

Fabrication and Development of Solar Powered Cart

D.Apparao¹, N. Yaswanth², K. Akhil Vinay³, Gopi Naga Babu⁴, Ch. Varun Kumar⁵,

Dr.V. Sridhar Patnaik⁶

^{1,2,3,4,5} B. Tech Final Year Students, Dept of Mechanical Engineering, Visakha Institute of Engineering and Technology.

⁶ Professor, Dept of Mechanical Engineering, Visakha Institute of Engineering and Technology.

Abstract - Electric vehicles (EVs) are becoming increasingly popular due to their eco-friendliness and low operational costs. However, the use of fossil fuels to generate electricity to charge these EVs undermines their sustainability goals. Combining solar energy with EV charging can create a sustainable and clean transportation system, which can reduce our dependency on non-renewable energy sources. The overall objective of the project is to develop and fabricate an optimized, efficient solar powered electric cart charging with bi-directional smart inverter control that can be used on campus in transporting and carrying Stationary loads. Subsystems such as the frame, drive train, power, suspension, Brakes and Steering that are modeled and analyzed through quantitative methods are purchased and fabricated. The cart is fabricated as per its design for 250kg load carrying capacity, acceleration of 1.2 m/s² and maximum achievable speed of 15km/h with a power rating of about 1.5kW. Secondary support software such as Excel, and solar analyzing software were used to assist in the planning of the various subsystems as well as data collection and assortment. The proposed model provides the IOT-based smart solar energy consumption analysis and control model by using solar photovoltaic micro grid. The proposed IOT design must meet product and process requirements.

Key Words:

Power optimization, golf cart, solar transport, Photovoltaic, Solar-powered, Emission Analysis, Environmental. Solar power.

1.INTRODUCTION

The issues of climate change or global warming have been rigorously discussed by many governments since the early 21st century. A great number of relevant reports have revealed the negative impact of climate changes dominantly driven by human activities. With the globally increasing civilisation and industrialization, a large number of fossil fuel burnings in industries have led to the acute problem of air pollution (Wee, 2010). Simultaneously, the exhaust emissions from automotive vehicles cannot be ignored. Vehicle emissions, which mainly include CO₂, CO, NO_x and particulate matters (PM₁₀ and PM_{2.5}), have been considered as the major contributors to the effect of greenhouse gases, also leading to the increase in different forms of cancers and other serious diseases (Fenton and Hodgkinson, 2001; Fajri and Asaei, 2008).

The ever rapidly growing transportation sector consumes about 49% of oil resources. Following the current trends of oil consumption and crude oil sources, the world's oil resources are predicted to be depleted by 2038 (Ehsani et al., 2010). Therefore, replacing the non-renewable energy resources with renewable energy sources and use of suitable energy-saving technologies seems to be mandatory. Electric Vehicles (EVs) as a potential solution for alleviating the traffic-related environmental problems have been investigated and studied extensively (Clement et al., 2009; Hajimiragha et al., 2010; Stephan and Sullivan, 2008). Compared to ICEV, the attractive features of EVs mainly are the power source and drive system.

2.0 SYSTEM OF SOLAR CART VEHICLE

2.1 CHASSIS



It is also known as a non-load-carrying frame. This type of chassis is made as a separate unit and joined with a ladder frame. This supports all the systems like [braking system](#), transmission system, [suspension system](#), etc. These chassis frames are normally seen in large trucks and SUVs. Here loads on the vehicle transferred to the suspension system by frame

3.1 FABRICATION METHODS:

- PIPE BENDING.
- BEVELLING.
- WELDING .
- REAMING.

3.1.1. PIPE BENDING:

In the pipe bending process we select the cnc pipe bending process to bend the pipe with a fine accurate dimensions what we need .

CNC Piping: -

Most bending operations now a days require only manual help, not continuous guidance. This is possible thanks to the bending machine with the CNC tubing. CNC stands for computer Numerical Control Machines. It is a term often used in manufacturing to describe a computer operating its operations in combination with programming software.

Popular tools for CNC machines include lathes, drills, and other tools for processing the programming software is used by the operator to enter the data necessary for the operation. The computer then executes those operations automatically. Pipe bending machines operated by CNC typically use a combination of presses and rollers to direct

pipes and pipes in the process. CNC pipe bending machines increase productivity and performance with the use of automation.

