Experimental Investigations of a Solar Vehicle for Poliomyelitis Effected People

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Abstract: The Developing Countries like India facing so many health problems like Poliomyelitis (often simply called polio) and Florolasis are the major problems. In the present work it is designed and manufactured a suitable vehicle that shows a bright opportunity to the suffering people. This vehicle will work on solar power, electrical and muscle power according to the availability of the power source. Day by day consumption of conventional fuels goes on depleting in rapid way. Therefore the present investigation focussed on the use of non-conventional energy resources. This vehicle will helpful for both the elderly and the handicapped people in their daily routines. The fact that they are no longer depending on someone else to perform daily duties so a big step forward in their lives. A large variety of mobility vehicles are available, from which one is to be selected as per mobility Vehicles are designed based on the usage, i.e. either indoor or outdoor. While making vehicle we observed the people very closely and considered their requirements. The each and every part of design specifications were critically examined in safety point of view and considered after analyzing the problems from the poliomyelitis persons. Comfort of the person in the vehicle is an important for their smooth journey. This paper shows implementation of innovative ideas for transportation of the people who are suffering from poliomyelitis and Florolasis in their legs or hand or handicapped due to any other reasons..

Key Words: Florolasis [1]. Design [2], energy storage [3], Polio [4], solar power [5], transportation [6]

I. History

Polio (also known as poliomyelitis) is a highly contagious disease caused by a virus that attacks the nervous system. Polio is a crippling and potentially fatal infectious disease. There is no cure, but there are safe and effective vaccines. Polio (poliomyelitis) is a highly infectious disease caused by a virus. The strategy to eradicate polio is therefore based on preventing infection by immunizing every child until transmission stops and the world is polio-free. Poliovirus is acquired by faecal-oral or oral transmission. An eradication program me has reduced the number of reported polio cases worldwide by more than 99% since the mid-1980s. Most infections are asymptomatic; a small number cause a minor illness that is indistinguishable from many other viral illnesses; less than 1% result in acute flaccid paralysis. The extent of paralysis varies from part of a limb to quadriplegia and respiratory failure. Surviving paralytic polio can be a life-changing experience. Individuals may be permanently physically disabled to varying degrees. Others remember the fear and isolation.

According to the World Health Organization (WHO), one in 200 polio infections will result in permanent paralysis. However, the disease has been largely irradiated thanks to the development of a polio vaccine. The most recent WHO poll, in 2010, reported only 1,352 cases of polio worldwide. (WHO).

Fluoride has been shown to have varying degrees of beneficial effects on bone mineralization and bone strength, despite its toxic effects on growth and leg disorders. Some studies have demonstrated an increase in bone ash resulting from F supplementation. The purpose of the present paper was to determine whether low levels of dietary F would have any beneficial effect on the bone strength and leg disorders of young chicks fed P-deficient diets.

One in 200 infections leads to irreversible paralysis, usually in the legs. This is caused by the virus entering the blood stream and invading the central nervous system. As it multiplies, the virus destroys the nerve cells that activate muscles. The affected muscles are no longer functional and the limb becomes floppy and lifeless – a condition known as acute flaccid paralysis (AFP).This paper provides better life for the poliomyelitis and Florolasis effected people in the form of a vehicle.

II. Introduction

We are reliant on one form of energy or the other for fulfilling our needs. One such form of energy is the energy from FOSSIL FUELS. We use energy from these sources for generating electricity, running automobiles etc. But the main disadvantages of these FOSSIL FUELS are that they are not environmental friendly and they are exhaustible. To deal with these problems of FOSSIL FUELS, we need to look at the NON-CONVENTIONAL SOURCES of energy. With regard to this idea we have designed a solar vehicle that runs on solar energy. The vehicle designed is a three wheel drive and can be used for shuttle and short distances. As these vehicles form the future of the automotive industry, we need to concentrate on improving their design and making them cost effective. This vehicle is an idea in this direction. Due consideration and attention is given to better manoeuvrability, effective use of solar energy, biomechanics and comforts, increased suspensions, all terrain traffic ability, ease of use etc. while designing this solar vehicle for physically disabled people we considered base height of vehicle, distance between passenger and handle, seating position and control of the vehicle with less manual effort.

