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Design and Fabrication of Hybrid Tri E-Vehicle

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ABSTRACT: Hybrid Tricycle is a widely used vehicle for transportation throughout India. The basic Tricycle is a three-wheeled design, pedaled by disabled persons in the side and seat in the middle for sitting arrangement. Of all vehicles, hand-powered tricycle are the worst affected by the rough, uneven roads in our country. Manual drive tricycle is more affordable than hand driven. We have developed a solar tricycle especially for disable person or handicap person. In this paper, we have discussed how to utilize solar power through the solar panel or photovoltaic cell and drive the brushless DC motor, battery, toggle switch and the entire component through the reduced human effort.

KEYWORDS: —solar panels, lead acid Battery, Frame, Spur gear, DC Motor, Brush controller. etc.

I. INTRODUCTION

All vehicles that are in the market cause pollution and the fuel cost is also increasing day by day. In order to compensate the fluctuating fuel cost and reducing the pollution a good remedy is needed i.e. our transporting system. Due to ignition of the hydrocarbon fuels, in the vehicle, sometime difficulties such as wear and tear may be high and more attention is needed for proper maintenance. Our vehicle is easy to handle and less fuel cost to the other existing vehicle. So this project “hybrid tri electric cycle” is very much useful, since it is provided with good quality of power sources and simple operating mechanism. Hence “each and every drop of fuel saves our economy and meet the needs” is the saturation point that is to be attained as soon as possible. Hybrid electric vehicles (HEV) are the short-term solution to the reduction in the demand for fossil fuels. HEVs pose a challenging energy management problem. The renewable energy is vital for today’s world as in near future the nonrenewable sources that we are using are going to get exhausted. The hybrid electric vehicle is a step in saving these nonrenewable sources of energy.

Much research has been done in recent years in HEV control and several management and control strategies have been proposed. These strategies include optimal, intelligent, as well as rule - based approaches. At present, hybrid electric vehicles are being developed and launched into the market. For long distance travelling it is necessary of periodic charging of their batteries, so this vehicle depends on the electrical sources. on this project work proposes to use solar and wind power to run the vehicle also leads to increase the cost of electricity. These kinds of problems will be solved by using hybrid solar vehicles.

II. LITERATURE REVIEW

Since the 1970s, inventors, government, and industry have helped to develop solar-powered cars, boats, bicycles, and even airplanes. In 1974, two brothers, Robert and Roland Boucher, flew an extremely lightweight, remote-controlled, pilotless aircraft to a height of 300 feet. It was powered by a PV array on the wings. (The U.S. Air Force funded the development of these aircraft with the hope of using them as spy planes.) The first totally solar-powered car was building 1977. It was small, lightweight, and cost relatively little. Experimental SPV’s, equipped with advanced technology, have been built with the backing of major auto manufacturers, including General Motors, Ford, and Honda. There will be a big area at the agi campus ward when it is fully built and operates. So students need a vehicle to move from one side to another. In state of using car or motorcycle that are costly, student will be prefer to used tricycle as their vehicle.

There several types of tricycle that can be chosen such as paddle tricycle, motorized tricycle and electric tricycle. But there are some weaknesses about that type of tricycle. To overcome the weakness this project will develop a better tricycle. Because of India is located in the topic of Capricorn area, this project will make used the energy of the sun that rarely used in India to generate the tricycle. As what had been mention earlier, there are several types of tricycle that can be categories that is paddle tricycle, motorized tricycle, and electric tricycle. The weakness of the tricycle make the people do not like to used tricycle. First, paddle tricycle needs a lot of energy to paddle the tricycle. The user will surely be tired after used the tricycle. This will not suitable for student to use to go to the class because they will be tired when they are in the class and will lost their concentration while hearing the lecture. Next, motorize tricycle that used fuel as it prime mover. The tricycle use fuel that is costly. As student, their allowance is limited and only can be used for their study material and for their food to survive at the campus. Besides that, motorize tricycle will make pollution that can be very bad for our environment especially in this period that global warming happen to the earth. Lastly, electric tricycle that generate by battery can be only be sufficient for about an hour. The user needs to find power supply to recharge the battery or else they need to paddle the tricycle that used more energy compare to the normal tricycle because of the weight.

