A REVIEW PAPER ON DIFFERENT MANUFACTURING PROCESSES INVOLVE IN GO-KART

Prof. S.V. Borkar[1]
Vidhi Petkar[2], Anurag Nakshine[3], Akshay Babhare[4], Ashutosh Zode[5]
Department of Mechanical Engineering, Priyadarshini Bhagwati College of Engineering,
RTMNU University, Nagpur

Abstract

Go-Kart racing is a constantly growing concept all over the world. Go-Kart is four wheeled vehicle designed for racing and in some countries for enjoyment purpose also. It is not a factory made product. Kart racing is accepted as it is one of the most economic forms of racing. It is bridge between theoretical knowledge and practical knowledge. It is a fun activity. We have designed, fabricated and manufactured the Go-Kart for racing application. This paper includes design of ideas, imaginary concept, designing, analysis, teamwork, project management and development, costing and budgeting. The main objective of kart is to manufacture the kart within a given period time, without any loss of time. So the remaining time can be utilized to increase the performance of kart to get better result in racing. Most of time is wasted in manufacturing and fabrication of the various parts of kart.

1. INTRODUCTION:-

Go-Kart is four wheele dracing car that can be used by any one and can be made by professional and non-professional personal so. Driver in Go-Kart may or may not be professional. They denote Formula1 car in manners of speed but it is less costly. They are widely used for racing in America and now increasing its popularity in India because of cost effectiveness and racing thrill. Go-kart is simple, light weight and easy to operate. Most of go-kart used simple mechanical principles to manufacture its body. As the popularity is increasing new participants are introducing themselves in competition. Each team has to the go through many positive and negative aspects throughout the designing process to achieve the exact solutions. We decided to stay focus on the event because of high point value. This was our first time, so the questions raised such as

- How much timed design will consume?
- How much time manufacturing will consume?
- What will be the total cost of project?

2. PARTSOFGO-KART:-

Go-Kart consists of various parts are as follows:

- Chassis.
- Engine and Power Transmission System.
- Steering Assembly.
- Breaking System.
- Electrical wiring and Enginewiring.

3. DEVLOPMENT OF CHASSIS:-

A.Selection of Material:

The material AISI-4130 is used in the frame design because of its good weld ability, its relatively soft and strengthens as well as it contains good machine ability. A good strength material is selected while designing the chassis in order to absorb as much energy as possible to prevent it from fracturing at the time of high impact. We have chosen AISI-4130 for the chassis because it has structural properties to provide the low weight to strength ratio.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. Various materials are available to manufacture Go-Kart chass is but focusing on competition, list of material can be preferred by using different research papers. From

research papers and rule book our team has selected Seamless tube AISI-4130(American Iron and Steel Institute 4130) material because of better mechanical properties compared with other material properties.

AISI-4130 is the best and the lightest material when it comes to making frames from hollow pipes. But its cost is much high than other allowable steels available out in the market. This material works best when welded using TIG welding. But this material has high tensile strength.

The mechanical properties of AISI-4130 are as follows:

Properties	**Values**
Ultimate Tensile Strength	664.996MPa
Yield Tensile Strength	610.528MPa
Yield Bulk Modulus	140GPa
Shear Modulus	80GPa
Modulusof Elasticity	200GPa
Poisson's Ratio	0.3
%of Elongation	29.5%

Table No.1

The abovementioned properties satisfy the technical requirements of material which is to be used in a frame.

B. Designing and Analysis: We had done designing of the chass is on CREO, CATIA,AUTO-CAD, software and analysis using ANSYS software by applying 1ton load on front, rear and both sides of chass is. This gives safe result for chassis.

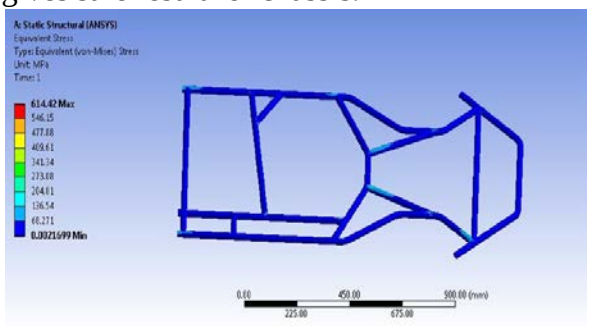


Fig:- ANSYS model of Go-Kart Chassis

C. Manufacturing:

To avoid time spending on Hydraulic press and overcome its unavailability our team has used welding which include Oxy-Acetylene welding and Arc welding and TIG welding. This process required 1hr35min.

D. Testing of Material:

Materials testing is a well-established technique used to determine the physical and mechanical properties of raw materials and components from a human hair to steel, composite materials and ceramics.

To meet the challenges posed in testing a wide diversity of materials, load Instruments offers a comprehensive range of high performance materials testing machines, designed to make accurate and repeatable force measurements in the range from 0.1 N to 300 kN (0.0225 lbf - 67443 lbf). Depending on the machine, elongations of between 1 micron and 2.5 m (98.4 in) can be measured.