Those who are suffering from poliomyelitis and Florolasis in their legs or hand for that this vehicle is well suitable. Considering the overall prevailing situation, development of a solar three-wheeler for disabled people is a vital effort where solar energy and its advantages are taken into account. A solar vehicle could be a stand-alone system; it will be self-operated and independent in nature, using unending solar energy from the sun. It is powered by solar energy from at-attached solar panel at top, exposed to sunlight. It can take us off the grid; can be used in a place where there is no electricity.

To defeat the difficulty and the fault, this development necessitates to do some make inquiries and study to develop improved technology. To create it achievement there are numerous thing that we need to know such as what will be the prime mover, how to stored it and the advantages of this new vehicle. In that case, these are the list of the intention to be conduct before persist to ensue on this plan:

- To develop a vehicle that use renewable energy, eco friendly and economical.
- To develop a solar vehicle that can charge the battery weather it is use or not in used.
- To develop low speed solar vehicle, but for a longer distance.

II.I Organization of the project

We have visited to Nalgonda district, prakasam which is located in Andhra pradesh state. The
Polio and fluoride effected people are lived and they are using manual operated tricycle. We are watching the most weakness physical handicapped person difficult to operate the tricycle. We think on the tricycle how would become easily operated by the aged person. In this way the **Idea comes in our mind**. Basically in India tricycle mostly used only the handicapped person. But in foreign country tricycle as the handicapped person is used as well as the non handicapped person is used.

II.II Possibility of solar vehicle

- To convert the solar energy to the electrical energy by using solar cells, then Converting this electrical energy to mechanical energy by using dc motor to run the vehicle.
- To find the alternative of fuel.
- To maintain the ecological balance.
- To form the solar vehicle.

III. Design and Explanation

While designing this vehicle we take care of dimensions of the vehicle in form of length, width and height. The vehicle having length of 135cm, width of 100cm and height 115cm.we used square hallows pipes for making body setup .On body we fixed seat, battery support and panel supporting rods. For solar panel, battery and seat support we used angular rods. Total weight of the loaded solar three-wheeler (with a person) will be 165 kg.

As a transport for the physically disabled people the overall safety, stability, reliability, control, comforts etc are a very much important and taken in to consideration while de-signing it. However, the general points of consideration during the designing of the solar three-wheeler are: simplicity, strength, stability, safety, corrosion and wear, weight, size, flexibility, ease of control, modularity, efficient extraction of solar energy, effective use of solar energy and energy storage, all terrain tires for all terrain traffic ability/mobility, increased suspensions, biomechanics and comforts and cost.

Table 1. Material cost Specification in Indian rupees

IV. Functional Diagram

The solar power system of the solar vehicle consists of solar panel (300W), MPPT solar charge controller, Lead-acid battery (12V-24Ahr.) etc. The typical solar power system is shown in Figure 1.

Normally the solar power captured by solar panel and that power passed through the power regulating device which supplies the power to motor and battery. When huge amount need more then available from sun then battery power will be consumed.

