go-kart, by definition, has no suspension and no differential. They are usually raced on scaled down tracks, but are sometimes driven as entertainment or as a hobby by non-professionals. 'Karting is commonly perceived as the stepping stone to the higher and more expensive ranks of motor sports. Kart racing is generally accepted as the most economic form of motor sport available. Kart racing is usually used as a low-cost and relatively safe way to introduce drivers to motor racing. Karting is considered as the first step in any serious racer's career. It can prepare the driver for highs-speed wheel-to-wheel racing by helping develop guide reflexes, Precision car control and decision making skills. In addition, it brings an awareness of the various parameters that can be altered to try to improve the competitiveness of the kart that also exist in other forms of motor racing. We have reviewed the data in various papers about go karts. In this paper we have focused on the working process in the development of a go kart. The work which is carried out , the systems which are used for the development of go kart is given in brief. The actual parameters which are taken or came to know after various calculations are also added in this paper.

Keyword : *Material selection, chassis design, steering system, transmission , engine, Solidworks*

1. INTRODUCTION

Go-kart is a simple self-propelled, lightweight and compact vehicle easy for operation. Due to low ground clearance, this type of vehicles are specifically designed and fabricated for racing. Its main parts are the chassis, axle, steering, engine, wheel, bumpers and tyres. As it is one of the racing vehicle, its ground clearance is low due to which no suspension system is placed. Its engine could be either two-stroke or four stroke engine. Chassis in one of the main component of this vehicle as the total weight of the vehicle should be beard by it. Due to this, chassis should have strength and stability.

Go-karting is adventurous and great sporting vehicle for the people who are interested in racing because of its low cost, simple construction and safer way of racing. Its racing track could be indoor or outdoor. Modelling and analysis are performed on Solidworks software. The chassis is designed in such a way that it requires less pipes and ability to withstand optimum loads applied on it. They are usually raced on almost any plain tracks with no pits and speed breakers. This is considered as the first vehicle for starting a career in racing field. A driver could easily

prepare for racing through this vehicle, wheel-to-wheel racing for high speed, precision control, impulsive racing skills and spontaneous decision-making skills. These vehicles, now called as "Go-Karts" had grown into a billions dollars industry in the USA and most of the developed countries in the world. They are made, sold, and used exclusively as recreational racers. However these vehicles are not designed for transportation and is considered illegal in most places to drive them on the road.

