

FABRICATION OF ELECTRIC TRI CAR

¹M Manikanta Dora, ²K. Veera Venkataramana, ³K. Srisai Kumar, ⁴K. Ramana, ⁵N. Raviraja

¹Asst. Professor, ²UG Student, ³UG Student, ⁴UG Student, ⁵UG Student

Department of Automobile Engineering

Godavari Institute of Engineering & Technology (Autonomous), Rajahmundry, A.P., INDIA.

Abstract : It is planning to made a three wheeled car which will be driven by an electric motor is used for multi purposes like travelling , patient carrying and it will be free from air pollution and noise pollution. This will be planned to carry two people with comfort and the car model will look like vintage cars. In the fabrication process firstly design has done in CATIA V5R20 according to the comfort of driver and to the meet the general requirements of an electric car, and the tests have done in ANSYS WORKBENCH 15.0. After complete design and analysis fabrication of vehicle has started. Round pipes, square pipes and L angular are used in chassis making, the floor of the vehicle has covered with GI sheet and green mat, the roof has covered with cloth and front end has covered with mess. The capacity of the motor that has been used in this Tri car is 1000 w, it is connected to the back wheel by chain, and Rack and pinion steering system has been used for better steering conditions, drum brakes are used for braking of the vehicle. Finally it has done according to the required aspects; it can carry two people in any road conditions, the maximum distance that it can move for full charge is 35 km, and the maximum speed that it can attain is 35 km/h, the amount that has spent for making of this Tri car is 90,000. It is completely eco-friendly and safe to drive in any road condition.

Index Terms - Tri Car, Cutting, Welding, Finishing, Controller, .

I. INTRODUCTION

A Tri car is a vehicle which has either one front wheel and two rear wheels or two front wheels and one rear wheel and can be driven by engine, motor or animal powered. The motorized tricycles legally called as motor cycles, if it is driven by electric motor it is called as tri cycles. The vehicle which was prepared by us has a two wheels at front and one wheel at back.

In daily life we can observe the difficulties of carrying the patients, old people, physically challenged in public places like airports, railway stations, bus stands, hospitals, college campuses etc. To aid such people we decided to a fabrication project to ease the task of carrying them. The final object should not be a simple motorized wheel chair or trolley car. It must be a concept vehicle. For this we had drawn so many drawings and finalized electrically driven Tri-Car with seats of side by side, so that the disabled can get on easily.

A configuration of two wheels in the front and one wheel at back presents two advantages: it has improved aerodynamics and that it readily enables the use of a small light weight motorcycle power plant and rear wheel. Alternatively, a more conventional front motor driving, front wheel drive layout as is common in four wheeled cars can be a used, with subsequent advantages for traversal stability (the center of mass is further to the front) and traction (to driven wheels instead of one) some vehicles have a front motor driving the single rear wheel, similar to the rear motor driving the rear wheel. The wheel must support acceleration loads as well as lateral forces when in a turn, and loss of traction can be a challenged.

For lower wind resistance (which increases battery efficiency), a tear drop shape is often used. A tear drop is wide and round at the front, tapering at the back. The three wheel configuration allows the two front wheels to create the wide round surface of the vehicle. The single rear wheel allows the vehicle to taper at the back.

II. FABRICATION

It includes 9 aspects which are chassis, suspension, steering, body work, and painting. Arc welding used for the joining process, grinding and buffering processes used for shaping, cutting tools used for the cutting process, different tools used during fabrication which are described below.



Fig. 1: Various operations performed during fabrication

2.1 Chassis

The chassis material we have used were mild steel pipes, box pipes and L angular, it is very strong and can be made from readily available natural materials. Steel is made up of carbon and iron, with much more iron than carbon. In fact, at the most, steel can have about 2.1 percent carbon. Mild steel is one of the most commonly used construction materials. It is very strong and can be made from readily available natural materials.

2.2 Suspension system

On a motorcycle with a single shock absorber rear suspension, a single shock absorber connects the rear swing arm to the motorcycle's frame. Typically this lone shock absorber is in front of the rear wheel, and uses a linkage to connect to the swing arm. Such linkages are frequently designed to give a rising rate of damping for the rear. In 1972, Yamaha introduced the Mono-Shock single shock absorber rear suspension system on their motorcycles competing in the Motocross World Championships. The

suspension which was designed by Lucien Tokens became so successful that other motorcycle manufacturers developed their own single shock absorber designs.

