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Design and fabrication of transmission system of modern Mech tech GO-KART vehicle

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Abstract:

Now a day's people are running behind two things, one is mobility and another is of Automotive. The purpose of this project was to demonstrate their practical abilities to develop a "Mech Tech go-kart Transmission" by using the kind of material. Prior to that, studies and researches have been done with the purpose to understand the material. A Go-Cart also spelled as Go-Kart is a four wheeled vehicle designed and they are usually raced on scaled down tracks, but are sometimes driven as entertainment or as a hobby by non-professional. The design guidelines is based on the specifications set by the organizer.

Keywords: Conceptual design, Racing car, Static test

I.INTRODUCTION

A go-kart, it means a vehicle which has no suspension and no differential. Basically, it is perceived as a stepping stone for the higher and more expensive ranks of motorsports available. It is a small four-wheeler run by I.C Engine. Go-kart is a factory product and can be made by engineer student to built simple but innovative. We are self-fabricated in "Modern Mech Tech Go-kart Transmission" chassis formed by a rectangular bar, powered by HONDA ACTIVA 125cc engine fitted in mid of vehicle with disc brake. An engine will power there are wheel through a chain sprocket. There is no suspension, therefore, chassis have to be flexible enough to work as a suspension. Modeling, simulations are performed using modeling software. i.e. SOLIDWORKS, and analysis on ANSYS.

The design process of this single-person Go-kart is iterative and it is based on the several engineering processes. The design work is done by the best standardized as well as optimized design possible to meet international standards. Besides performance, consumer needs of serviceability, endurance ability and affordability were also kept in concern which we got to know through the market and internet research and reviews for go-kart vehicles. In this, there is no suspension system provided for the go-kart, so it becomes very complicated to the design such as flexible chassis,

which can be work as suspension during the turns. After the primary specifications were set 3-D software model is prepared in solid works software. Based on the result obtained from these tests the design is modified accordingly.

Design Considerations:

To fabricate the high performance modern mech tech Kart vehicle which will be safe by economical, environmentally by all means safety considerations following main parameters were set before the designing is carried out by our project,

- Driver Ergonomics.
- Serviceability and maintainability.
- Maneuverability.
- Use of optimum power efficiency.
- Cost of the components.

Student competition based on the product they designed and fabricated is a good activity carried out by students. One such example is Collegiate Design Series (CDS) where in these events the design competitions are organized to encourage engineering students to gain experience in the design, manufacture and testing of vehicles. Competitions such as like Formula SAE, have inoculated the student's experience in design and manufacture of vehicles.

Go-karts Launched In India:

Go-karts Launched in India since 2003 from MRF company, it has a 250cc two-stroke engine, which will produce up to 15 bhp of power,

which will cost near 3 lakhs. Indus motor s are also offering Go-karts for 2 lakhs to 3 lakh. There are many racing tracks in Nagpur for racing, which is known as the home of Go-karts.

Main parts of Our Project:

They are given below

- Chassis
- Engine
- Steering
- Transmission
- Tires
- Brake

II.LITERATURE REVIEW

[1] Alephs V. Mehta conducted experimental design and analysis of hybrid Go-Kart.to improve the mileage of the car using simple mild parallel hybrid technology.

[2] Govardhana Reddy conducted test the design of a go kart vehicle with the view point of objective is to design a safe and functional vehicle based on rigid and torsion free frame .

[3] Dr.D.Ravikanth conducted experimental design of a go-kart vehicle by explaining the design and engineering aspects of making a Go–Kart.

[4] G.RavindraLaxmanGaikwad conducted experimental design of Go-Kart vehicle system and they gives description of the design considerations, dynamic analysis of design of a Go-Kart vehicle.

[5] SandeepRamini conducted test in design and Structural Analysis of a Go-Kart Vehicle Chassis . They concluded the design they have performed various crash tests to find when our model fails.

III.OBJECTIVE

Almost similar to the original Go-kart, but in the project the main achievement is to make a moving vehicle is the help of Mid-engine.

A simple Go-kart will be recreated and will be provided with a more advanced safety system and accelerating technology to improve the kart's handling and performance.

The chassis is made of steel hollow tube. In this, there is no suspension but it has chassis which have to be more flexible enough to work as a suspension and stiff enough to not break or give way on a turn.

IV.METHODOLGY

1. Steel hollow circular shafts of different size are cut with different length.

2. Steel shafts are welded together with appropriate order so as to make a strong and stable chassis. A go kart has no suspension system, the frame needs to be very strong and reliable for cornering and handling shocks.

