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DEVELOPMENT AND TESTING OF ELECTRIC GO-KART

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ABSTRACT:

Go-Kart is a racing vehicle having very low ground clearance and can be work on only flat racing circuits. This paper concentrates on explaining the engineering behind of a safe, rigid and torsional free frame, well-mounted power train along with braking and steering system. The design process of the vehicle is iterative and is based on various engineering and reverse engineering processes depending upon the availability, cost and other such factors. The set out to be achieved were four simple goals applied to every component of the vehicle: durable, Safety & ergonomics, lightweight and high performance. All the parameters like Reliability, safety, Cost, Performance, aesthetics, ergonomics, Standard dimensions & material were also taken in consideration on the same time. Where ever possible finite element analysis was done on the regularly loaded parts & modifications were done accordingly to avoid any type of design failure. Power train is specially to get maximum speed and torque for high performance which can be given by the any other geared vehicle.

Key Words: Go kart, EV Go-Kart, Chassis, Stability, Motor, Battery.

Introduction:

The general definition of any kart, a vehicle without suspension and differential. It is a vehicle specially designed for a flat track race. A wide range of engine karts were on track since the mid of the twentieth century. The present automotive scenario encourages eco-friendly vehicles to minimize the damage done by the emissions. An effective alternative for the engine is the electric motor which in comparison can give the same output power. This can be Implemented in the karting field. Motor replaces the engine and hence the kart

gets dramatically changed in both testing and performance. The vehicle, hence runs only on electricity and is designed to meet the necessary requirements for karting. The frame indicates that it is an open kart with a straight chassis. The frame acts as a suspension in karts. It must also be rigid not to break under extreme load conditions. Hence, flexibility should be compromised with stiffness. The primary objective is to design a stable and safest vehicle for the driver. Every subsystem is designed based on the primary objective and then integrated into a final blueprint. The center of gravity is kept as low as possible to obtain maximum stability. The length of the vehicle is shortened so as to reduce the weight of the vehicle. The wheelbase and track width of the vehicle are chosen accordingly. The front track width is minimized to reduce the turning radius of the vehicle and to increase the maneuverability.

Engine powered / conventional go-kart

A conventional go-kart is a small, open-wheel vehicle that is typically used for recreational purposes. It typically has a simple frame made of steel or aluminum and is powered by a small engine, usually less than 10 horsepower. The go-kart is an lightweight and maneuverable, allowing it to take tight corners and reach relatively high speeds, usually between 50 and 70 miles per hour. Conventional go-karts can be enjoyed by people of all ages, and they are often used for racing and other competitive activities.

They can be found at amusement parks, race tracks, and other recreational facilities. Many people also build their own go-karts at home as a DIY project, using kits or plans that are widely available online. While conventional go-karts are relatively simple and straightforward vehicles, they can still be dangerous if proper safety precautions are not taken. It is important to wear appropriate safety belt, including helmets, gloves, and eye protection and to follow all rules and guidelines when operating a go-kart.

An engine-powered go-kart is a type of small vehicle that is powered by a gasoline or electric engine, rather than being powered by pedals or human power. These types of go-karts are popular for recreational activities, such as racing or riding on private property. Gasoline-powered go-karts typically have engines ranging from 5 to 20 horsepower, although some professional racing go-karts can have engines that produce more than 50 horsepower. These engines can be either two-stroke or four-stroke and are usually air-cooled.

E-Powered Go-kart

An electric go-kart is a type of go-kart powered by electric motors and batteries. Electric go karts are also safer to drive than gas engine go karts. With the evenly-distributed battery weight, electric go karts are less likely to tip or flip than gas go karts. Electric go karts also have covered mechanical components to prevent the driver from getting burned or injured.

An electric go-kart is a type of go-kart that is powered by an electric motor rather than a gasoline engine. These vehicles are becoming increasingly popular due to their low maintenance requirements, environmentally

friendly nature, and quiet operation. Electric go-karts are powered by rechargeable batteries, which provide energy to an electric motor that drives the vehicle's wheels. The batteries can be charged using a standard household electrical outlet, and the charging time typically ranges from several hours to overnight, depending on the battery capacity and the charger used.

Electric go-karts are generally more expensive to purchase than gasoline-powered models, but they offer several advantages, such as low operating costs and reduced environmental impact. They also tend to be quieter and smoother to operate than gasoline-powered go-karts, which can make them more enjoyable to drive. Electric go-karts are suitable for a variety of applications, from recreational use on private property to commercial use at amusement parks and other attractions. Some models are specifically designed for racing and can reach speeds of up to 50 miles per hour or more.

