Design And Fabrication of Electric Go-Kart

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Abstract- *Today with the growing population, the number of vehicles is growing drastically. This growth has led to massive increase in air pollution . Around the globe, automobile sector is the major contributor towards air pollution. Go-karting is a growing segment in the automobile sector. In order to control air pollution through this growing segment . This project aims towards designing of an electric kart which is environment friendly as it causes no pollution. Various subsystems of the vehicle i.e. Chassis, Steering, Brakes & Powertrain were designed and fabricated. The electric kart is motor and battery operated. The designs aimed towards a highly stable vehicle in order to maximize the power to weight ratio. Reliability, durability, safety & comfort were the key factors which were kept in mind while fabrication of the electric kart. The attempt is made to make a self generating electric power kart.*

I. INTRODUCTION

Today with the growing population, the number of vehicles is growing drastically. This growth has led to massive increase in air pollution . Around the globe, automobile sector is the major contributor towards air pollution. Go-karting is a growing segment in the automobile sector. In order to control air pollution through this growing segment . This project aims towards designing of an electric kart which is environment friendly as it causes no pollution. Various subsystems of the vehicle i.e. Chassis, Steering, Brakes & Powertrain were designed and fabricated. The electric kart is motor and battery operated. The designs aimed towards a highly stable vehicle in order to maximize the power to weight ratio. Reliability, durability, safety & comfort were the key factors which were kept in mind while fabrication of the electric kart. The attempt is made to make a self generating electric power kart**.**

II. LITERATURE REVIEW

C. Cardasoet.al (2006). This paper we present an electric go-kart suitable for an instructional laboratory in electric drives. An overview of propulsion system design, power conversion structure and control is presented. A three-phase squirrel-cage induction motor is used as propulsion system. The motor is controlled at different operating conditions by means of a simple scalar control using a low cost controller board developed for light electric vehicles used in local areas. The prototype has been designed specifically to meet the requirement of low cost and it contains all of the active functions required to implement the control of the go-kart.

Kristaps Vitolset.al(2010). In this paper the parameters for choosing an electric drive for an electric kart have been analyzed. The advantages and disadvantages of different electric drive configurations had been shown while focusing on development of academic research prototype for future use in student education.

Eli Davis et.al(2012).This undergraduate thesis documents the design considerations and specifications of building a personal battery-powered go-kart. This includes designing and building a custom brushless DC motor for use in the drivetrain. Details of the fabrication and assembly processes are included for reference. The motor was not finished in time to be able to be tested, but the performance of the go-kart has been estimated through scientific calculations.

F.S. Garcia et.al (2013).An electric go-kart was designed and built. It uses a hybrid energy storage system composed of a battery and an ultracapacitor. To integrate the two energy storage devices, a multiple-input DC-DC converter was used to implement a control strategy that divides the power between them. The main objectives of using ultracapacitors in complement to batteries are: improving performance (i.e. acceleration), increase the system efficiency (including through the use of more regenerative braking) and extend the battery life. This paper presents the design of the electric go-kart and the experimental results obtained with the prototype.

Dr. D.Ravikanthet.al(2015).There are many motor sports in the world. Bikes, Cars, Formula one are examples of them. The drivers in these are very professionals and accurate. They can drive it very fast. But there are also motor sports which do not need professional drivers and need no great speed. The vehicles used are also very cheap. Such a motor sport is Go Karting. They resemble to the formula one cars but it is not as faster as F1 and also cost is very less. The drivers in go karting are also not professionals. Even children can also drive it. Go karts have 4 wheels and a small engine. They are widely used in racing in US and also they are getting popular in India.

W. O. Avelino el.at (2015). An electric go-kart was designed and built. It uses a hybrid energy storage system composed of a battery and an ultracapacitor. To integrate the two energy storage devices, a multiple-input DC-DC converter was used to implement a control strategy that divides the power between them. The main objectives of using ultracapacitors in complement to batteries are: improving performance (i.e. acceleration), increase the system efficiency (including through the use of more regenerative braking) and extend the battery life. This paper presents the design of the electric go-kart and the experimental results obtained with the prototype.

