International Journal of Research
Available at https://edupediapublications.org/journals
e-ISSN: 2348-6848
p-ISSN: 2348-795X
Volume 05 Issue 12
April 2018

Design and Analysis of Utility Go Kart

Saurabh Kumar Gupta, Bhupesh Sonkar, Satyam Gupta, Manish Rk Sahu
Department of Mechanical Engineering, Shri Shankaracharya Institute of Professional Management and Technology
Mujgahan, Raipur

ABSTRACT

The best way to evaluate a functioning go-cart would be testing its performance under various conditions and points. Therefore a new gokart called Utility Go-Kart has chassis s presented in this report. Utility Go-Kart was constructed based on the common go-cart size found in the market but with slight difference in the frame design. Utility Go-Kart chassis has built using mild steel square bar, bent and welded together, with consideration to the position, braking system, steering system, seat position and many more. Other go-kart's components such as engine seat steering wheel, brake system, bumper and wheels are mounted to the chassis to test the performance.

Introduction

A go-kart, also written as go-cart (often referred to as simply a kart), also called shifter karts is a type of open wheel car. Gokarts come in all shapes and forms, from motorless models to high-powered racing machines. Some, such as Superkarts, are able to beat racing cars or motorcycles on long circuits.

Recreational karts can be powered by fourstroke engines or electric motors, while racing karts use a twostroke or, rarely, higher powered four-stroke engines. Most of them are single seater but some recreational models can accommodate a passenger.

In some countries, go-karts can be licensed for use on public roads. Typically there are some restrictions, e.g. in the European Union a go-kart on the road needs head light (high/low beam), tail lights, a horn and indicators, and their power must not exceed 20 hp (15 kW).

Go-kart is a simple four-wheeled, small engine, single Seated racing car used mainly in United States.Go-karts emerged in India in 2003 from MRF, which has a 250cc two-stroke engine, which produce 15 bhp of power, which costs around 3 lakhs.From our developments, we have successfully managed to bring the cost down to 30000-35000.

History of Go-Kart

Go-Kart technology has been widely developed since the introduction of wheels. But, it was not fully implemented in racing activity until the past three hundred year in America. The first go-kart was simply a cart consisting of wheels and handles jointed together as children pushed from behind when learning to walk or a four-wheeler platform where children can sit on it while another push the kart around.

Go-Kart invented in California by Art lngels and Lou Borelli using 100cc mower engines

and string steel frames. Then, newly designed kart were beginning to gain popularity in Britain around the year 1959-1960. Go-Kart has long existed in our world whether used in sport or recreation. By definition of international karting commission – Federation International Automobile (CIK-FIA), a kart is defined as a land vehicle with or without a bodywork, with 4 non-aligned wheels in contact with the ground, two of which control the steering while the outer two transmit the power. Its main part the chassis (which consist of a body work that is made up of a set of bent steel pipes that are welded together) with an engine, four wheels and tyres attached on it.

Go-Kart Today and Future

Go-Kart racing is a cheaper and smaller way of automobile racing not forgetting, a lot safer compared to other motor racing sports such as Formula one. Today, go-kart racing is not only practiced by adult but the younger generation. Allowing an early start on this sport, as young as the age of 5 or 6 year old. Would be beneficial as it is the most suitable period for them to gain experience to be a professional driver in the future. Practicing on go-karting can properly expose the driver to the actual racing environment. Training them to be professional motor racer in various competition such as Formula One. NASACAR, Indly racing, and other.

Nowadays, go-kart is as popular as it has ever been with continued growth every year, and the manufacturers who have stayed with go-kart industries are capable to stabilize and obtain a stabilizing at a stage even though minor improvement was done one the performance. One of the challenges in improvement go-karting would be building more standardized track for the growing number of go-kart's driver.

With continuous improvement in go-kart industry whether on go kart design, equipment, services such as available track, or driving techniques, this sport would obtain a very high ranking of popularity in the near future.

Literature Review

A chassis consists of an internal framework that supports a manmade object in its construction and use. It is analogous to an animal's skeleton. An example of a chassis is the underpart of a motor vehicle, consisting of the frame (on which the body is mounted).

If the running gear such as wheels and transmission, and sometimes even the driver's seat, are included then the assembly is described as a rolling chassis. The chassis takes a load of the operator, engine, brake system, fuel system and steering mechanism, so chassis should have adequate strength to protect the operator in the event of an impact. The driver cabin must have the capacity to resist all the forces exerted upon it. This can be achieved either by using high strength material or better cross sections against the applied load. But the most feasible way to balance the dry mass of chassis with the optimum number of longitudinal and lateral members. The chassis must be constructed of steel tubing with minimum dimensional and strength requirements dictated by

ASME(AMERICAN SOCIETY OF MECHANICAL ENGINEERS).

Design Objectives

- Provide full protection of the driver, by obtaining required strength and torsional rigidity, while reducing weight through diligent tubing selection
- Design for manufacturability, as well as cost reduction, to ensure both material and manufacturing costs are competitive with other Go Karts.
- Improve driver comfort by providing more lateral space in the driver compartment
- Maintain ease of serviceability by ensuring that chassis members do not interfere with other subsystems
- Deciding the cost efficiency of such in terms of large scale manufacturing.
- Calculation of stresses acting on the chassis of the vehicle under different loading conditions.
- The product can prove to be very efficient in all the aspects such as cost, drivability, maintenance, easy usage, safety etc.

METHODOLOGY

The main objective of the study is to obtain a maximum deflection of chassis under static condition.

