



Hybrid Powered Vending Cart

Dr. Sayyad Naimuddin¹, Awez Sheikh², Sangharatna Somkuwar², Shadan Sheikh², Shweta Mate², Zoheb Sheikh²

¹Professor, Electrical Engineering Department, ACET/ RTMNU/ Nagpur, Maharashtra, India

²UG Scholar, Electrical Engineering Department, ACET/ RTMNU/ Nagpur, Maharashtra, India

ABSTRACT

A 'Hybrid Powered Vending Cart' has been designed and developed in accord with citing two major concerns of our society, better livelihood and good health. Basically, in urban societies, better livelihood comes from good incomes, which collaterally comes from adequate employability rate or provisions of employment. Similarly, good health is a product of consuming edible good food and this most of the good food comes from good vegetables & fruits. But, when we try to gross such vegetables & fruits, it's quite difficult to fetch them because both vegetables & fruits tend to get musty and inedible very quickly as soon as they get cut. Thus, to overcome this difficulty we have a developed this unique mobile street vending cart with an installed working refrigerator. This arrangement will not only help to keep vegetables fresh for at least 2 to 3 days, but also, it will benefit the vendor's health, lessening the exhaustion by notably reducing the human efforts required in providing mobility to the vending cart. The vendor can easily travel, across, in and around the city for selling vegetables and fruits.

Keywords : Hybrid Powered Vending Cart (HPVC), Reverse tricycle vending cart, refrigeration system, BLDC Hub Motor, Lead-acid batteries, Solar panel.

I. INTRODUCTION

There is a rapid increase in the migration of people from rural areas to urban areas, incited by accelerating urbanization and industrialization, in search of adequate employability, better livelihood and upgraded living standards. But, the urban centres and their provisions are insufficient to provide employment to the entire incoming workforce, thus, the unemployed have to find other opportunities of settlement in the informal sector. Within this informal sector, the street vendors sell their goods in the competitive market.

A number of these urban poor are involved in street vending in poor living conditions due to less income. Street hawkers, are often described from an economic, cultural and legal perspective, are those people who offer goods or services for sale in public places, primarily streets and pavements. Street hawking is a phenomenon present globally and the most notable aspect of the informal sector. These street hawkers are those who are incapable to procure regular jobs in the lucrative formal sector due to incompatibility in the job requirements due to their lower education and skills qualifications. They are solving their livelihood problems with their own measures of monetary resources. They are the prime facilitation channel for many types of day to day use goods and

utilities like household gadgets, toys, stationery, newspapers, and magazines, perishable items, fruits, vegetables, milk, readymade garments, shoes and so on.

II. LITERATURE SURVEY

As per the study of street vending by Mr. Sharit Bhowmik [1] in seven cities from Mumbai, Ahmedabad, Kolkata, Imphal, Patna, Bhubaneswar and Bangalore. It stated the problems of street vendors in urban areas. It identifies some common traits of street vending in all the seven cities. The daily income (profit) of the street vendors ranged from Rs. 50-100 for males and Rs. 35-40 for females. They were constantly troubled by the municipal authorities and the police. The situation of street vending in Patna was worst where bribery rate was very high. The working condition of the many street hawkers is very pathetic and most of them are compelled to live a very hard life due to poverty. They worked for more than 10 hours a day to earn an adequate income.

Jonathan Shapiro Anjaria [2] studied the life of street vendors in Mumbai. It was revealed that in the central areas of Mumbai, many former mill workers and their families have been compelled to pursue street hawking. Many street hawkers were migrants from various rural areas. It was because of ease of market entry and the limited requirement of initial capital, they have entered street vending. It was also because of lack of other employment opportunities, individuals have taken up street vending. Many hawkers make a regular payment to the police and the BMC in the form of money or assets.

As per the study by Sonawane, S.T. [3] on street vendors of Bangalore based on 80 street vendors from Lalgagh, Avenue Road, MG Road, Brigade road,

Maleeshwaram, Tannery road, Ulsoor lake and CMH road. The study revealed that most of the street vendors belonged to Karnataka. And very few were migrants from Tamil Nadu, Bihar, Andhra Pradesh.

Pradesh, Uttar Pradesh and West Bengal. The study also revealed that 40% of the respondents knew at least 2 languages, 56% were from family size with below 5 members, 49% travelled to their work place by bus, 72% spent more than 8 hours at work and many suffered because of increasing pollution in the city. All the street vendors paid bribe regularly.

Testing of vegetables such as tomatoes, potatoes, and leafy vegetables, oranges, grapes, carrot, radish, beet, banana, cauliflower have been carried out and their shelf life was increased considerably.