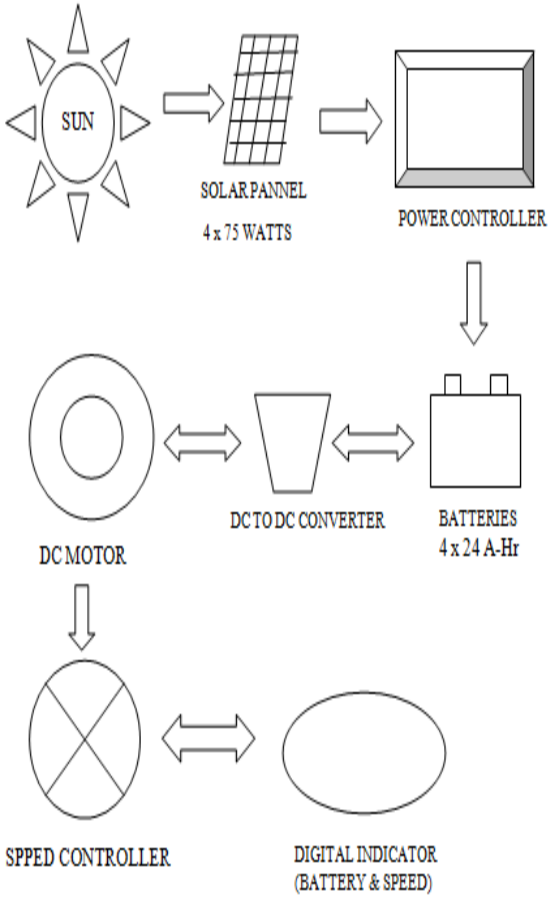

Fig:1 working Diagram of Solar Vehicle

V. Components Used

Table 2. List of components

S.N	compone nts used	capacity	quantity
1.	Solar Panel(S)	75 WATTS	4
2.	Batteries	26A-Hr	4
3.	Dc Motor	250 WATTS	1
4.	Power Controlle r	250 WATTS	1
5.	Dc To Dc Converter	---	1
6.	Accelerat or	0-55KMPH	1

S.NO	Name of the product	Cost of each item	quant	Total cost
1.	Iron bars square	450	4	1800.00
2.	Iron bars angular	500	1	500.00
3.	Dc motor 48 V	4500	1	4500.00
4.	Speed control unit	1500	1	1500.00
5.	Batteries 24 a-hr,12 V	510	4	2040.00
6.	Solar panels 75W	2150	4	9600
7.	Connecting cables (per meter)	10	8 m	80.00
8.	wheels	300	4	1200.00
9.	Fabrication charges	1500	---	1500.00
10.	Misslenious	2500	---	2500
Total cost				25220.00

V.I Solar Panel

The solar panel used in the solar vehicle is of the rating of 300 WP.

The main point that should be kept in mind while making a solar vehicle is the mounting of the solar panel. The Panel should be mounted in such a way that it receives maximum sun rays so that it gives its maximum efficiency. For the

vehicle designed, we have mounted the solar panel in SOUTH-EAST direction during the time 6 AM to 11.30 AM.After that the panel is changed to a SOUTH-WEST direction. We have used the conventional roof-top mounting technique for the solar panel A 4.5 feet by 3 feet steel hallow frame has been used and mounted on the top of vehicle. The solar cell used in the vehicle is poly-crystalline. The reason behind using the multi crystalline cell is that it is more efficient than the mono-crystalline cell and the rate of conversion of energy is faster in the former. 48 cells are used in the PV module of this vehicle. The upper frame of this solar module is covered with thick glass to avoid breakage of the solar panel.

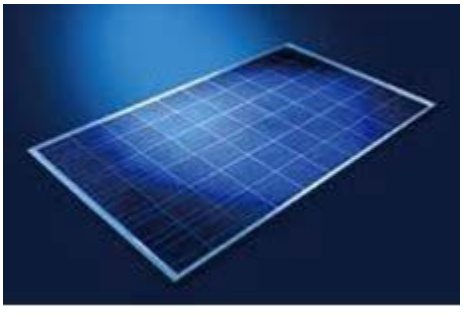

Fig.2 solar panel

V.II Batteries

A solar vehicle is the stand-alone system**.** To make practical use of the solar energy generated from solar panels, batteries are used to store the energy to meet up motor power requirement as needed at any time either in day or night. A 12-volt, 24 A-hr lead-acid four batteries are preferred and used here in solar power system as used in most of the PV systems. Main reason of using such lead acid battery is, it's availability and comparatively cheaper cost

Battery specifications:

Power: 12v 24 Amps
Length, mm: 60
Width, mm: 170
Height, mm: 160
Weight kg: 4kg
Power: 12v 24 Amps
Length, mm: 60
Width, mm: 170
Height, mm: 160
Weight kg: 4kg

Fig.3.Batteries

V.III Motor

The prime mover to be used in this solar three-wheeler is a permanent magnet D.C. motor. The main reason for using this motor is that it is highly efficient and the flux density does not decrease with time. It's performance characteristics suite very well to the requirement of our solar three-wheeler. At standard load condition, the motor needs 250 Watts. This power will cover the required power needed to run the solar vehicle at a speed of 8 km/hr. If the load increases or the vehicle climbs up-ward slope, then the current will also increase and power output of the motor will also increase.

