Charging station for electric vehicle using Solar-Wind system

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***Abstract*—This paper speaks about the use of solar PV-wind system in designing a charging station for electric car. And an algorithm is proposed and implemented for effective charging output. This could reduce the need of draining power from the the supply lines and we can control the load demand during peak hours.**

Keywords—solar pv system, wind system, charging station .

I. INTRODUCTION

This paper gives a better solution for DC link for pv-wind system. Two separate batteries will be used such that any voltage rating batteries can be used for solar and wind system. Also the solar and wind system can be designed for any different power ratings. For this microcontroller is used to check the power of batteries periodically. The constant voltage can be maintained in both pv and wind by using boost converter and also used for charging the battery. Electric cars are going to rule the world in the future, for that charging station is being laid in the roadways. Hence during peak hours the increase in number of charging station will draw more power. The main idea of this project is to prevent the power factor loss due to the charging stations in the peak hours. For that an algorithm is used to check the batteries of solar and wind system. Only when these both batteries are drained the power from main supply is drawn.

II. LITERATURE SURVEY

The various configurations for hybrid solar wind systems has been presented [1].].Standalone hybrid pv-wind system is presented[2]. Models of a horizontal axis wind turbine and a PV array and their MPPT power tracking controllers and adaptive voltage controllers and supervisory controller are given in [1][3Some charging station concepts are discussed [4][6]. Mainly there are four modes of charging and are discussed in[5][6]. Some hybrid techniques are discussed in [7][8].

III. IMPLEMENTATION

In this an arduino board is used. And this arduino will check the battery voltages. As the arduino cannot hold 12 volts, the voltage from battery is minimized using voltage divider circuit and then fed into the arduino. In this we reduce 12 volts to 4 so that each 1 volt = 3 volt. By using this measurements we set up the voltage level drop of battery upto 8 volts(ie.2.66 in arduino). After that volage level no battery is allowed to charge the upcoming units(i.e. E-cars) instead the supply will charge for 1 hour. This is continuous process and it happens periodically. By using two separate batteries it is easier that different ratings of wind mill and solar panel can also be used. A charger with 12 volt and 10 A is made so that the battery can be charged quicker and easier.

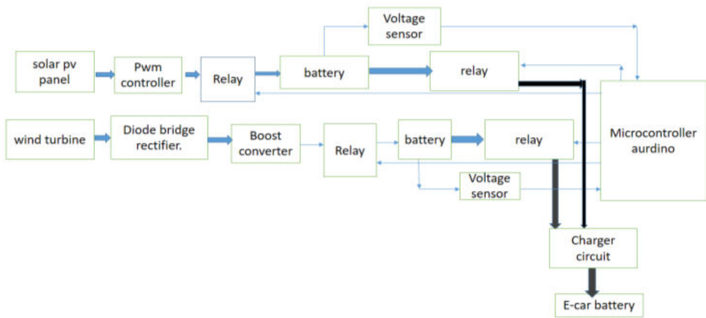

fig.1 Flow chart.

IV. SOLAR PANEL DESIGN

For Solar PV system:

- Rating:10W panel
- Voc:21 v
- Voltage at load condition: 12v.
- Isc:0.833
- A PWM charge controller is also used.

In this setup a boost converter is designed by rising it to 24volt from 12volt to charge a 24volt battery. And the boost converter is fed with a closed loop circuit inorder to manage the fluctuations that will be caused by a solar panel.

fig.2 Solar panel used

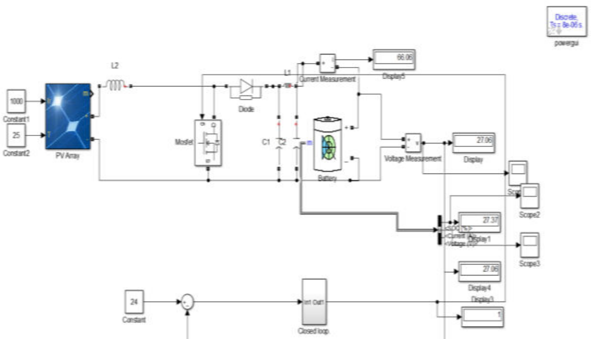

fig.3.Solar panel simulation.

V. WIND MILL DESIGN

In wind system for matlab we used permanent magnet synchronous machine and a wind turbine coupled to it. Then inorder to store it in a battery a universal bridge is used. Then they are converted into a dc source and stored in a battery. To control the pitch angle, a pitch angle controller is used.