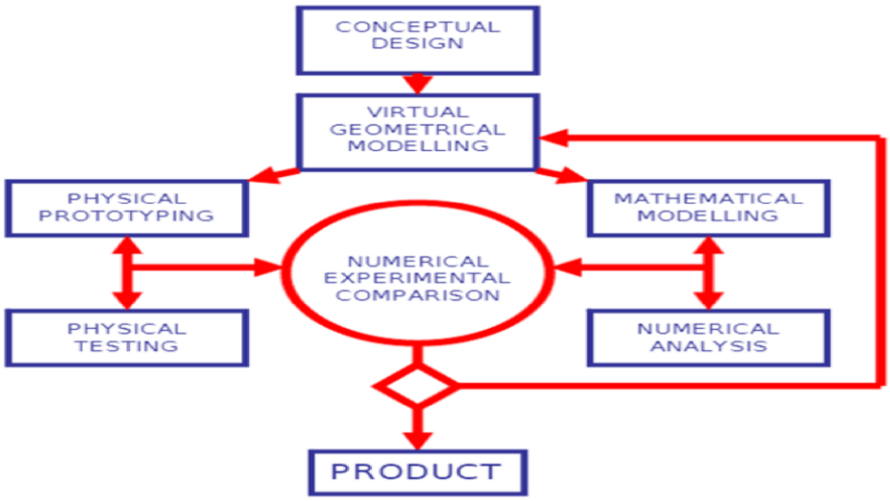

Fig.1- Methodology Flow Chart

DESIGN METHODOLOGY

Design of any component is consists of three major principles:

1. Optimization
2. Safety
3. Comfort

The primary objective of the roll cage is to provide a 3-dimensional protected space around the driver that will keep the driver safe. Its secondary objectives are to provide reliable mounting locations for components, be appealing, low in cost, and low in weight. These objectives were met by choosing a roll cage material that has good strength and also weighs less giving us an advantage in weight reduction.

A low cost roll cage was provided through material selection and incorporating more continuous members with bends rather than a collection of members welded together to reduce manufacturing costs. The modeling of the roll cage structure is done by using catia v-5 software. This design is checked by Finite Element Analysis. We have focused on every point of roll cage to improve the performance of vehicle without failure of roll cage. We began the task of designing by conducting extensive research of go kart roll cage through finite element analysis.

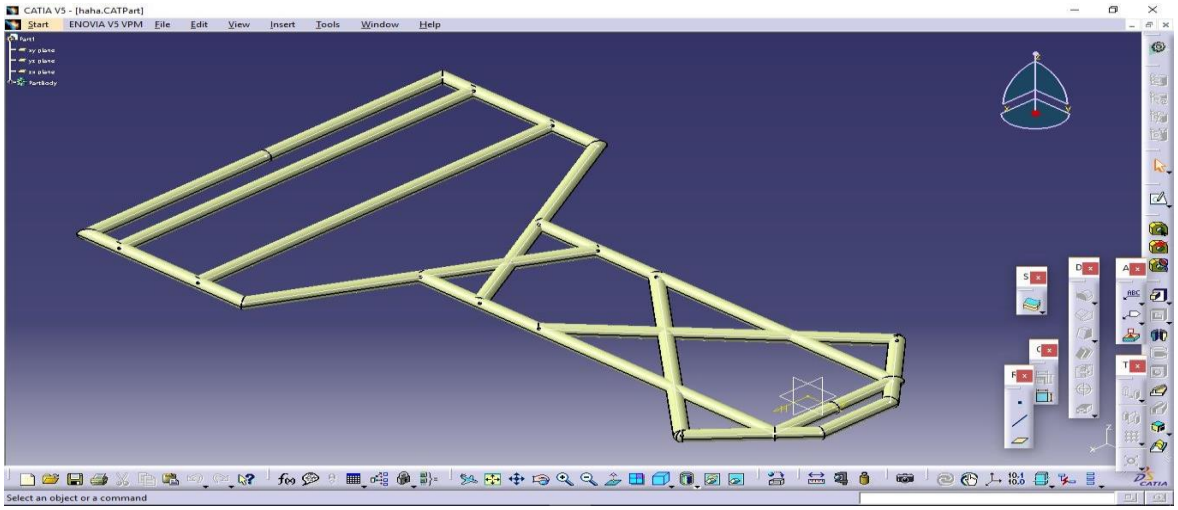

Fig.2 -3D Modelling was done using Catia V5 software as shown in above picture.

MATERIAL METHODOLOGY

The carbon content in the steel is very important to determine the hardness, strength, machining and weld ability characteristics. Material selection for 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. Aluminum 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 AISI1018. AISI 1018 is a mild/low carbon steel Tables:

Table1. Composition of AISI 1018

COMPOSITION	AISI 1018
Iron	98.8 to 99.25%
Manganese (Mn)	0.6 to 0.9%
Carbon ©	0.15 to 0.2%
Sulfur (S)	0 to 0.050%
Phosphorus (P)	0 to 0.040%

Table 2. Properties of AISI 1018

PROPERTIES	AISI 1018
Density	7.9 *g/cm3*
Elastic (Young's, Tensile) Modulus	210 *GPa*

Finite Element Analysis (FEA)

Finite element analysis (FEA) is a computerized method for predicting how a product reacts to real-world forces, vibration, and other physical effects. Finite element analysis shows whether a product will break, wear out, or work the way it was designed. Here we divide the roll cage into small sizes known as element and collective elements on the model form a mesh. The computer analyses the elements and shows us a collective result. The computer solves by the computational method provided. The material and structure of roll cage was finalized and then FEA was performed on it. It is tested whether the roll cage will be able to withstand torsion, impact. The analysis was done in ANSYS.

Conclusion

Result concluded that the AISI 1018 material is more economic and gives better performance. Itis also suitable for large scale production. Static analysis using finite element method was successfully carried out on chassis CAD model to determine equivalent stresses, maximum deformations, Factor of Safety and its location on chassis model. The Factor of safety calculated is found to be greater than 1.