Fig.4.DC motor

V.IV Working of the Vehicle

The solar module mounted on the top of vehicle is used to charge the batteries via charge controller. A 300 WP solar module is used with output ranging from 17 V to 38V at STC. The batteries are initially fully charged and then they are connected to solar module for charging. This helps to keep the battery charged always. This is also done as the

efficiency of solar module is only 34%.Thus under this condition the battery gets fully charged again within 2.3hrs-3hrs. Thus to keep the full sine wave of charging this time lap is made. The maximum solar radiations are obtained between morning 10am to evening 3:30pm. Hence the panel is so mounted that maximum output may be obtained. As the supply is given through dc-dc switch the motor takes a high starting current to propel the wheel to move in forward direction. On start the load on motor is nearly 250kg including the weight of person driving it. The motor after start acquires the maximum speed of 10kmph to 20kmph. The batteries get charged always from the solar panel and so it provides the continuous run for the vehicle. The speed may be varied later according to the driver's requirements. As the speed varies the load current also varies. So the speed variation must be low to keep battery alive for maximum duration of time. For stopping the motor, the speed control switch should be brought to minimum speed and then switch should be open; thereafter the mechanical brakes should be applied. The mechanical brakes can be applied instantly during emergency but this should be avoided as this could damage the motor and also produce unnecessary back emf. The average battery back-up is around four hours. The batteries are continuously charged by the solar panel

Fig: 6. power controller

Fig: 7.DC-DC converter

V.V Desired Speed and Power Requirement

In considering the physical condition of a disabled person, over all terrain condition, safety etc., the speed of the solar three-wheeler is set to 8 km/hr. This speed will ensure better stability as well as comfort for the user. Practically it is experienced and measured that the total force (F) required for moving the loaded solar three-wheeler on smooth road is almost 10 kg. Here rear wheel diameter is 0.52 m; speed of the three-wheeler is 8 km/hr. So, wheel rpm and torque will be 100 rev./min and 15 N-m respectively. Finally required power is 250 W. If power loss due to chain drive is 10% then desired power requirement for driving the solar three-wheeler will be around 235W.

Fig: 5.accelerator

V.VI advantages of the vehicle

- The solar vehicles are the future of the automobile industry.

- They are highly feasible and can be manufactured with ease. The main advantages of a solar vehicle are that they are pollution less and are very economical.

- Since they cause no pollution they are very eco-friendly and are the only answer to the increasing pollution levels from automobiles in the present scenario.
- By harvesting the renewable sources of energy like the solar energy we are helping in preserving then non-renewable sources of energy.
- The other main advantages of the solar vehicle are that they require less maintenance as compared to the conventional automotives and are very user-friendly.
- Solar power technology is improving consistently over time, as people begin to understand all of the benefits offered by this incredible technology.

V.VII limitations

Even though it runs by solar power few limits are there

- The vehicle may not run more than 4 hours without sun.
- It will be compatible to only for two persons with their minimum language.
- Have to replace the batteries for every 3 to 4 years.
- It may not run more than 35^0 inclinations.

VI. Conclusions

The attempt made in fabricating a solar vehicle with the available indigenous material is successful. We can say that this is the best way for the people for their transportation those who effected by polio and fluoride. The working of the vehicle shows the indigenous infrastructure, well outlook and the capabilities of the wheel chair. The Recharging capacity of the panels is satisfactory. The desired functionality of the Steering Mechanism is achieved. The vehicle can provide an uninterrupted journey of 46 KM or it can travel up to 4 hours continuously.

Fig: 8. Final vehicle

Acknowledgment

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