Mark Burridge et.al(2016).This paper presents an electric propulsion system designed specifically to meet the performance specification for a competition racing kart application. The paper presents the procedure for the engineering design, construction and testing of the electric powertrain of the vehicle. High performance electric Go-Kart is not an established technology within Australia. It is expected that this work will provide design guidelines for a high performance electric propulsion system with the capability of forming the basis of a competitive electric kart racing formula for Australian conditions.

Chassis KoustubhHajareel.at(2016). This paper aims to the design analysis of a go kart chassis. The main intention is to do modelling and static analysis of go-kart chassis. The maximum deflection is obtained by analysis. The go-kart chassis are different from chassis of ordinary cars on the road. The paper highlights the material used and structural formation of chassis. The strength of material, rigidity of structure and energy absorption characteristics of chassis is discussed. The modelling and analysis are performed using 3-D software such as SOLIDWORKS, ANSYS and HYPERMESH. The loads are applied to determine the deflection of chassis.

Swapnil Gaikwad et.al(2017). A go kart is a small four wheeled vehicle basically used for traditional kart racing and amusement purpose. Go-kart is designed and fabricated for participation at the national go kart event. The main objective of the design is to make a car that is durable as well as reliable and will last through the endurance using parts that are cost effective and easily available in India. The kart has been designed using sound design principles. This paper aims to the design analysis of a go kart chassis. And fabrication of Kart. The chassis is made from tube pipe. The material used is AISI 1020 steel. The go-kart chassis are different from chassis of ordinary cars on the road.

Akshay Pai et.al(2017). A Go Cart also spelled as Go Kart is a four wheeled vehicle designed and meant for racing only (though in some countries it is used for fun personal transportation). It is a small four wheeler run by I.C Engine. It is a miniature of a racing car. Go Cart is not a factory made product; it can be made by Automobile engineers. This report documents the process and methodology to produce a low cost go-kart. Simple but innovative. We are reviewing the data in various papers about go-karts. We will review hybrid go-karts, gokarts steering design and their analysis. We have kept our focus majorly on eco-friendly karts and the data presented in the papers.

III. METHODOLOGY

3.1 DESIGN

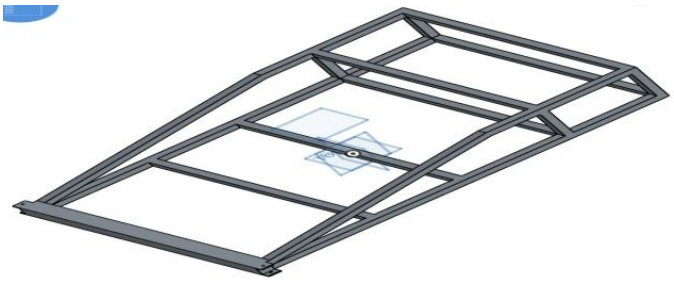

Fig.3.1 Design of frame.

Onshape is a computer-aided design (CAD) software system,delivered over the Internet via a Software as a Service (SAAS) model. It makes extensive use of cloud computing, with compute- intensive processing and rendering performed on Internet-based servers, and users are able to interact with the system via a web browser or the iOS and Android apps.

Onshape allows teams to collaborate on a single shared design, the same way multiple writers can work together editing a shared document via cloud services. It is primarily focused on mechanical CAD (MCAD) and is used for product and machinery design across many industries, including consumer electronics, mechanical machinery, medical devices, 3D printing, machine parts, and industrial equipment.

Onshape upgrades are released directly to the web interface, and the software does not require maintenance work from the user.

3.2 MATERIALS

Chromium metal is most widely recognized for its use in chromium plating (which is often referred to simply as

'chrome'), but its largest use is as an ingredient in stainless steels. Both applications benefit from chromium's hardness, resistance to corrosion, and ability to be polished for a lustrous appearance. Chromium is a hard, gray metal that is valued for its incredible resistance to corrosion. Pure chromium is magnetic and brittle, but when alloyed can be made malleable and polished to a bright, silvery finish.