In real time we couple a 6volt 3watt dynamo and used it to charge the battery from wind turbine.

In this two types of windblades are used

Table: Average voltage produced by windblades

Wind speed	Average voltage produced	
	Small blade	Large blade
4-6m/s	10.20	3.80
6-12m/s	13.40	4.20
12-16m/s	16.30	4.80

fig.4.Aerofoil types used

In this the program is programmed in such a way that it will first detect whether the charger connected to the e-vehicle, once it detect it is connected then it will check the solar panel battery. And then if the solar panel battery voltage is below 8v it will switch over to wind mill battery. Similarly it will also check with voltage of wind mill battery if the volt above 8 v it will continue it's operation; if it is low then switch over to solar battery. If both the battery voltage is below 8v then it will switch to main supply.

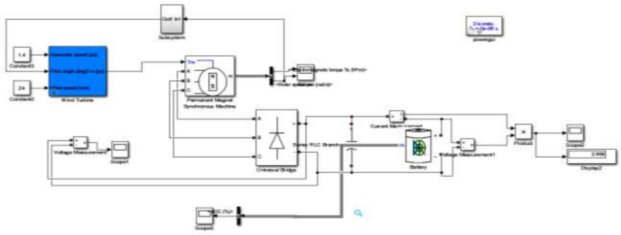

Fig.5.Windmill simulation for 3 watt system

VI. SETUP:

In this we used a solar and wind system. And the wind system is coupled to battery through a boost converter. For a wind system 6V (3 watt) dynamo (fig.4) is used and a boost converter is used to boost the voltage to 12volt before storing in battery.

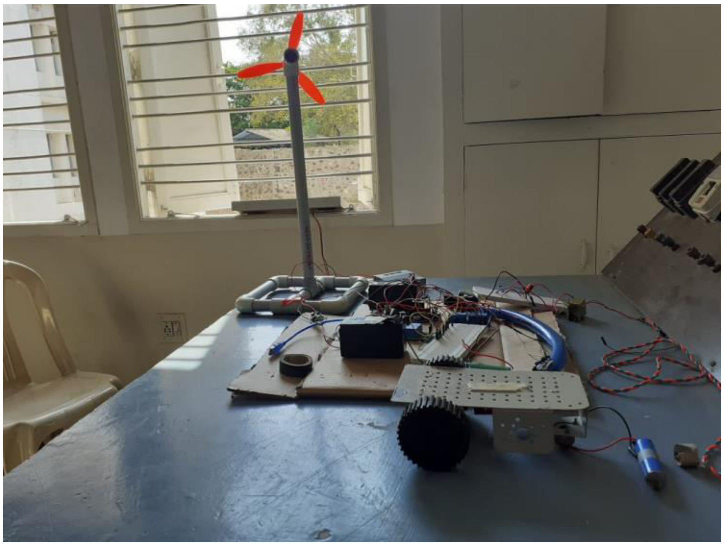

fig.6. Overall view of experimental setup.

VII. Charge converter simulation

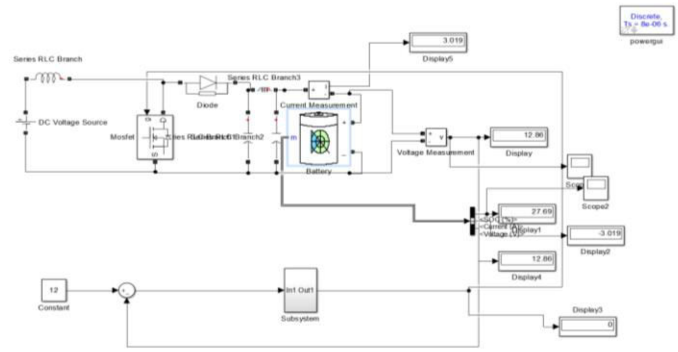

fig.7.Charge converter simulation at 27% State of charge in battery.

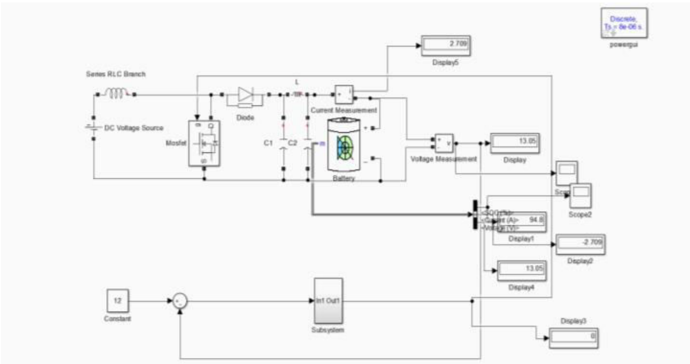

fig.8.Charge converter simulation at 94% state of charge in battery.

