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SMART SELF CHARGING BATTERIES IN ELECTRIC VEHICLE

Karthikeyan P[1], Suresh M[2], Raghavendran PS[3], Kowsalya P[4], Sudhakar A[5], Gokulraj K[6]

[1,2]*Assistant Professor, Department of Electrical and Electronics Engineering, Kongu Engineering College, Erode, Tamil Nadu, India.*
[3]*Associate professor , Department of Electrical and Electronics Engineering, Kongu Engineering College, Erode, Tamil Nadu, India.*
[4,5,6]*Student, Department of Electrical and Electronics Engineering, Kongu Engineering College, Erode, Tamil Nadu, India.*

Abstract - *The proposed work deals with a design of a battery electric vehicle with self-charging system for one passenger and for weight up to 50 kg. This method has been made to fabricate a self-charging battery electric vehicle which utilizes the rotational energy of wheels to charge the batteries, thereby introducing a system which makes the vehicle pollution free. In order to work with more efficient, the solar panel can also be implemented on the top of the car. The fabrication of chassis is made for the similar dimensions with some modification in its size and shape using Mild Steel (MS) material. The components such as DC Generator, Motor and Buck-Boost converter was arranged in a manner to transfer the rotational energy being experienced by the MS bright rod to the dc generator. The dc generator here has the capacity to produce 12V to 14V, which is directed to buck-boost converter through a battery source. Here in buck-boost converter the voltage source is stepped up to 24V, which is enough to charge the two set of series connection which yields to 24 V usage. The batteries are used to provide the rotational energy to the shaft through a motor. Batteries are receiving back the sufficient voltage source to recharge.*

Key words - *Electric Vehicles, DC Generator, Batteries, DC-DC Convertor*

1. INTRODUCTION

Today we are generating electricity from fossil fuels, they are not environmental friendly. It causes global warming, therefore we need Non-Conventional sources of energy. A great part of the oil consumption is recently allocated to the transportation sector and a large portion of that is used by road vehicles. According to the international energy overview report, the transportation sector is going to increase its share in world's total oil consumption by up to 55% by 2030. In order to increase the energy a revolution in the transportation sector occurs. To reduce use of energy from fossil fuels in transportation usage and make environment clean and green, we have designed electric vehicle that uses solar energy and electricity to run[7]. The Photovoltaic cells used to harness solar energy to generate voltage to charge the battery.

An Electric Vehicle (EV) can be referred to as an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. A few electric vehicles will emerge on the market that it can be powered by a rechargeable battery. The Battery Electric Vehicle (BEV) is mostly dependent on the battery technology[9]. It provides a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. However, in recent years, increased concerns over the environmental impact of gasoline cars, higher gasoline prices, improvements in battery technology, and the prospect of peak oil, have brought about renewed interest in electric vehicle, which are reported to be more environmentally friendly and cheaper to maintain and run. Electric vehicles are becoming popular and more prevalent due to increased energy costs and concern regarding the reduction of greenhouse gas emissions. Electric vehicles are powered by batteries that are contained with the vehicle and usually provide a sufficient charge for the propulsion of the vehicle through city traffic. The batteries are mounted along with the vehicle and are used to run the vehicle. In addition to the solar, we can also use alternator to recharge the batteries. The alternator is connected at the midpoint of the back wheel. The rotational energy of the wheel can be converted into electrical energy by using generator and by which supply is fed to the batteries.

2. LITERATURE SURVEY

Haw wang and Arish Balasubramani in the year 2018 published the paper titled as "Optimal Planning of Renewable Generations for Electric vehicle charging Station". This paper has reviewed that electric vehicles (EVs) have grown rapidly and are widely deployed to enable a sustainable transportation system. One of the key challenges is how to optimize the sizing and operation of the charging stations to meet the ever-increasing EV demands. Renewable energy resources from solar and wind can provide clean power to meet the EV charging demand. The proposed framework can determine the optimal capacity of renewable energy generation, and the optimal scheduling for power supply, in two stages. The arrival patterns and demand profiles of EVs using real-world data to facilitate a practical EV request model. Numerical results demonstrate the

optimal planning for a renewable-powered EV charging station.