Fig. 3.2 Square chromium steel pipe

Chromium derives its name from *khrōma,* a Greek word meaning color, due to its ability to produce vivid, colorful compounds, such as chrome oxide. According to the International Development Association for Chromium, of the total chromite ore extracted in 2009, 95.2% was consumed by the metallurgical industry, 3.2% by the refractory and foundry industry, and 1.6% by chemical producers. The major uses for chromium are in stainless steels, alloyed steels, and nonferrous alloys.

Stainless steels refer to a range of steels that contain between 10% to 30% chromium (by weight) and that do not corrode or rust as easily as regular steels. Between 150 and 200 different stainless steel compositions exist, although only about 10% of these are in regular use.

3.3 FABRICATION

3.3.1 Preparation of frame

Arc welding is a process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the late part of the 19th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.

Fig. 3.3 Arc welding process

First the square pipes of cr-steel were cut into the required dimensions as follows:

Table No. 3.1 List of dimensions of the pipe.

S. no.	Size (in inches)	No. of pieces
1	60	2
2	64	2
3	34	3
4	32	5
5	6.5	4

A disc cutter is a specialized, often hand-held, power tool used for cutting hard materials, for example ceramic tile. This tool is very similar to an angle grinder, with main difference being cutting disc itself (circular diamond blade for disc cutter vs. abrasive grinding wheel for angle grinder).We used this cutter to obtain pipes of dimensions specified in the table 3.1.

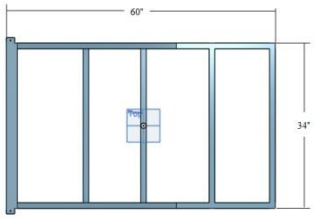

Fig.3. 4 Top view of the frame.

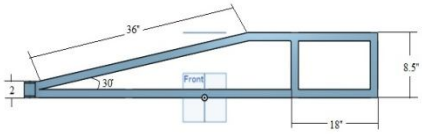

Fig. 3,5 Front view of frame.

IV. RESULT

4.1. Prototype

Fig. 4.1 Final model of Electric Go-kart

4.2 Specification of go-kart

SIZE OF VEHICLE: 60” long , 34” width
SIZE OF FRONT WHEEL: 10” diameter
SIZE OF REAR WHEEL: 14” diameter
CAPACITY OF MOTOR: 24V , 500W ,2500rpm
CAPACITY OF BATTERY: 12V (2 battery), 35Ah

4.3 Speed test

The speed test of the electric go-kart was conducted in the college by the team members. First the kart was supported in the air and the calculation was done solely on the body weight of the kart itself. The ideal speed of the vehicle was up to 52 km/h. The second test was done by driving the kart and the total weight estimation of the kart was 100 kg and the obtained speed was 20 km/h. The third test amounted the total weight as 120 kg and the obtained speed was approximately 18 km/h. The fourth test had a total weight of 126 kg and and the speed variation was not as much from that of the third test. Fifth test had a weight of 130 kg and the drop observed was to 16 km/h. the last test had the total weight equal to 144 kg and the speed was 15 km/h.

Table 4.2 speed test calculations

s. no.	Load (kg)	Speed (km/h)
1	Body load	52
2	100	20
3	120	18
4	126	18
5	130	16
6	144	15

V. CONCLUSION

The Go-kart was designed using basic automobile principles. There were many challenges throughout the design process. The selection of motor to achieve the required starting torque and top speed was a challenging task. Finally a PMDC Motor of 24V was selected. Hence, both speed and torque requirements are compromised and hence the speed control is achieved through a voltage controller. To make the kart more effective and efficient in performance, chain drive selected for power transmission is considered to be a master stroke. To come up with an excellent racing kart the subsystems were designed in such a way that they can achieve maximum performance. Finally, an effective design for the kart is developed which can outperform the existing karts and also in the upcoming era of electric automobile vehicles.

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