2.3 Steering System

The steering system is of important part of the dynamic design of any automobile to facilitate a smooth change of direction and make use of the tyres ability to generate lateral force to the highest event. Racing driver's sensory input supply vision, tactile, and inertial information used in developing a feel for car handling and performance.

Hence the steering is an important feedback mechanism giving the driver information on stability and directional control.

The Rack & Pinion system is actually a simple system that only uses a few different gears to control the direction of the vehicle. The Pinion is the part of the system that is connected to the steering shaft. As you turn your steering wheel, the pinion rotates. This rotation occurs in the grooves of the rack, forcing the rack to move in either direction (depending on the directional change of the steering wheel).

2.4 Seating

The position of the seat fixed by considering the ergonomics means comfort and clear vision to the driver, seats fixed rigidly by using the material of L angular and fitted with the suitable bolts. The seat was fixed at a particular distance from front and rear side according to the centre of gravity. The company we have taken is TATA NANO. These seats are equipped with seat belts for the safety of the driver; we can move these seats to and fro according to the driving condition and position of the driver. The driver has also had a choice to sleep by adjusting the seat.

2.5 Mounting of Motor

The motor was fixed at the rear of the vehicle at back side of seat; a sprocket of 32 teeth was attached to the motor. The motor was fixed rigidly with L clamps and bolts to the frame, from the motor a chain drive was attached to the back wheel for the power transmission purpose.

2.6 Braking System

A brake is a mechanical device that inhibits motion by absorbing energy from a moving system. It is used for slowing or stopping a moving vehicle, wheel, axle, or to prevent its motion, most often accomplished by means of friction.

There are so many types of braking systems are using in present vehicles in that the old type of braking system is mechanical braking system is described below.

1. Mechanical brakes - these acts by generating frictional forces as two surfaces rub against each other. There are two types of mechanical brakes :
 - Drum Brakes: The drum brake has a metal brake drum that encloses the brake assembly at each wheel. Two curved brake shoes expand outward to slow or stop the drum which rotates with the wheel.
 - Disc Brakes: A friction system using a wheel brake to slow the rotation of the automobiles wheels; brake pads are pushed against the brakes rotor with a set of calipers..

2.7 Body Work

In this the information about the total body fabrication was provided, general body works that had done in our project were

1. Arc welding
2. Grinding
3. Cutting
4. Facing
5. Drilling
6. Buffering

2.7.1 Arc welding:

Arc welding is a welding 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 a metal stick ("electrode") and the base material to melt the metals at the point of contact. Arc welders can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes.

The welding area is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated.

2.7.2 Grinding:

Grinding is used to finish work pieces that must show high surface quality (e.g., low surface roughness) and high accuracy of shape and dimension. As the accuracy in dimensions in grinding is of the order of 0.000025 mm, in most applications it tends to be a finishing operation and removes comparatively little metal, about 0.25 to 0.50 mm depth. However, there are some roughing applications in which grinding removes high volumes of metal quite rapidly. Thus, grinding is a diverse field.

2.7.3. Cutting:

Cutting is a compressive and shearing phenomenon, and occurs only when the total stress generated by the cutting implement exceeds the ultimate strength of the material of the object being cut.

2.7.4. Facing:

Facing on the lathe uses a facing tool to cut a flat surface perpendicular to the work piece's rotational axis. A facing tool is mounted into a tool holder that rests on the carriage of the lathe. The tool will then feed perpendicularly across the part's rotational axis as it spins in the jaws of the chuck. A user will have the option to hand feed the machine while facing, or use the power feed option. For a smoother surface, using the power feed option is optimal due to a constant feed rate.

2.7.5 Drilling:

A drilling machine is used when a perfectly sized hole is required to be made on the metal surface and the same is done by applying a combination of force and rotation over the metal surface.

2.7.6. Buffering:

It is the process in which the rust particles which are present on the iron will be removed by simply buffering that part.

2.8 Painting:

Automotive paint is paint used on automobiles for both protection and decoration purposes. Water-based acrylic polyurethane enamel paint is currently the most widely used paint for reasons including reducing paint's environmental impact.