It is important to operate electric go-karts safely, wearing appropriate safety gear such as helmets and gloves, and following all applicable laws and regulations. Proper maintenance and charging of the batteries are also critical to ensuring the safe and reliable operation of the vehicle.

Materials and methods

Materials:

1. Chassis
2. Steering
3. Motor
4. Battery
5. Controller
6. Brakes
7. Tires
8. Knuckle
9. Axle and shaft

1. Chassis: The chassis of go-kart is a skeleton frame made up of pipes and other materials of various cross sections. The chassis of go-kart must consist of stability, torsional rigidity, as well as it should have relatively high degree of flexibility as there is no suspension. Go-Kart chassis are often made from a steel alloy.

Fig.1 Chassis

2. Steering System: The 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 cause the wheels to turn. There is a relationship in the wheels movement to a turned center.

Fig 2. Steering System

3. Motor: A motor functions on direct-current electricity. The motors contain permanent magnets rather than electromagnets used in induction motors. The permanent magnet contains less heat loss and energy compared to electromagnets.

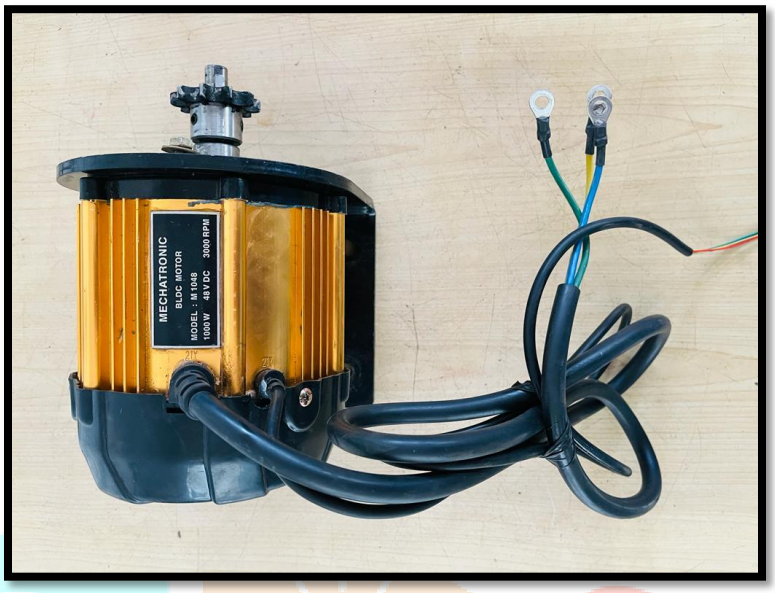

Fig 3. Motor

4. Battery: The most important part of an electric go-kart is the battery. A battery is a power source of the vehicle in which we should consider some parameters such as performance of the vehicle, cost of operation, lifespan of the battery, power requirements of the vehicle, energy density and charging time of the battery. For batteries, lithium or lead-acid batteries are to be considered. The Li-ion Battery is considered to be the top of the traditional lead-acid battery. The specific energy and energy density of each battery are different.

Fig 4 Battery

5. Controller: Motor controllers are devices which regulate the operation of an electric motor. In artificial lift applications, motor controllers generally refer to those devices used in conjunction with switchboards or VFDs to control the operation of the prime mover.

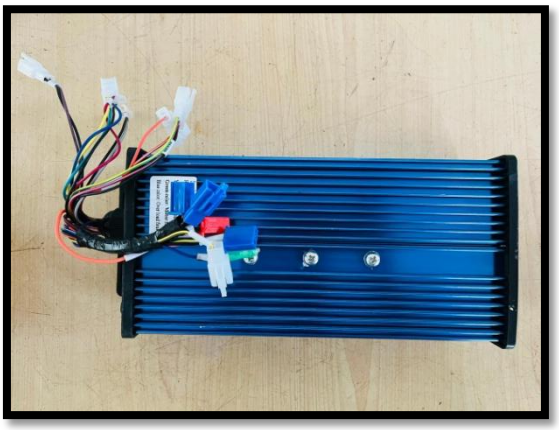

Fig 4. Controller

6. Brakes: An excellent braking system is the most important safety feature of any land vehicle. A karting vehicle requires an efficient braking system that provides adequate braking power to the wheels. The main requirement of the vehicle's braking system is that it must be capable of stopping all four wheels. A hydraulic brake circuit is designed in accordance with the vehicle weight, vehicle length and top speed. The disc brake assembly fits on the transmission shaft. The braking system includes brake pedal, master cylinder, brake hose, caliper assembly and brake disc.