2. CAD Models

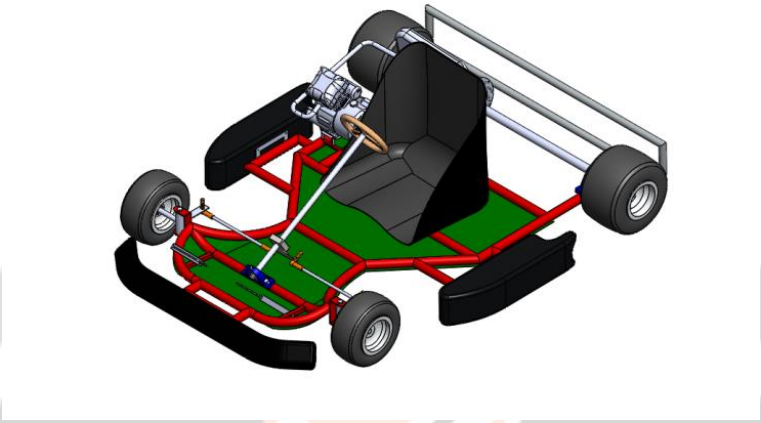

Fig 1: Isometric view

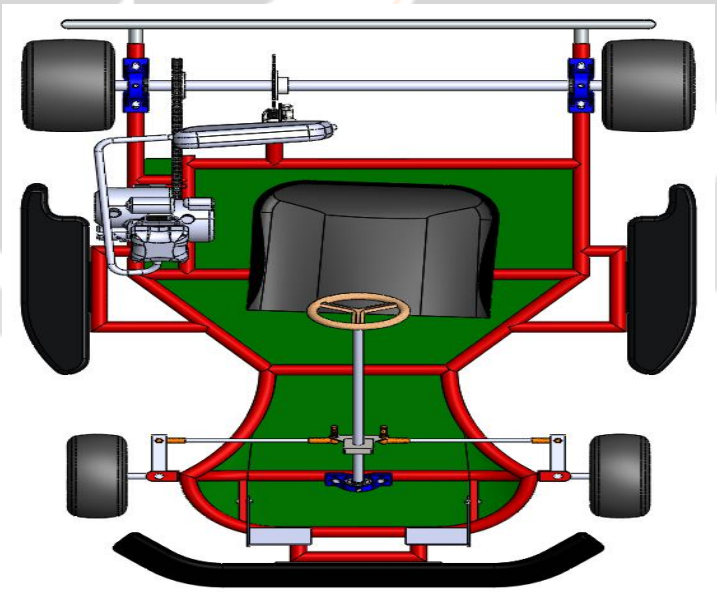

Fig 2: Top view

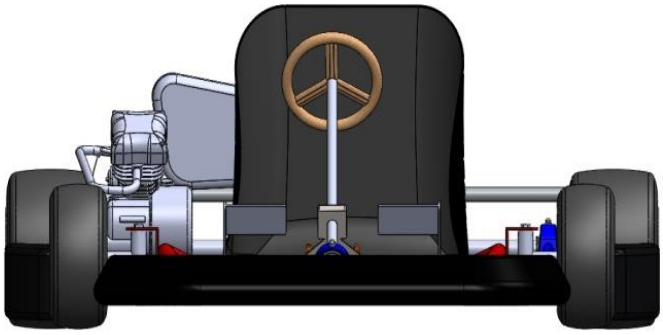

Fig 3: Front view

Fig 4: Side view

3. CHASSIS

A vehicle frame also known as chassis,is the main supporting structure of motor vehicle,to which all other components are attached , comparable to the skeleton of a organism. The load of the components of vehicle beared by the 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 1010 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 has high thermal conductivity and offers good balance of toughness and ductile

Table 1: Properties of SAE 1010

SR NO.	PROPERTIES	VALUES
1	Tensile Strength	365MPa
2	Yield Strength	305MPa
3	Bulk Modulus	140Gpa
4	Shear Modulus	80 Gpa
5	Young's Modulus	190 GPa
6	Poisson's Ratio	0.27-0.30

Table 2: Chassis Dimension

SR NO.	PARAMETERS	VALUES
1	length	1482mm
2	Wheel base	1180mm
3	Width	1020mm
4	Chassis material	SAE 1010
5	Tube dimension	31.75mm
6	Pipe thickness	1.5mm

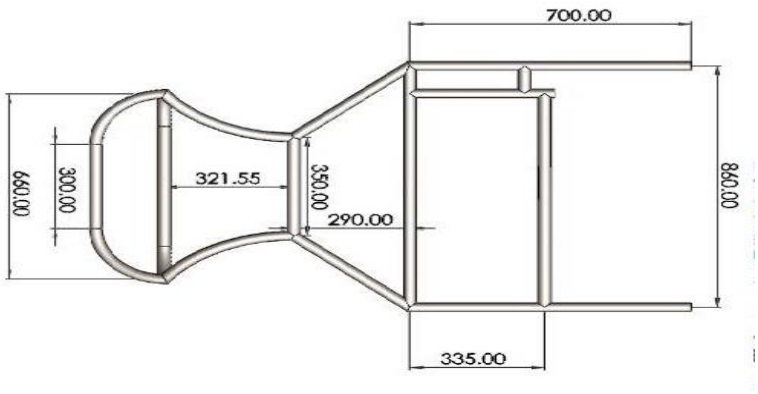

Fig 5- chassis with dimensions

4. Transmission system

A transmission is that which consists of power source and power transmission system, which provides control of the power. Often the term transmission refers simply to the gear box that uses gears and gear trains to provide speed and torque conversion from a rotating power source to another machine device. The transmission reduces the higher engine speed to the slower wheel speed, increasing torque in the process. Often, a transmission has multiple gear ratios with the ability to switch between them as speed varies. This switching may be done manually or automatically. The basic objective of the transmission assembly is to transmit the power from the engine to the wheels in a controlled manner.

In this Go-kart the transmission is carried out by using roller chain drive mechanism. There are several advantages of using roller chain drive as it contains number of rigid links which are together by pin joint in order to provide the necessary flexibility for warping round for driving and driven wheels. These wheel have projecting teeth of special profile and fit into the corresponding recesses in the link of the chain. The tooth wheel are known as sprocket wheels or simply sprockets. The sprockets and the chain are thus constraint to move together without slipping and ensures perfect velocity ratio .It gives a high transmission efficiency upto 98%. It also gives less load on shaft.

5. Engine:-

Go-kart can be run by both engine and motor. The Power is transmitted from the engine to the rear axle by way of a chain drive. An engine is a machine designed to convert one form of energy into mechanical energy. Heat engines burn a fuel to create heat, which is then used to create a force**.** Engine provides power to the kart. Go kart engine may be two stroke or a four stroke engine

A single cylinder four stroke 125cc engine is selected. So there should have number of option for the selection of engine such as Honda shine, Bajaj discover etc. After some research work and survey,It is decided to use Honda stunner 125cc engine to power a kart.It has inbuild gearbox of manual 5 speed constant mesh gearbox, with multiplate wet clutch. So the design is according to the engine Specification..

Table 3: Engine specifications

Components	Type
Displacement	125cc
Cylinder	1(single)
Maximum power	10bhp@8000rpm
Maximum torque	11Nm@6500rpm
Fuel Ignition system	Digital CDI
Cooling System	Air cooled
No. of gears	5
Transmission type	Chain drive
Valves per cylinder	2(inlet and outlet)

6. Steering system

Steering is the collection of components, linkages, etc. which allows any vehicle to follow the desired Path. The primary purpose of the steering system is to allow the driver to guide the vehicle. The most conventional steering arrangement is to turn the front wheels using a hand operated steering wheel which is positioned in front of the driver through the steering column, which may contain universal joints, to allow it to deviate somewhat from a straight line. Other arrangements are sometimes found on different types of vehicles, for example, a tiller or rear wheel steering.

