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CHARGING OF A PLUG-IN HYBRID ELECTRIC VEHICLE BATTERY WITH MULTIPLE SOURCE

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Abstract:- In present days Electrical Vehicles (EV), Hybrid Electrical Vehicles (HEV), Plug-In hybrid electric vehicle (PHEV) are increasing. So the main fuel used here is battery/dry cell. In this paper, I am going to discuss the charging of the battery in PHEV. The battery is charged by using an AC charger, DC charger, and solar energy by placing PV panels on the top side of the vehicle.This project by using aLithium-ion -Nickel Cobalt Aluminium oxide (NCA) battery as a rechargeable battery to run the car. The efficiency is increased by using a modern type of Li-ion dry cells.

Keywords: - Battery, Plug-In hybrid electric vehicle, Solar panel, AC/DC charger, On-board charger.

1. Introduction

The battery can be charged in many ways like solar power or a DC charger or by using an AC charger.By using an on-board charger the vehicle is charged using AC voltage in the home or other public or private stations while traveling.Using this new technology the efficiency of a system is increased and the capacity of a system is also increased. Li-ion-Nickel Cobalt Aluminium oxide dry cell is a new technology using in this project [1, 2].

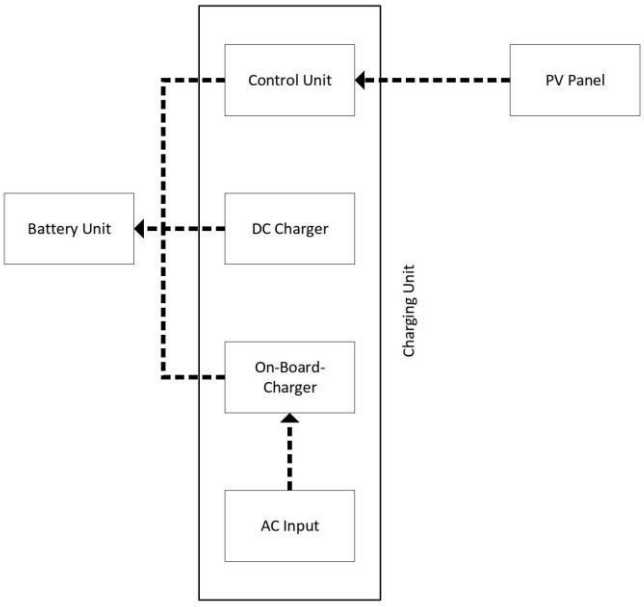

Fig1: - Charging unit present in a vehicle

The above figure shows the Charging unit present in a vehicle, this unit present in a vehicle. This says how the battery is charged by using a PV panel, AC charger, and DC charger [3]. Power coming from the PV panel is given to the control

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box it converts the power that is required to a battery and the battery is charged [4]. The on-board charger is used to charge the battery by taking the AC power from home or other public or private stations while traveling. By using a DC charger battery can be charged directly [5-9].