3. The type of chassis is an open type chassis, and a single seater with low ground clearance.

4. Engine is mounted on a rear end of the kart. It will power the rear wheel through a torque converter. Engine will power the rear wheel through a chain mechanism.

5. Dual disc brakes are installed on the rear wheel.

6. Tires and tubes of appropriate size are used for front and rear.

7. Rack and pinion type steering mechanism is installed.

V.PROCESS DESCRIPTION

A. SPROCKET:

Fig.1 chain sprocket

The sprocket is welded on the axle at required place.

B. BRAKE:

The Brake is also placed in the axle in left side. The boredom is connected to left pedal in front of kart.

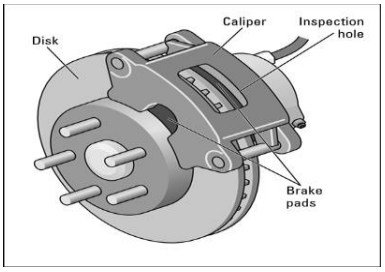

Fig.2 Disc Brake

C. ACCELERATOR:

The accelerator pedal is placed in the right side of the front of the kart and is connected to the engine.

D. ENGINE:

Fig.3 Engine

The engine is mounted in the mid of the chassis and the chain is connected to the sprocket and engine.

E. FUEL TANK:

The fuel tank which is placed in the upper position of the engine level using clamps and bolts.

Technical Specifications of a Go-kart:

Table 1:specification of brake

BRAKE	
Position	Single Rear
Type	Disc Brake
Brake diameter	110mm

Table 2:specification of sprocket

SPROCKET	
Type of material	MS
Outer radius	80mm
No.of Teeth	44

Table 3:specification of engine

ENGINE	
Position	Mid of chassis
Type	2 stroke petrol
Cooling system	Air cooling

Table 4:specification of fuel tank

Fuel Tank	
Material	Metal
Capacity	4 Lit

F. STEERING:

Fig 4.steering

The steering spindle and steering are made as per instructed dimensions and bolted together. This is connected to the plate and link mechanism. This mechanism is connected to the two front wheels.

G. SEAT:

The seat is mounted on seat stand using bolts and the seat is bolted on chassis.

H. STEERING SYSTEM:

The aim of our project steering is to ensure that the wheels are turning in the desired directions. In this process achieved by a series attached of linkages, rods, pivots, and gears etc., The pitman arm is a steering component in an automobile or truck. In our project is modernly fabricate the linkage is connected to wheel shaft.

I. DISC BRAKE:

The braking system has to provide enough braking force to completely lock the wheels at the end of a specified acceleration run, it also proved to be cost effective

- Master cylinder Dia. 10 mm
- Caliper piston diameter 25.4 mm
- Brake Pedal Lever ratio 4:1
- Stopping distance 2.237 m

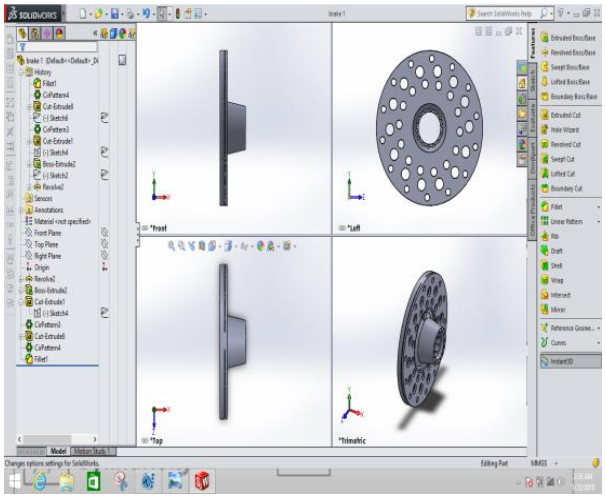

Fig 5.solid works diagram of disc brake

A brake is a device which is used to slowing or stopping the vehicle manually. Most commonly brakes use friction force between two surfaces pressed together to convert the kinetic energy of the moving object into heat, though other methods of energy conversion may be employed. "For example the regenerative braking converts the most of the energy to electrical energy, which may be stored for the later use."Brake is an important part of any vehicle as brakes are used to stop the vehicle. Go-kart having single rear axle which is used to transmit the power from engine to the wheel disc brake is directly mounted on the axle so that when brake pedals are applied, it compress against the rotor that connected to the wheel immediately and vehicle will come to rest position in less time and in less distance. But as there are some components of brake system are not possible to manufacture the area directly taken as original equipment manufacturer (OEM) like Disc, Caliper, Master cylinder and Fluid lines as stated in the following table.