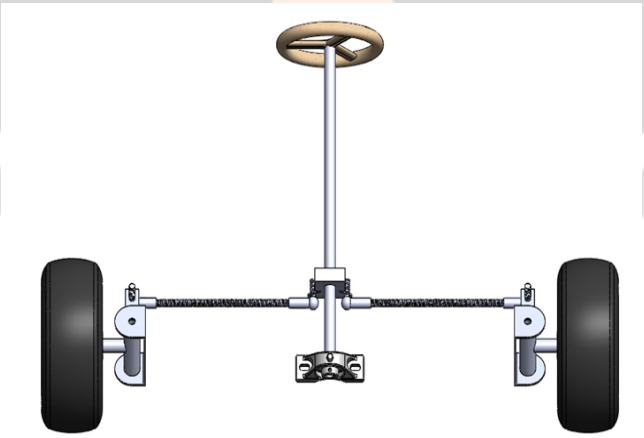

Fig 6: Steering system

The type of Steering system used is Ackerman steering system. Its mechanism is very simple and is implemented in maximum go kart vehicle. The Ackerman steering mechanism is a geometric arrangement of linkage in the steering of a vehicle designed to turn the inner and outer wheel at appropriate angle.

The Ackermann steering system also known as steering knuckles system is where the axles are mounted on knuckles out and away from the go kart. The wheels rotate vertically around these pivots, and tends the wheels to turn. There is a relationship in the wheels' movement to a turned centre. There is also a positioning system on the

steering knuckles which is very important for steering. The positioning system is more important when applied to heavier vehicles, For lighter vehicles, like go karts, the positioning is not as important. Some important values of our steering system are in the table below:

Table 4: Steering system specifications

Parameters	Values
Turning radius	2.7m
Length of tie rod	360mm
Kingpin Inclination	7^0 (positive)
Camber Angle	2^0(positive)
Castor angle	5^0 (positive)
Ackerman Angle	23.17^0
Steering rod length	630mm
Outer steering Angle	18.60^0
Inner steering Angle	25.31^0
Steering ratio	1.94

7. Braking system

A Brake is a device or a mechaism by means of which artificial frictional resistance is applied to a machine member in moving condition, in order to retard or stop the motion of machine. Brake are generally applied to rotating axle or wheel but may take also other forms such as surface of a moving fluid.

The main objective of braking system is to Decrease the speed of moving kart and to ensure safety of the driver. The efficieny of braking system depends on the time and distance taken after the application of brake, to bring the kart to rest from moving condition, the less will be the time the more will be the braking efficiency.

The Braking system type used is hydraulic disc braking system. The use of disc brake contributes for reduction in overall weight of the vehicle.The different brake components used in our Kart are as follows:

a) Disc brake :- Bajaj pulsar 220
b) Master cylinder :- KTM 200
c) Calliper :- Bajaj pulsar rear calliper

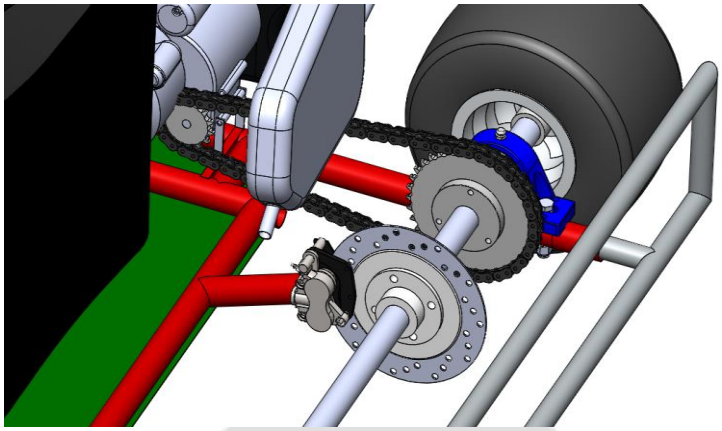

Fig 7: Braking system actual model

8. Future scope

In future gokart will develop by applying several advancements. Alternative Fuel like bio fuel which are cheaply available will be use as a replacement to petrol.Use of solar energy will be in great demand in future go kartsas it leads to less emission of carbon to the enviroment.

9. Conclusion

The basic need of Go-kart vehicle is less weight to strength ratio and less clearance . Keeping fabrication in the mind, we tried to make the design optimum and simple with high in strength and stability. Thus chassis has good strength against collisions from the front, rear as well as side. Hence we can conclude that the chassis design is safe and stable. The prior aim of the team was to build a go kart with minimum cost without compromising the safety and performance of the vehicle. The final result is a desired Go Kart design meeting all the above factors.

10. Reference

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