The simulink results shown comparing the charge converter curve of voltage and current at 27 percent state of charge and 94 percent state of charge shows that the charging time at both state of charges are nearly same. The current drawn and supplied to the battery will drop in the later stages, but in this we tried controlling the current and voltage to be constant even in the later stages.

VIII. SIMULINK RESULTS:

SOLAR PANEL BATTERY CHARGING:

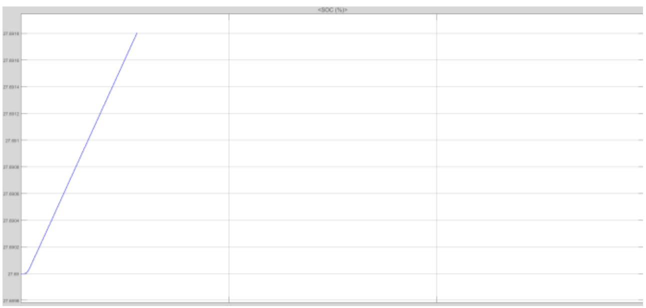

fig.9.Solar panel charging curve

In this the battery charging characteristics is shown in fig.11 for the solar panel. Initially the state of charge is kept low and then the charging curve is plotted for the voltage level.

WIND MILL BATTERY CHARGING:

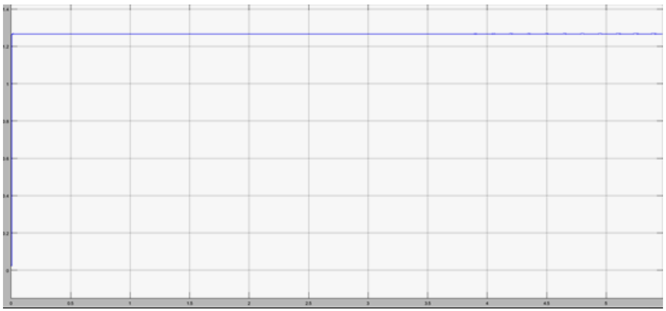

fig.10.Voltage curve of the windmill

Similarly, the state of charge is kept low and then the charging curve for the voltage increases for the windmill system. This paper gives the result of solar(fig.11) and wind(fig.12) charging pattern and hence they give experimental setup for wind and solar system when connected to a charging station.

CHARGE CONVERTER OUTPUT RESULTS:

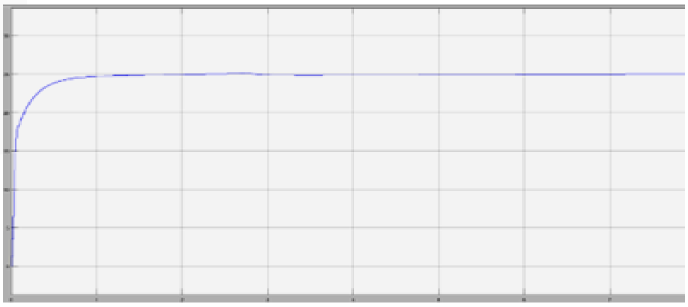

fig.11.Charge converter output voltage

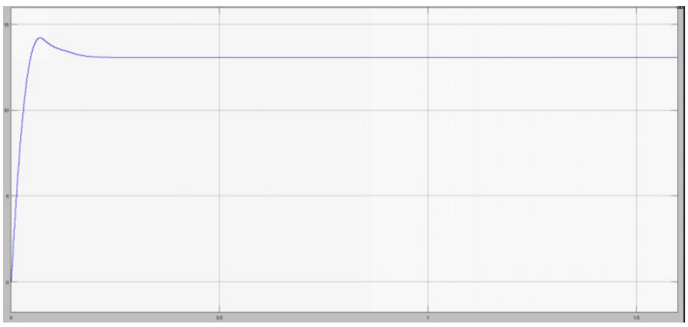

fig.12.Charge converter output current

The simulink results shown comparing the charging converter curve of voltage and current at 27 percent state of charge and 94 percent state of charge shows that the charging time at both state of charges are the same. The time does not increases.

CONCLUSION:

The paper gives a clear view of solar-wind charging system. And it is an easier technique to replace the battery with continuous power supply to charging station, incase of any repair. This work is done considering the charging stations that are going to come in near future.

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