1. SCHEMATIC DIAGRAM

- Manufacturing processes are the steps through which raw materials are transformed into a final product.
- The manufacturing process begins with the creation of the materials from which the design is made.
- These materials are then modified through manufacturing processes to become the required part.
- Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material.
- The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.

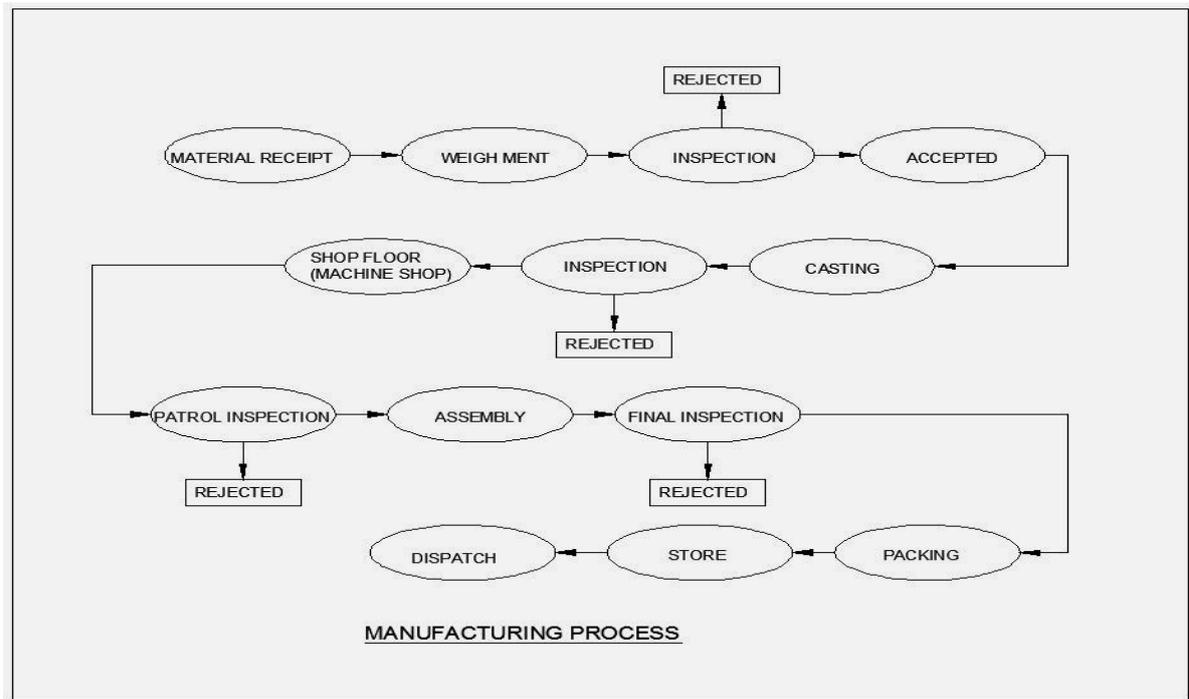
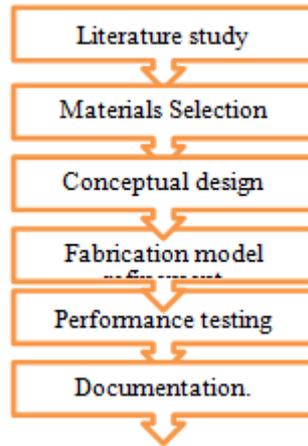


Fig 1.1 Schematic Diagram of Hybrid Tri E-Vehicle

2. PROPOSED METHODOLOGY



3.OBJECTIVES

1. The main objective of this project work is to design and develop prototype electric vehicle using solar energy.
2. To provide a solution for reducing usage of fossil fuels, by using available renewable energy source i.e. solar and wind energy.
3. It doesn't cause any damage to the nature.