7. Tyres:

Product	Dimension
Front tyre	10 x 4.5-5 inches
Rear tyre	11 x7.1-5 inches
Rim	5 inches
Bearing	30 mm

Fig 5. Tyres

8. Knuckle: The steering knuckle is one of the components that make up the automotive steering system. It contains wheel hubs (or spindles) and attaches to the suspension and steering components of a vehicle to transfer the movements of a steering wheel to the front wheels.

9. Axle and shaft: A live axle on a go-kart is nothing more than a rear axle that equally delivers power to both rear wheels. In order to do so, the live axle must be one long shaft where both wheels are attached to both ends. It does this with a sprocket that is attached via a go-kart chain to the crankshaft of the engine.

A go-kart jackshaft is a mechanical component that transfers rotational force between the crankshaft and the axle. In essence, a jackshaft is a long shaft, which actually looks like an axle and is located in between the engine crankshaft and the rear axle.

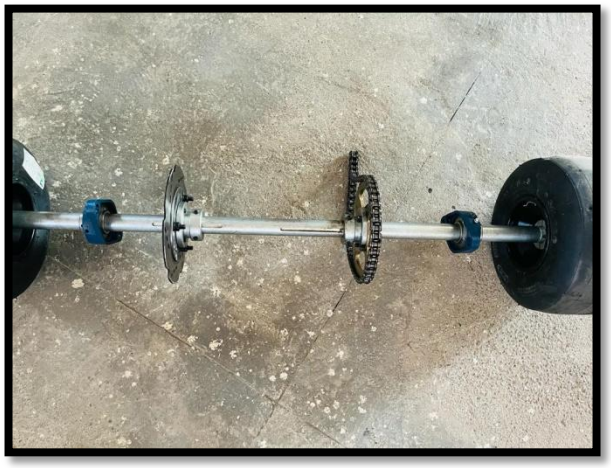

Fig 5. Axle and shaft

Methodology:

The design is mainly focused on the following objectives:

1.Safety, 2. Serviceability,3. Strength,4. Ruggedness, 5.cost, 6.durable, 7.lightweight, 8.high performance, 9.ergonomics, and 10.Aesthetics.

First step in methodology is design of vehicle and finite element analysis which is most important part in designing of vehicle proper material selection is important towards performance and safety of vehicle .The cost of the vehicle should be less as possible.

1.Transmission System

Electric powertrain- EVs have a single-speed transmission which sends power from the motor to the wheels.The motor is powered by a battery or by multiple batteries which store the electricity required to run an EV. The higher the kW of the battery, the higher the range. We have used chain drive type Transmission Between motor and drive shaft. The main advantage being its lightweight, highly efficient, low maintenance characteristics.

2.Braking System

The hydraulic disc brakes are used in motor vehicles to slow down its rotational motion by the help of frictional force. It is caused by pushing the brake pads against the disk rotor. It converts kinetic energy into heat energy that dissipates through the rotor vents and slows down the vehicle. Disc brake offers much better stopping performance.

3.Steering System

Steering system is one of the crucial mechanisms, which are responsible for a smooth maneuver controlling of the vehicle. Apart from the controlling of the vehicle, steering system is expected to display its Good

Ergonomics as well as the ease of use. The primary objective of the any steering mechanism is to reduce the steering effort as possible and for that, decreasing the steering wheel travel which results in a quick responsiveness of the steering wheel.

Results and discussions:

The Chassis was designed and the assembling was done. We have assembled all the components of the E Go kart and as a result our final go-kart is in a well go running condition. As we all know Electric Karting Market size is growing at a moderate pace with substantial growth rates over the last few years our project will help the future generation coming in mechanical department of our college to understand the stream in both technical and theoretical ways.

Conclusions:

There are several factors to be considered that are common to all or any engineering vehicles. With an approach of engineers can come up with the most effective possible product for the society. The chassis is the safest & the foremost reliable car for any racing vehicle. All the parameters like Reliability, safety, Cost, Performance, aesthetics, ergonomics, Standard dimensions & material were also taken in consideration on an equivalent time. Wherever possible finite element analysis was done on the regularly loaded parts. The designing of Go-kart can develop many skills.

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