Kartik S Mishra, Shubham V Gadhawe and S. B. Barve in the year 2016 published the paper titled as "Design and Development of Solar vehicle" and has reviewed that a solar bicycle is an electric vehicle that provides that alternative by harnessing solar energy to charge the battery and thus provide required voltage to run the motor[8]. India is blessed with nine months of sunny climate thus concept of solar bicycle is very friendly in India. Hybrid bicycle combines the use of solar energy as well as the dynamo that runs through pedal to charge the battery to run the bicycle. Two or more Photovoltaic cells may be used to harness solar energy to generate voltage to charge the battery. Thus solar hybrid bicycle can become a very vital alternative to the fueled automobile thus its manufacturing is essential.

Ajit B. Bachche and N. S. Hanapure have studied the fuel prices is rising steadily day by day. The pollution due to vehicles in heavy traffic cities and urban areas is increasing steadily. To overcome these troubles, an effort regarding this is made to search some other alternative sources of energy for the vehicles. It is not possible to purchase costly vehicles by poor peoples. Keeping this in mind, a search for some way to provide these economically poor people and also to provide a solution for the environmental pollution was in progress. The solar panels placed on the carriage will charge the battery and which in turn drives the wiper motor. When the vehicle is idle, the solar panel charges the battery. This arrangement is used to replace the arrangement of petrol engine, the gear box and the fuel tank.

M.Bilal Chouhary and M. BilalChouhary in the year 2016 published the paper titled as "Solar Powered Electric vehicle" the solar powered electric bike will be demand of near future. As by using solar powered bike, it will save non-renewable sources. The basic principle of this solar powered electric bike is to store energy in battery and used it after charging. Nearby all electric bikes uses AC powered to charge. First AC power is converted into DC power through inverter and it includes power losses. By replacing AC Drive to DC Drives, the charging time is reduced and maintenance of AC drive is more difficult as compare to DC Drive.

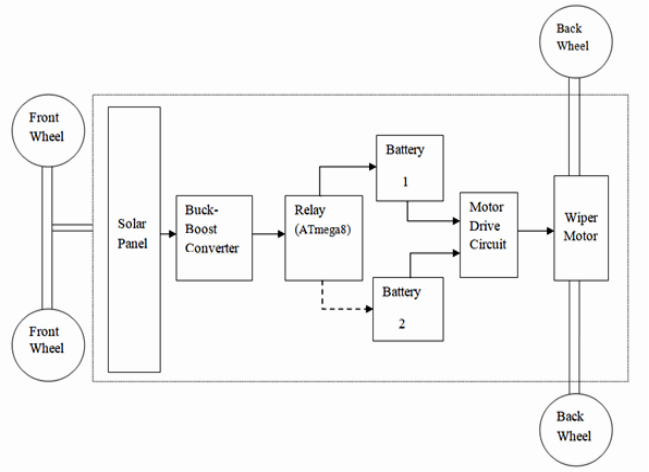
SUMMARY OF THE LITERATURE REVIEW

The following points are observed from the literature review

- Methods of charging electric battery detail information about charging method.
- Renewable energy resources from solar can provide clean power to meet the EV charging demand.
- Hybrid vehicle combines the use of solar energy as well as the dynamo that runs the electric vehicle.
- A solar vehicle is an electric vehicle which provides alternative by utilizing solar energy to charge the battery and thus provide required voltage to run the motor.
- Increasing the usage of electric vehicles can reduce CO2 emission and the fuel costs.