3.Design of solar powered reverse tricycle vending cart with refrigerator

Solar powered reverse tricycle vending cart with refrigerator is basically a three wheeler cycle rickshaw has been modified to accommodate working fridge.

The tricycle is redesigned to take into consideration of load of vegetables and cooling system inbuilt in the fridge to avoid any chance of the failure possible. It has been redesigned by taking into consideration following points.

1. Mechanical design
2. Utilisation of space
3. Total power requirement.

III. SELECTION OF THE COMPONENTS

The different components used are listed below:

- 1) BLDC Hub motor
- 2) Refrigerator

- 3) Solar Panels
- 4) Solar Charge Controller
- 5) Batteries
- 6) Step down transformer
- 7) Inverter
- 8) BLDC Hub Motor Controller
- 9) Ball Bearing (Pivot Joint)
- 10) Mild Steel Rods

1. BLDC Hub Motor

Almost every mechanical movement that we see around us is accomplished by an electric motor. Electric machines are a means of converting energy. Motors take electrical energy and produce mechanical energy. Motors are broadly classified into two types AC motors and DC motors. The AC motors operate on alternating current whereas the DC motors operate on the direct current. After doing the surveying on the DC motor we came to the conclusion that BLDC Hub motor is the best for our application. The selection motor should be proper such that it should be able to generate the enough torque to move the vehicle in forward path. That is the reason we select the BLDC motor of 750 W capacity for our project. BLDC Hub motor is responsible for the mobility of the cart.

2. Refrigerator

A 115 v, 50 hz, 1.1 amp, 45 litres is mounted on the platform of the cart to provide the cooling storage for the vegetables or the food item those will be suppose to be sold by the vendors. The power consumption of the fridge is approximately

3. SOLAR PANEL- 2*20w, 1*40w

Solar panel works on the principal of photovoltaic (PV) effect. In general, the photovoltaic effect means the generation of a potential difference at the junction of two different materials in response to visible or other radiation. The whole field of solar

energy conversion into electricity is therefore denoted as the “photovoltaic”. Photovoltaic literally means “light-electricity”, because “photo” is a stem from the Greek word “phos” meaning light and “Volt” is an abbreviation of Alessandro Volta’s (1745-1827) name who was a pioneer in the study of electricity. A popular and common term to refer to PV solar energy is solar electricity. The sun gives off radiated energy in the form of light photons which is converted into electrical energy by the solar panels. Solar panels are composed of silicon based semiconductors and when the radiation comes in contact with the silicon atoms, the photons are absorbed and the electrons are separated from the rest of the atoms. These free electrons are responsible for carrying and creating an electrical current. The electricity generated is most usually stored in batteries to be used later. These Solar Panels generally used for small off grid systems like Solar Lantern, Solar Mobile Charger, small Solar Battery Banks, Solar Garden Lights, Solar Street Lights Etc. Here is complete Detail, Size, Watt, Volt, Working.

Technical Specification and Cost of the 20w, 40w solar panel.

4. Solar Charge Controller

Solar power charge controller is used in various sectors. For instance, it can be used in solar home system, Hybrid systems, solar water pump system etc. In this, a solar panel convert’s sunlight energy into electrical energy through an electrochemical process also known as photovoltaic process. Energy is stored in the battery with the help of solar panel through a diode and a fuse. Energy stored in the battery can be used when there is no sunlight as during discharge, chemical energy is converted into electrical energy which in turn illuminates electrical appliances. Hence, it is needed to protect battery form overcharge, deep discharging mode while dc loads are used or in under

voltage as it is the main component in a solar power charge controller.

For our application we select PV solar charge controller as it is designed for use with all types of 12V photovoltaic panels/systems and different types of 12V batteries, such as wet or sealed lead acid, lead calcium and lead antimony battery.

5. Batteries

An electrochemical power source or battery is a device which enables the energy liberated in a chemical reaction to be converted directly into electricity. Batteries fulfill two main functions, they are portable sources of electric power and they are used to store the electrical energy. 4 batteries of 12v each are connected in series to fulfil the need of motor of 48v. As the motor is of 750 w, it draws power from the batteries.

6. Step down transformer

A step down transformer of 230v/115v, 3 amp is needed for the stepping down of the voltage so as to supply it to the fridge for the operation.

7. Inverter

An inverter of 12v/ 230v is needed to boost the voltage so as to further could be supplied to the transformer for the refrigerator operation.