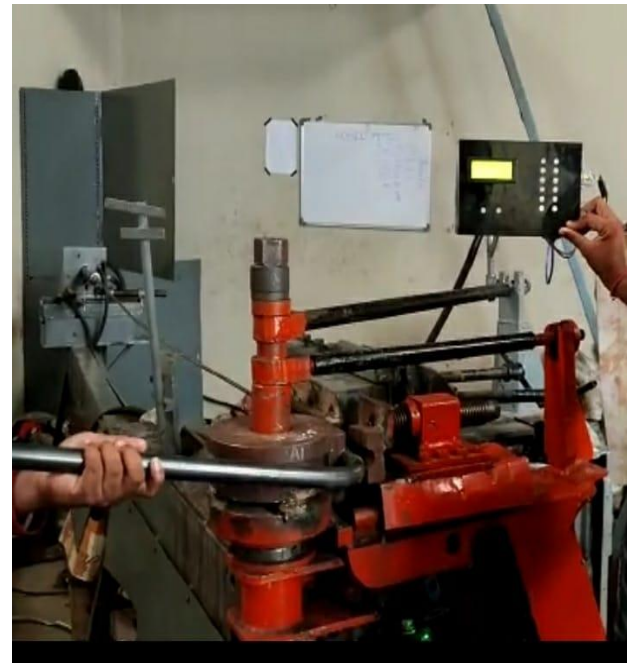


Fig 3.1: CNC Pipe Bending Machine

3.1.2 Portable grinding machine: -

This is a small grinder operated with electric power. It can be easily carried anywhere. Grinding can be done by holding it in hand. It is used for cleaning heavy welding jobs.

On one end of the motor shaft, a grinding wheel is fitted and on the other end, a handle or switch for operating the machine is fixed according to our convenience. It should be used carefully since there is a possibility of getting an electric shock.

Fig 3.2 Portable grider



3.3 Flexible grinder



3.1.3Bevelling: -

Beveling is a process used to **prepare metal for a welded seam by cutting a slope at an angle on the edge of the metal**. This weld preparation sequence is an integral part of building everything from simple metal cabinets to complex metal structures to erecting bridge work.

The beveling process is done by using beveling machine which will make the end of the pipe surface inclined.



Fig 3.4: beveling machine.

3.1.4 WELDING:

Welding is a permanent joining process in which two pieces of metal together to form one piece by heating the metals to their melting points. Additional metal also called filler metal is added during the heating process to help bond the two pieces together.

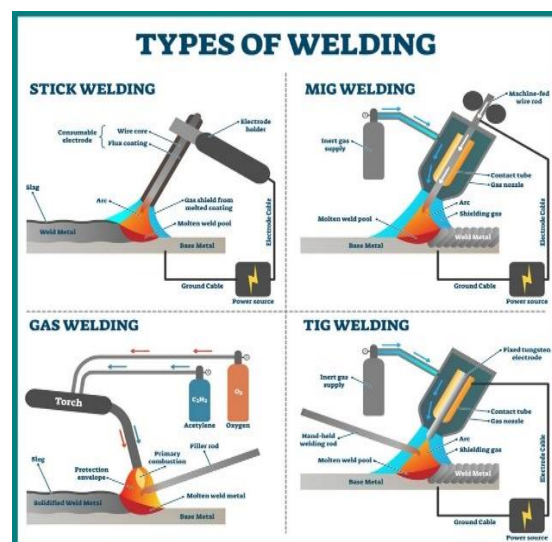


Fig 3.5 TYPES OF WELDING

There are different types of welding process, we choose tig welding process for the fabrication of EV-Tricycle.

3.1.5 REAMING:

Reaming involves widening the opening of a hole. Reaming is a cutting process in which a cutting tool produces a hole of a very accurate size. Reaming is a finishing operation of high-precision holes performed with a multi-edge tool. High surface finish, superb hole quality and close dimensional tolerance are achieved at high penetration rates and small depths of cut. When performing reaming operations, there are several parameters that affect reamer tool life to consider.

4 PARTS IN SOLAR CART VEHICLE:

1. Chassis: First of all, the chassis is constructed. The AISI1018 Carbon steel pipe taken as per the dimensions and bends in required places using bending machine.