3. BLOCK DAIGRAM OF PROPOSED METHOD

In electric vehicle, we can use the solar panel on the top of the car for recharging the batteries. The supply from the solar can be increased and decreased by using buck and boost converter. Then the output from the buck and boost converter is fed to the battery 1 and battery 2 alternatively. This operation can be done by using ATMEGA 328. Thus the battery provides a sufficient energy to drive the wiper motor to run the vehicle. In order to increase the efficiency of the vehicle the dc generator is connected at the midpoint of the back wheel. The dc generator converts the rotational energy into electrical energy. Then the electrical energy is fed to the buck boost converter and then to the voltage regulator for constant supply to motor.



4. BLOCK DIAGRAM DESCRIPTION

A self-propelled vehicle which is used in transporting people and goods from one place to another on road is called as an automobile. The early history of the auto-mobile can be divided into a number of eras, based on the prevalent means of propulsion. Their focus was on more economical, noiseless, emission free and uninterrupted alternate source of electricity named self charging inverter. An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. A few electric vehicles will emerge on the market that it can be powered by a rechargeable battery. The success of the battery electric vehicle (BEV) is very dependent on the battery technology. It provides a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. However, in recent years, increased concerns over the environmental impact of gasoline cars, higher gasoline prices, improvements in battery technology, and the prospect of peak oil, have brought about renewed interest in electric cars, which are perceived to be more environmentally

friendly and cheaper to maintain and run. Electric vehicles, especially automobiles, are becoming popular and more prevalent due to increased energy costs and concern regarding the reduction of greenhouse gas emissions. Electric vehicles are powered by batteries that are contained with the vehicle and usually provide an adequate charge for the propulsion of the vehicle through city traffic. The batteries are mounted within the vehicle and are used to propel the car as an alternative to using an internal combustion engine. In addition to the solar, we can also use alternator to recharge the batteries. The alternator is connected at the midpoint of the back wheel. The rotational energy of the wheel can be converted into electrical energy by using this alternator and this supply is fed to the batteries.

In our electric vehicle, the alternator is connected to the back wheel of the car for the purpose of generation. While running, the wheel gets rotated. This rotational energy can be sent to dc alternator. The dc alternator converts the rotational energy into electrical energy. The buck boost converter can be used to step up or step down the voltage source from solar panel. The output produced in the buck-boost converter is fed to the batteries via the voltage regulator. Then the constant supply can be given to the batteries that can satisfy the amount of voltage which starts the wiper motor. When battery1 gets discharged, relay is connected it to the battery2and vice versa, So that the battery can always remain charging.

Table -1: Components used in proposed method and its specifications

S.No	*Name Of Component*	*Specification*
1	Battery	4*6V=24V
2	Switches	SPST
3	Solar Panel	18W
4	Atmega328	5V
5	Buck-Boost Converter	12V
6	Electro Magnetic Relay	12V
7	Dc Series Motor	12V

4.1Battery

In this proposed work 6-volt batteries connected in series. The important things to note about a series connection are the battery voltages add together to determine the battery pack voltage. An electric battery is a device consisting of two or more electrochemical cells that convert stored chemical energy into electrical energy. Each cell contains a positive terminal or cathode and a negative terminal or anode[5]. Electrolytes allow ions to move between the electrodes and terminals, which allows current to flow out of the battery to perform work. The batteries are used to store the charges by using the solar as well as dc generator. The specification is list out in table number II.

Table -1: Specification of batteries used in proposed method

S.NO	SPECIFICATION	RANGE
1	Nominal Voltage	(2*6)=12V
2	Type	Lead Acid
3	Nominal Voltage	12.3 – 12.8V
4	Initial Current	0.1c
5	Capacity	4*4.5Ah=18Ah
6	Charging Hour	10Hr
7	Cycle use	14.10-14.40v(0.25C Max)
8	Charging Instruction	25oC

A voltaic cell develops a potential difference when electrodes of two different metals are immersed in an electrolyte. The potential difference is due to the difference in charge between the two electrodes. Lead acid battery is used to supply the electrical energy to run the electric vehicle.