2.8.1. Processes and Coatings:

The body is dipped into the Electro-Coat Paint Operation (ELPO/E-Coat), and then a high voltage is applied. The body works as a cathode and the paint as an anode sticking on the body surface. It is an eco-friendly painting process. In E-Coat, also called CED paint, utilization is approximately 99.9% and has great salt spray test life compared to other painting processes

2.8.2. Primer:

The primer is the first coat to be applied. The primer serves several purposes. It serves as a leveler, which is important since the cab often has marks and other forms of surface defect after being manufactured in the body shop. A smoother surface is created by leveling out these defects and therefore a better final product. It protects the vehicle from corrosion, heat differences, bumps, stone-chips, UV-light, etc. It improves ease of application by making it easier for paints to stick to the surface. Using a primer, a more varied range of paints can be used.

2.8.3. Base Coat:

The base coat is applied after the primer coat. This coat contains the visual properties of color and effects, and is usually the one referred to as the paint. Base coat used in automotive applications is commonly divided into three categories: solid, metallic, and pearlescent pigments.

2.8.4. Clear coat:

Usually sprayed on top of a colored basecoat, clear coat is a glossy and transparent coating that forms the final interface with the environment. For this reason, clear coat must be durable enough to resist abrasion and chemically stable enough to withstand UV light. Clear coat can be either solvent or water-borne.

2.9. Tools and Machinery used

The tools that were used during fabrication are grinding wheel, Cutting wheel, Steel rule, Cutting player, Hammer, Wrenches of different numbers, Vernier calipers, Centre punch, Angle finder, Try square, Buffer wheel, chipping hammer.

2.10. Safety Features

2.10.1 Seat Belt

An adjustable upper belt lets you change the position of the shoulder strap to accommodate a person's size. This feature may encourage passengers to wear their belts, since it increases shoulder belt comfort.

III. RESULTS AND DISCUSSION

3.1 Final View of the Tri Car

Finally the fabrication of Tri car has done, the outlook of the vehicle is similar to the vintage cars. It has taken approximately 45 days for the fabrication and this electrical can carry 2 people up to 30 km for one complete charge. The fabricated tri car is shown below.



Fig. 2. Fabricated Electric Tri Car

3.2 Specifications of Tri Car

specific information of our TRI car project is described below.

Table 1 Specifications of Tri Car

SPECIFICATION	VALUES
Length of the car	9 Feet
Width of the car	5.5 Feet
Wheel base	81 Inches
Track width	56 Inches
Total weight	180 kgs
Capacity of motor	1000W
No. of teeth on motor sprocket	14
No. of teeth on wheel sprocket	32
Seating capacity	2
Maximum mileage	30 km
Maximum speed	36 km/hr
Battery capacity	12V & 42 Amps
No. of batteries	4
Types of brakes	Drum brakes
Type of steering	Rack and pinion steering system

REFERENCES

Books:

1. Electric Motors and Drives, Author: Austin Hughes and bell Drury
2. Practical Electric Motor Hand Book Author: Irving M Gottlieb
3. Manufacturing Technology Author: R.K. RAJPUT

Articles:

4. India's Electric Vehicle, THE HINDU
5. Car and Bike, AN NDTV venture
6. Electric Vehicles in India, AN NDTV Venture
7. Two-wheelers, not cars, a better bet to meet India's Electric Vehicle goal, businessstandard.com
8. In the two-wheeler sharing market, Electric Scooters are getting hot, m.timesofindia.com

Websites:

9. Electric vehicle https://en.m.wikipedia.org/wiki/Electric_vehicle
10. Hub motor https://en.m.wikipedia.org/wiki/Wheel_hub_motor
11. Battery https://en.m.wikipedia.org/wiki/Electric_battery
12. Suspension [https://en.m.wikipedia.org/wiki/Suspension_\(motorcycle\)](https://en.m.wikipedia.org/wiki/Suspension_(motorcycle))
13. Bajaj sunny https://en.m.wikipedia.org/wiki/Bajaj_Sunny
14. Tyres <https://www.amazon.com/SET-TWO-Electric-Scooters-Bikes/dp/B01D5AR2O8>