PART	OEM	VALUE
Disc	Maruthi 800	200 mm dia
Caliper	Maruthi 800	29 mm dia
Master cylinder	Maruthi 800	25.4 mm dia

Assumptions Data:

We have to assume certain data or we can say, we have to estimate some required specification of our vehicle. Though, we cannot accurately guess or know weight ratio of vehicle, but since our Go-kart is rear drive and engine compartment is at mid of chassis, thus more amount static load will be at rear portion of Go-kart.

Pedal ratio – 3:1

Manual force applied – 80N

Weight transfer ratio – 40:60 at static condition

F1 – Force of master cylinder,

A1 – Area of master cylinder,

F2 – Force of caliper,

A2 – Area of caliper

F a = 80N

By considering pedal ratio

Fa x H = F1 x h

Fa x 3 = F1 x 1

F1 = 240N

By Pascal's Law,

F1 / A1 = F2 / A2

F2 = F1 / A1 x A2

$F2 = (240 \times 20.268 \times 10^{-4}) / 2.85 \times 10^{-4}$

F2 = 1706.78

By Newton's Law,

$F2 = m \times a_x$

$a_x = F2/m$

$= 1706.78/150$

$a_x = -11.38\ m/s^2$

Negative indicates retardation i.e. 1.16 g

Now,

By Newton Law,

V = u + at

V = 0 u = 45 kmph

= 12.5 m/s

t = -u/a

= -12.5/(-11.38)

Stopping time, t = 1.1 sec

Also, v2 = u2 + 2as

V=0,

s = -u2/2a

= -12.52/2 x(-11.38)

Stopping Distance, s = 6.86 m

Transmission:

Transmission means the total mechanism that transmits the power from the engine crankshaft to the rear wheels. In this vehicle, the power from the engine is transmitted to the sprocket by using chain, i.e. this is chain drive. The driver sprocket has 12 teeth and driven sprocket has 44 teeth. Usually, Go-kart has no differential. This Go-kart has no clutch and gears because this is automatic transmission Chain and sprocket type continuously variable transmission used in this kart. The power from the engine is transmitted to the rear wheels by using chain drive. We use chain drive because it is capable of taking shock loads.

Tires:

For Go-karts, wheels and tires are much smaller than those used on a normal car. The tires will increased grip and a hard one. And also it can withstand the high temperature. In this kart, we use tires having 10”dia for front and 10’dia for the rear. The tires must have a pressure of at least 18 psi.

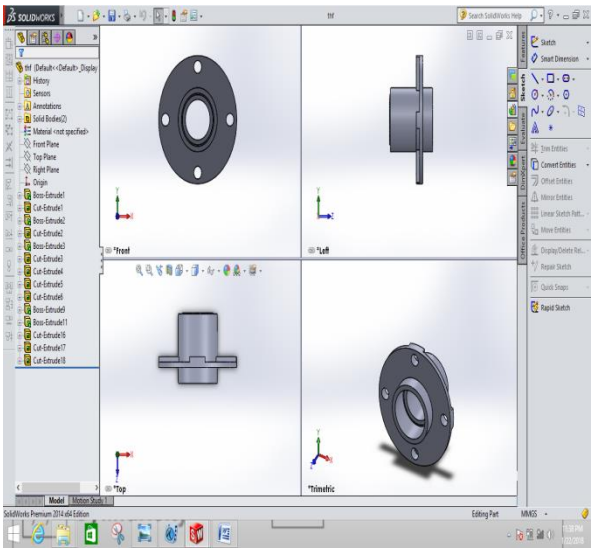

Fig 6.solid work diagram of wheel hub

VI.FUTURE SCOPE

Go-karts can develop by using 4 stroke engine. Bio-Fuels which are of low cost can be used in place of petrol. Solar energy can also utilize by solar panels where they are pollution free with moderate cost. Suspension system can also be added to the system to lower vibrations and shocks. Go-kart body can be developed to preventing it from environmental conditions and by making it as more flexible to aerodynamic shape of body it highly increases its speed.

VII.CONCLUSION

Fig 7. Overall diagram

We calculated all the design parameters and analyzed the shaft, disc brake, wheel hub etc. Thus after all the test and calculation, we have concluded that our design is safe for fabrication. Design and fabrication of GO-KART were reported in this paper. From this exercise, engineering and industrial design students have learned design, fabrication, and testing of real GO-KART. The competition activity gives students the opportunity to apply theories they have learned, as well as exposure to practical work and challenges. The use of solid modeling system has helped a designer to perform higher quality to design. Students have also experienced real situation and challenge from design stage until fabrication of a real GO-KART. Finally, the GO-KART was tested on track to evaluate its capability and endurance, and the results were monitored for further improvement.

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