4. REQUIREMENT OF COMPONETS

A. FRAME: -

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

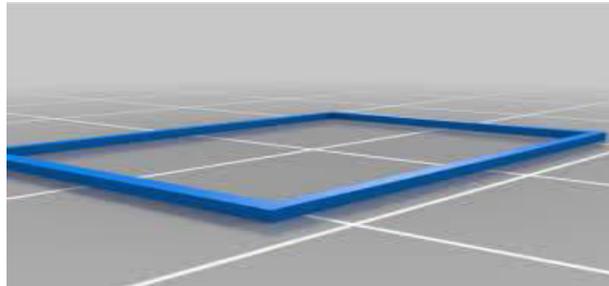


Fig 4.1 Frame

B. LEAD ACID WET CELL: -

Where high values of load current are necessary, the lead-acid cell is the type most commonly used. The electrolyte is a dilute solution of sulfuric acid (H_2SO_4). In the application of battery power to start the engine in an auto mobile, for example, the load current to the starter motor is typically 200 to 400A. One cell has a nominal output of 2.1V, but lead-acid cells are often used in a series combination of three for a 6-V battery and six for a 12-V battery. The lead acid cell type is a secondary cell or storage cell, which can be recharged.



Fig 4.2 lead acid wet cell

The charge and discharge cycle can be repeated many times to restore the output voltage, as long as the cell is in good physical condition. However, heat with excessive charge and discharge currents shortens the useful life to about 3 to 5 years

for an automobile battery. Of the different types of secondary cells, the lead-acid type has the highest output voltage, which allows fewer cells for a specified battery voltage.

C. DC. MOTOR / GENERATOR:

An electric motor is a machine which converts electrical energy to mechanical energy. Its action is based on the principle that when a current-carrying conductor is placed in a magnetic field, it experiences a magnetic force whose direction is given by Fleming's left-hand rule. When a motor is in operation, it develops torque. This torque can produce mechanical rotation. DC motors are also like generators classified into shunt wound or series wound or compound wound motors.



Fig 4.3 DC. motor / generator

D. BEARING: -

The bearings are pressed smoothly to fit into the shafts because if hammered the bearing may develop cracks. Bearing is made up of steel material and bearing cap is mild steel. However, such bearings cannot be used indiscriminately without a careful study of the loads and operating conditions. In addition, the bearing must be provided with adequate mounting, lubrication and sealing. Design engineers have usually two possible sources for obtaining information which they can use to select a bearing for their particular application.



Fig 4.4 Bearing

Catalogs Textbooks are excellent sources; however, they tend to be overly detailed and aimed at the student of the subject matter rather than the practicing designer. They, in most cases, contain information on how to design rather than how to select a bearing for a particular application. Manufacturers' catalogs, in turn, are also excellent and contain a wealth of information which relates to the products of the particular manufacturer. These catalogs, however, fail to provide alternatives – which may divert the designer's interest to products not manufactured by them. Our Company, however, provides the broadest selection of many types of bearings made by different manufacturers. For this reason, we are interested in providing a condensed overview of the subject matter in an objective manner, using data obtained from different texts, handbooks and manufacturers' literature. This information will enable the reader to select the proper bearing in an expeditious manner. If the designer's interest exceeds the scope of the presented material, a list of references is provided at the end of the Technical Section. At the same time, we are expressing our thanks and are providing credit to the sources which supplied the material presented here.

E. SOLAR PANEL

Solar panel refers either to a photovoltaic module, a solar thermal energy panel, or to a set of solar photovoltaic (PV) modules electrically connected and mounted on a supporting structure. A PV module is a packaged, connected assembly of solar cells. Solar panels can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions (STC), and typically ranges from 100 to 320 watts. The efficiency of a module determines the area of a module given the same rated output an 8% efficient 230 watt module will have twice the area of a 16% efficient 230 watt module. There are a few solar panels available that are exceeding 19% efficiency. A single solar module can produce only a limited amount of power; most

installations contain multiple modules. A photovoltaic system typically includes a panel or an array of solar modules, an inverter, and sometimes a battery and/or solar tracker and interconnection wiring.