4.2 Switches

The switch has been provided with two terminals, one for the motor connections and the other for the battery connections. It is a single pole single through switch. There are two switches. One is for ON and other is for OFF the contact between relay circuit and batteries.

4.3 Solar Panel

Photovoltaic solar panels absorb sunlight as a source of energy to generate electricity. A Photo Voltaic (PV) module is a packaged, connected assembly of typically 6x10 photovoltaic solar cells. Photovoltaic modules constitute the photovoltaic array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications.

The solar panel used in the solar vehicle is of the rating of 140 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 as 6 feet by 4 feet plywood has been used and mounted on the top of vehicle[3]. The solar cell used in the vehicle is multi-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. 36 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. The solar panel act as a source to charge the batteries. It provides a best result during day time.

4.4 Atmega328

The ATMEGA328 is a single-chip microcontroller created by Atmel in the mega AVR family (later Microchip Technology acquired Atmel in 2016). It has a modified Harvard architecture8-bitRISC processor core.

The Atmel 8-bitAVRRISC-based microcontroller combines 32 kb ISP flash memory with read-while-write capabilities, 1 kb EEPROM, 2 kb SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. It performs the complete control operations.

4.5 VOLTAGE REGULATOR

IC7805 is a voltage regulator used in proposed work. It is a member of 78xx series of fixed linear voltage regulator ICs. The voltage source in a circuit may have fluctuations and would not give the fixed voltage output. The voltage regulator IC maintains the output voltage at a constant value. The xx in 78xx indicates the fixed output voltage it is designed to provide. 7805 provides +5V regulated power supply.

4.6 ELECTROMAGNETIC RELAY

A relay is an electromagnetic switch used to switch High Voltage or Current using low power circuits. For example, we can use it for controlling home appliances with a normal low voltage electronic circuit. Electromagnetic relay uses an electromagnet to operate a switching mechanism mechanically. It also provides isolation between low power circuit and high power circuits. The construction and working of a relay can be understood from the above diagram. The main part of a relay is the electromagnet. The electromagnet is made by a coil of wire wrapped around a soft iron core which provides low reluctance path for magnetic flux.