Input parameters	
Serial no.	M-123(1)
Cross section area	147.1 mm*mm
Outer Diameter	25.29mm
Original Gauge Length	50.00mm
Final gauge length	84.75mm

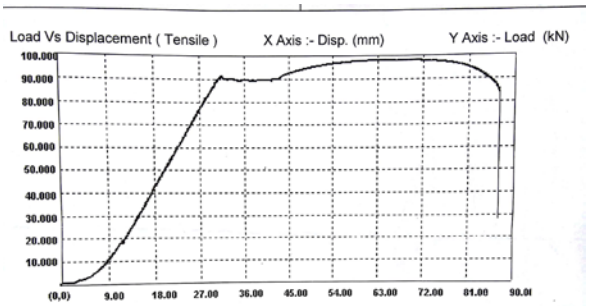
Table No. 2

Result	
Ultimate Load	98.16KN
Ultimate strength	664.96N/mm*mm
%elongation	29.50
Yield Load	90.120KN
Yield stress	610.528N/mm*mm

Table No. 3

Sample Indensity	YS (N/mm*mm)	UTS (N/mm*mm)	Gauge length
Pipe	610.528	664.996	29.50

Table No. 4



Fig(3)

Sample Identity	Pipes
C%	0.234
Si%	0.253
Mn%	0.536
P%	0.013
S%	0.004
Cr%	0.926
Ni%	0.023
Mo%	0.178
Al%	0.015
Cu%	0.028
V%	0.006
Nb%	0.004
Ti%	0.005

Table No. 5

E. Making Fixtures of Chassis:

We made the fixtures for locating and describing the limits for the material. In our chassis we have made the fixtures of small wooden blocks and then we just nailed it on the full scale sketch across the sketch made on the wooden sheet. After that we want some elevation on the front side of the chassis for that, we make a wooden block with desired angle and then nailed over the sketch. In this way we got the elevation on front side.

Fixture can be of any material. As the wood is cheap and strong so we preferred the wood. Elevated fixture should not be removed for making the mass production.

Fig:- Wooden Fixture

F. Cutting and Bending of Material:

Cutting is the separation or opening of a physical object, into two or more portions, through the application of an acutely directed force.

For metals many methods are used and can be grouped by the physical phenomenon used.

- Chip forming – sawing, drilling, milling, turning etc.
- Shearing – punching, stamping, scissoring.
- Abrading – grinding, lapping, polishing; water-jet.
- Heat – flame cutting, plasma cutting, laser cutting.
- Electrochemical – etching, electrical discharge machining (EDM).

Every method has its limitations in accuracy, cost, and effect on the material. For example, heat may damage the quality of heat treated alloys, and laser cutting is less suitable for highly reflective materials such as aluminium. Laser cutting sheet metal produces flat parts and etches and engraves parts from complex or simple designs.

Bending is a manufacturing process that produces a V-shape, U-shape, or channel shape along a straight axis in ductile materials, most commonly sheet metal. Commonly used equipment includes box and pan brakes, brake presses, and other specialized machine presses. Typical products that are made like this are boxes such as electrical enclosures and rectangular ductwork.

G. Welding:

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by using high heat to melt the parts together and allowing them to cool causing fusion. Welding is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal.

In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that, based on weld configuration (butt, full penetration, fillet, etc.), can be stronger than the base material (parent metal). Pressure may also be used in conjunction with heat, or by itself, to produce a weld. Welding also requires a form of shield to protect the filler metals or melted metals from being contaminated or oxidized.

Many different energy sources can be used for welding, including a gas flame (chemical),

an electric arc (electrical), a laser, an electron beam, friction, and ultrasound. While often an industrial process, welding may be performed in many different environments, including in open air, under water, and in outer space. Welding is a hazardous undertaking and precautions are required to avoid burns, electric shock, vision damage, inhalation of poisonous gases and fumes, and exposure to intense ultraviolet radiation.

To avoid time spending on Hydraulic press and overcome its unavailability our team has used welding only which include Oxy-Acetylene welding and Arc welding and TIG welding. This process required 1hr35min.

H. Extra Mounting:

Mountings are used for placing and holding the various elements of the kart. In our chassis some mountings are:-

- Steering rod mounting: We had welded MS bend rod of equal length to hold the steering rod rigidly. There should be such arrangement for rotating of steering rod at its bottom and its middle.
- Engine mounting: For that we had welded thin MS flat on the chassis on which we can hold the engine on it.
- Pedestal bearing mounting: We welded the MS flat plate with long U slot on the inner edges of the chassis.
- Calliper mounting: With the help of design of the calliper we cut thin flat MS and fix it on the chassis.
- In pedestal mounting U slot is provided or adjusting the wheel base.
- Seat mounting and battery mounting are mounted as per the space available on the chassis.

I. Finishing:

To eliminate sharp edges that can harm driver or any other person, finishing is necessary. And also by giving round shape on the edges we eliminate the stress concentration.

For that we used different types of files and grinding machine. It may be hand grinder or bench grinder and by finishing the various parts it looks good.

J. Painting:

Painting of different parts is necessary.

Painting of different parts such as toe point, jack point should be done. Because it should be visible and can access easily.

The kill switch should be painted in red because red indicates emergency in danger.

The paint of chassis will be of a colour. Generally it should be black.

4. CONCLUSION:-

In this way we manufacture our Go-Kart Chassis with all the calculation done by the members. The Kart is manufactured according to the specification mentioned by the Competition Organisers in their rule book.

So a detailed study of various automotive systems is taken as per our approach. Thus, this report provides a clear insight in design and analysis of our vehicle.

5. REFERENCE:-

- Automobile Engineering, By Kripal Singh.
- Machine Design, By R.S. Khurmi
- Machine Design, By Shigley.
- Race car vehicle dynamics, By Milliken & Milliken.
- Vehicle Dynamics, By Thomas Gillespi.

- Abhijit Padhi, Ansuman Joshi, Hitesh N, Rakesh C “Increase Factor of Safety of Go-Kart Chass is during Front Impact Analysis ”International Journal for Innovative Research in Science & Technology,Volume3, Issue04, September 2016.