Fig 4.5 Solar panel

F. WHEEL:

Motorcycle wheels are made to cope with radial and axial forces. They also provide a way of mounting other critical components such as the brakes, final drive and suspension. Wheels, and anything directly connected to them, are considered to be unsprung mass. Traditionally motorcycles used spoked wheels with inner tubes and pneumatic tyres. Although cast wheels were first used on a motorcycle in 1927, it would not be until the 1970s that mainstream manufacturers would start to introduce cast wheels on their road going motorcycles. Spoked wheels are usually made with steel spokes and steel or aluminum rims.



Fig 4.6 Wheel

Cast wheels are predominantly made from aluminum or an alloy of, but can also be made from more exotic materials such as magnesium or carbon fiber. The advantages of the cast wheels versus spoked are several, and include the use of tubeless tires for higher speed and better retention of inflation; better out tolerance and the elimination of spoke maintenance; better rigidity and thus better handling; weight reduction due to smaller hub size and better handling of side loads for motorcycles with sidecar rigs.

G. SPUR GEAR

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with the Spur gear is projecting radially. Viewing the gear at 90 degrees from the shaft length (side on) the tooth faces are straight and aligned parallel to the axis of rotation. Looking down the length of the shaft, a tooth's cross section is usually not triangular. Instead of being straight (as in a triangle) the sides of the cross section have a curved form (usually involute and less commonly cycloidal) to achieve a constant drive ratio. Spur gears mesh together correctly only if fitted to parallel shafts. No axial thrust is created by the tooth loads. Spur gears are excellent at moderate speeds but tend to be noisy at high speeds.

Spur gear can be classified into two pressure angles, 20° being the current industry standard and 14½° being the former (often found in older equipment).^[3] Spur gear teeth are manufactured as either involute profile or cycloidal profile. When two gears are in mesh it is possible that an involute portion of one will contact a non-involute portion of the other gear. This phenomenon is known as "interference"

and occurs when the number of teeth on the smaller of the two meshing gears is less than a required minimum. Undercutting (cutting the tooth narrower closer to its base) is sometimes used to avoid interference but is usually not suitable because the decreased thickness leaves the tooth weaker at its base. In this situation, corrected gears are used. In corrected gears the cutter rack is shifted upwards or downwards.



Fig 4.7 Spur gear

H. SHAFT

A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power



Fig 4.8 Shaft

III. RESULT

TRAILS	LOAD	LOAD IN KG	SPEED KM/h
TRAIL 1	WITHOUT LOAD	0	11 -13
TRAIL 2	WITH LOAD	50	8-10

IV. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between the institution and the industries. We are proud that we have completed the work with the limited time successfully. is working with satisfactory conditions. We can able to understand the difficulties in maintaining the tolerances and also the quality. We have done to our ability and skill making maximum use of available facilities.

In conclusion remarks of our project work, let us add a few more lines about our impression project work. Thus, we have developed a hybrid system for tri electric cycle which helps to climb up the walls of high-rise buildings at a significant low cost which may be used for several applications. By using more techniques, they can be modified and developed according to the applications.

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4. **Bor Yann Liaw Et.al** [4] investigated driving cycle to understand the battery performance in real-life electric hybrid vehicle.
5. **Karan C. Prajapati Et.al** [5] investigated about the type of hybrid vehicles and have given us information about the different types of hybrids in their paper and concluded that there are six types of hybrids which include the plug ins and self-charging types.
6. **Teresa Donate Et.al** [6] in her paper of intelligent usage of IC engines in hybrid vehicles stated that focuses on different approaches presented in literature on the usage of information about traffic and weather conditions for the optimal energy management of hybrid electric vehicles.
7. **Ivan Arsie Et.al** [7] have given us information on the possibilities hybridizing the currently used Fuel engines with renewable sources of energy.
8. **Jinmingliu Et.al** [8] investigated about the Toyota Hybrid System [THS] is used in Toyota Prius and compared the two major types of hybrids with the split power hybrids.



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