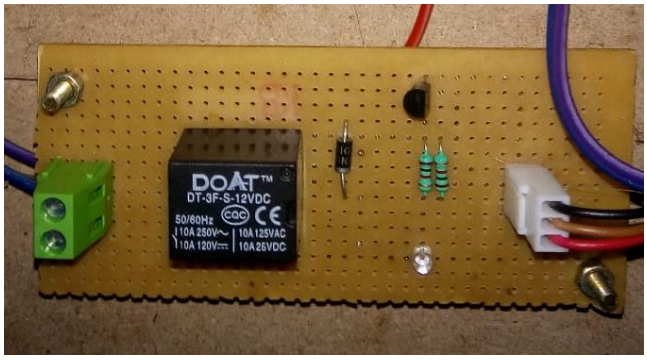


Fig. 2: Forward direction in relay

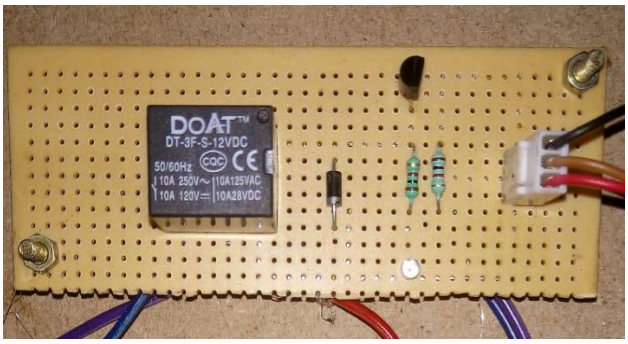


Fig. 3: Reverse direction in relay

4.7 Dc Series Motor

The series motor provides high starting torque and is able to move very large shaft loads when it is energized. From the diagram you can see that the field winding in this motor is wired in series with the armature winding. This is the attribute that gives the series motor its name. Since the series field winding is connected in series with the armature, it will carry the same amount of current that passes through the armature[6]. For this reason the field is made from heavy-gauge wire that is large enough to carry the load. Since the wire gauge is so large, the winding will have only a few turns of wire. In some larger DC motors, the field winding is made from copper bar stock rather than the conventional round wire used for power distribution. The square or rectangular shape of the copper bar stock makes it fit more easily around the field pole pieces. It can also radiate more easily the heat that has built up in the winding due to the large amount of current being carried. handle large currents since the motor does not operate for an extended period.

Since only one of the windings needs to be reversed, the armature winding is typically used because its terminals are readily accessible at the brush rigging. Remember that the armature receives its current through the brushes, so that if their polarity is changed, the armature's polarity will also be changed. A reversing motor starter is used to change wiring to cause the direction of the motor's rotation to change by changing the polarity of the armature windings.

5. HARDWARE IMPLEMENTATION

The supply from the solar can be used to charge the batteries via buck-boost converter and relay circuit. The source from the solar can be stepped up or stepped down to a constant voltage of 12V. The voltage can charge the batteries alternatively by using relay circuit. The relay circuit can be tripped by sensing the signal from microcontroller. The voltage regulator can be used to provide a 5V supply to microcontroller. If the battery 1 is in discharging, the battery 2 is in charging.

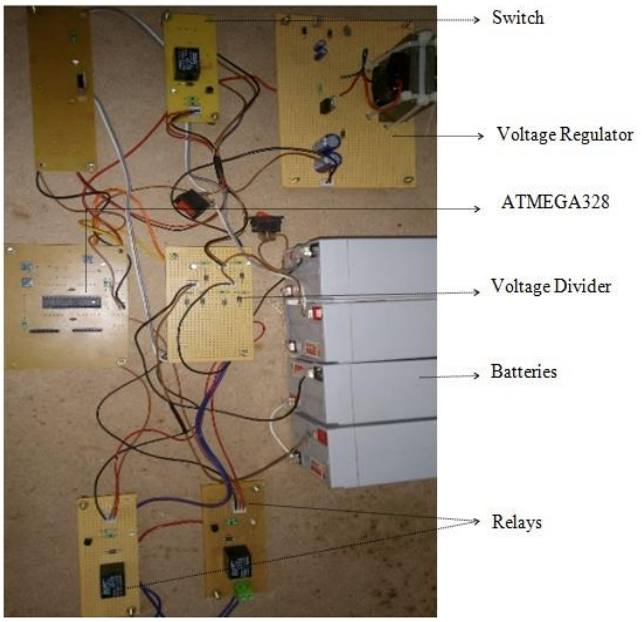


Fig. 4 : Hardware setup of proposed method

6. ADVANTAGES OF PROPOSED METHOD

- Eco-friendly and Quiet: Solar-powered vehicles have zero emission level, as they don't utilize non-renewable resources and burn fuel. The electric motors generate electricity that doesn't emit any greenhouse gases or any other pollutants. These cars are quieter than the vehicles powered by conventional fuels, which does not cause noise pollution as well.

- Energy Availability: Solar cars derive their power from the sun, indirectly, that always shines and provides endless energy. The efficient solar panels can produce and store more horsepower for the vehicle.

- No Fuel Costs: Unlike the conventionally fueled vehicles, solar vehicles have no fuel costs and a low cost of maintenance.

- Driving Comfort: Having aluminum and lightweight components, the solar-powered cars run faster and more smoothly than petrol and diesel engine vehicle.