8. BLDC Hub Motor Controller

A 12 volt solar charger is surprisingly easy to build and will help you save money, reduce pollution and reduce dependence on foreign oil. This article will talk about the different kinds of solar battery chargers, which type is best and even how to build your own 12 volt solar charger. The simplest battery charger is just a power supply that sends electricity of the correct voltage to a battery. You can connect battery to the power supply until the battery is fully charged

and then disconnect it. For a 12 volt battery, you can plug it into a 15-18 volt power supply and then, when it is fully charged, disconnect it. Unfortunately, though there is nothing to prevent you from overcharging the battery using such a simple system. Charger controller to make sure that you don't overheat.

9. Ball Bearing (Pivot joint)

A bearing is a machine element which supports another moving machine element (known as journal). It permits a relative motion between the contact surfaces of the members, while carrying the load. Bearings are used to support large skyscrapers to allow them to move during earthquakes, and bearings enable the finest of watches to tick away happily. Without bearings, everything would grind to a halt, including people, whose joints are comprised of sliding contact bearings. There are two types of bearings, contact and noncontact. Contact-type bearings have mechanical contact between elements, and they include sliding, rolling, and flexural bearings. Mechanical contact means that stiffness normal to the direction of motion can be very high, but wear or fatigue can limit their life. Non-contact bearings include externally pressurized and hydrodynamic fluid-film (liquid, air, mixed phase) and magnetic bearings.

10. Mild Steel Rods

Carbon, other elements and inclusion within iron acts as hardening agents that prevent the movement of dislocations that naturally exist in the iron atom crystal lattices. Fig. 3.12 shows the schematic of Mild steel bars. Varying the amount of alloying elements, their form in the steel either as solute elements or precipitated phases, retards the movement of those dislocations that make iron so ductile and weak and so it controls qualities such as the hardness, ductility

and tensile strength of the resulting steel. But only by trading away ductility of which iron has an excess.

Solar Panel Capacity

The power required to charge the battery is given by the solar panel. Total power of solar panels required to drive the cart can be calculated as,

$$\text{Total power of solar panels} = [\text{battery voltage} \times \text{battery capacity} \times (1 + \text{loss}) \times (1 - \text{state of charge})] / \text{charge duration in hours} \quad (12)$$

Assume,

State of Charge = 0%

Losses = 25%

Charge duration in hours = 6 hours

Then, total power of solar panel

$$= [24 \times 17.76 \times (1 + 0.25) \times (1 - 0)] / 6$$

= 88.8 watts.

5. Performance Evaluation

Experiments were conducted on the HPVC for the no load condition & loaded condition.

Thermocouples copper constantans were mounted to measure temperature at various locations. The sling psychrometer is used to measure the wet bulb temperature.

Results indicate that the cooling chamber maintains the temperature of 18 -20 C throughout the day. The graph of temperature vs time of the day clearly indicates the above observation. This temperature is sufficient to maintain the freshness of vegetables. Thus the vendor can sell it at high prices.

IV. CONCLUSION

The traditional and conventional carts require tremendous human efforts to move and don't have cold storage facility, which causes great inconvenience to the vendors. These street vendors

are the medium between the farmers and consumer who cannot afford to sell their goods in big markets. We can reduce unemployment if we can involve the mid-range people in this type of business as well. As the cost of cart is not very high but we can further reduce the cost if we go for mass production and government provide the subsidy. Government can provide different identification system to manage the vendors and to manage the business.

1) Refrigeration cooling systems have a very large potential to propitiate thermal comfort. Nowadays, refrigeration cooled storage system is increasingly being used for on-farm storage of fruits and vegetables. Refrigeration cooling system not only lowers the air temperature surrounding the vegetables and fruits, it also increases the moisture content of the air.

2) This street vending cart is developed for common vegetable and fruit vendors. The cost of the cart is very low relative to other conventional carts and affordable for the street vendors.

3) The fabrication of this street vending cart is very simple and no need of any special skills. The assembly and disassembly of cart is very simple, no external help is required.

4) The refrigeration system installed in the cart can regulate the temperature about 15-16 degrees than surroundings temperature, such that shelf life of vegetables also increases.

V. REFERENCES

- [1]. Sharit Bhowmik, Study on Hawkers and The urban Informal Sector: A Study of Street Vending in Seven Cities, NASAVI Publisher, 2001.
- [2]. A.Bharathi Sankar, R.Seyezhai (2016) SCIENTIFIC RESEARCH PUBLISHING SIMULATION AND IMPLEMENTATION OF SOLAR POWERED ELECTRIC VEHICLE