2. Axle: The required shaft is taken as per the dimensions and turned on the lathe.

3.Sprocket: The sprocket is connected to the BLDC Motor.

4.Brake: The brake is also placed in the axle in the rear side. The brake drum is connected and is connected to rear side back of vehicle.

5. Accelerator: The accelerator pedal is place in the right side of the front of vehicle and is connected to the motor.

6. BLDC Motor: Brushless DC Motors or BLDC Motors have become a significant contributor of the modern drive technology. Their rapid gain in popularity has seen an increasing range of applications in the fields of Consumer Appliances, Automotive Industry, Industrial Automation, Chemical and Medical, Aerospace and Instrumentation.

7.BATTERY: Lithium battery provides users with reliable and high-performance batteries. Its energy density, safety, charge retention, long endurance all show excellent performance. It is an ideal choice for two wheels / three wheel electric vehicles, logistics robots, etc.

8.Rear Wheel And Tyres: The One wheel is connected to the ends of the axle and bolted. Then the assembly is connected to the chassis using bushed bearing.

9.Steering: The steering spindle and steering are made as per the dimensions and bolted together. This is connected to the plate and link mechanism. This mechanism is connected to the 2 front wheels. This type of vehicle steering works based on the Rack and pinion steering mechanism.

10.Seat: First the seat is mounted on seat stand using bolts and the seat is bolted on the chassis.

11.Electric Starter: The battery is placed down inside the seat and connecting to the starting motor using wires. The use of the battery we place a self-switch for the motor.

12.Painting: The painting is done to increase the appearance of the vehicle. The chassis steering and steering spindle, wheels, seat, etc. are painted using colours.

13.Solar Panel: solar panels are those devices which are used to absorb the sun's rays and convert them into electricity.

5 ASSEMBLY

5.1 ASSEMBLY OF MOTOR TO REAR WHEEL:

Brushless DC electric motor (BLDC motors, BL motors) also known as electronically commutated motors (ECMs, EC motors), or synchronous DC motors, are synchronous motors powered by DC electricity via an inverter or switching power supply which produces an AC electric current to drive each phase of the motor via a closed loop



Fig 5.1: Rear wheel motor

6.SAFETY MEASUREMENTS

6.1General Safety Checklist:

Before setting out for a trip on your [Hybrid](#) vehicle, make sure that everything is in order. You can check the following things to ensure safety

1. Lights are working properly.
2. Check your brakes.
3. Tires are inflated.
4. The seat is secure and properly fastened.
5. Steering are fixed and secure.



CONCLUSION

“The Design and Fabrication of Hybrid Vehicle” of self-designed and self-assembled has been carried out by our team with diligent and continuous effort. The design of the chassis and relevant components are designed by using the Fusion 360 software by one of the project teams of our college. Then the fabrication process is started by applying the methods like Pipe bending, Pipe cutting, beveling, welding, reaming and grinding processes. Followed by the completion of fabricating the components of the vehicle the power transmission system is placed by means of motor to the rear wheel through chain mechanism. The connections for the motor and solar panel are given from the battery through the controller. The power generation by the solar equipment is sufficient to supply the power to lights and horn. For protecting the kart from atmospheric corrosion paints are applied. The project has succeeded to run the vehicle by means of both battery and solar panel.

REFERENCES

1. A Ajith Kumar¹, Chandru R¹, Devarajan K¹, Harish S¹, C D Hampali².
2. Ajit B. Bachche et al. “Solar hybrid tricycle”.
3. Henry M. Gannon, et al: “Multi wheeled vehicle”
4. Glenn C. Streif, et al. “Solar intensifying collector’s”
5. Arvind Prasad et al. “Powered Wheelchairs”
6. Arun Manohar Gurrama et al. “Solar Powered Wheelchair:
7. Md. Shahidul Islam et al.
8. Nida Riaz et al.
9. Umesh M. Laybar, Neha W. Makode, Shubham U. Tayde, Prof. Bhushan S. Rakhonde.
10. A.H. Ingle, Buddhhabhushan Wankhade, Nikesh Lanjewar, Amol Umale.
11. Mr. Prashant Kadi.
12. M. Viswanath, K. M. Arunraja, K. Lakshan Raaj.
13. Omkar S Chitnis, Dept of EEE, KLE Dr.M.S.Sheshgiri College of Engg& Tech, Belgavi.