7. RESULT AND CONCLUSION

The transportation sector is one of the major contributors to air pollution and carbon dioxide emissions. Widespread adoption of Electric Vehicles (EVs) is a promising solution to address the environmental problems and de-carbonize transportation sectors. In this project, we developed a charging circuit for a battery and its performance characteristics is analyzed under the consideration of supply from both the electricity and renewable energy. Thus the project, make the vehicle pollution free and it is not depending upon any external source to recharge the batteries. By the use of solar panel, the vehicle can be efficiently charged. This prototype model can be expanded in future by many ways to serve many purposes. By combining capacitor with a battery based uninterruptible power supply system, the life of the batteries can be extended. When the generator is connected at the midpoint of the back wheel efficiency can be increased considerably.

REFERENCES

[1] Becker Technical sales Engineer," A Guide to Battery Charging.Company Manual Operating Technical Electronics",Inc.

[2] Chenglin Liao, Bing Yang: PhasesMARCH 2018, "Controlled Coordinated Charging Method for Electric Vehicles , CES transactions on electrical machines and systems, VOL. 2, NO. 1.

[3] Engr.M.BilalChouhary 1, Engr. SaifulTalpur 2, Engr.Taimor Zafar1 January, 2016, "Solar Powered Electric Bike", European International Journal of Science and Technology Vol. 5, No.1.

[4] FahmidaNaznin TVS Motor Company Ltd year 2013, "State of Charge (SOC) Governed Fast Charging Method for Lithium Based Batteries", COMSOL Conference in Bangalore.

[5] Florian Feckl December 2014, "Efficient Charging with TPS62740", TEXAS INSTRUMENTS Application Report SLVA678.

[6] H. S. Upare, P. S. Pandure," Design and Experimental Study of Solar Hybrid vehicle", A review IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684, p-ISSN: 2320-334X PP. 44-48.

[7] Haw wang Arish Balasubramani year 2018, " Optimal Planning of Renewable Generations for Electric vehicle charging Station", Workshop on Computing, Networking and Communications (CNC).

[8] Joachim Skov Johansen September 2013, "Fast-Charging Electric Vehicles using AC", IEEE.

[9] Kartik S Mishra, Shubham V Gadhawe, Dhiraj C Chaudhari, BhupendraVarma year 2016,"Design and Development of Solar Hybrid vehicle", International Journal of Current Engineering and Technology E-ISSN 2277 – 4106, P-ISSN 2347 – 5161, IMPRESSCO.

BIOGRAPHIES

P.Karthikeyan was born in India, Tamilnadu, in 1986. He received the degree in electrical and electronic engineering, the ME degree in power electronics and drives from the Anna university, Chennai, Anna University Coimbatore, in 2008 and 2010.Since 2010, he has been with the department of Electrical and Electronic Engineering, Kongu Engineering College, where he is currently an Assistant Professor. His research interests include Electric vehicle, renewable energy, power electronics, power quality and digital control of power converters.

P.Kowsalya was born in Tamil Nadu, India on 1997. She is currently pursuing a Bachelor of Engineering in the department of Electrical and Electronics Engineering at Kongu Engineering College, Tamil Nadu, India. Her current research interest include Electrical Vehicles, Power Electronics and Renewable energy.

A.Sudhakar was born in Tamil Nadu, India on 1996. He is received Diploma In Electrical And Electronics Engineering in department of Electrical and Electronics Engineering from Sri Ragavendra polytechnic College Tamil Nadu, India in 2016 . He currently pursuing Bachelor of Engineering in department of Electrical and Electronics Engineering from Kongu Engineering College Tamil Nadu, India. He is active secretary for department Association. His research interests include Electrical Vehicles, Power Electronics and Renewable energy.

K.Gokulraj was born in Tamil Nadu, India on 1996. He is received Diploma In Electrical And Electronics Engineering in department of Electrical and Electronics Engineering from Muthayammal polytechnic College Tamil Nadu, India in 2016 . He currently pursuing Bachelor of Engineering in department of Electrical and Electronics Engineering from Kongu Engineering College Tamil Nadu, India. He is active secretary for department Association. His research interests include Electrical Vehicles, Power Electronics and Renewable energy.