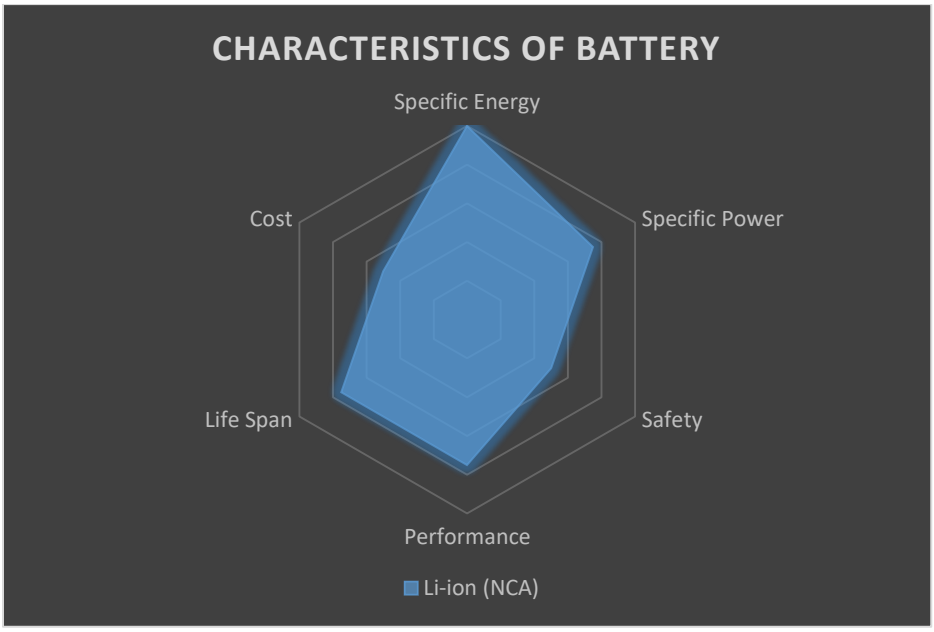

Fig2: - Characteristics of a Li-ion (NCA) battery

The above figure shows the Characteristics of a Li-ion (NCA) battery. Lithium-ion- Nickel Cobalt Aluminium oxide has a high performance and low cost. The chemical formula of the Li-ion (NCA) battery is $LiNiCoAIO_2$ [7, 8].

Items	Reference Paper (2)	Reference Paper (7)	Current Paper
Battery (kWh)	50	23.4	75
Battery Voltage	335V	120V	300V
Type of Battery	Li-ion	NiMH	Li-ion (NCA)
Methods of charging	AC,DC	AC,DC	Through AC,DC and by using PV Panel
Time takes to charge the battery	2-6 Hrs (Commercial)	8-14 Hrs	5-9 Hrs

Table1:- Comparison for old and new model vehicle

The above table shows the values of the old project and current project, and they rating. Compared to old values the present project has much more efficiency. The vehicle is moved with a more speed and more distance, compared to other

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cause here the capacity of battery is 75kWh. The battery can also charge, while vehicle is in braking condition called regenerative braking.

2. Simulation Results

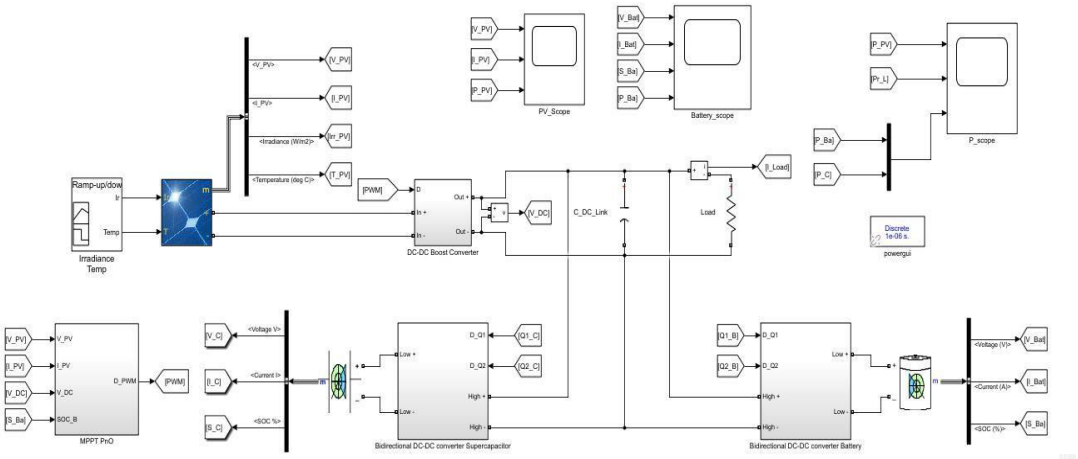

Fig3: - Simulation Circuit of the proposed system

The above figure shows the simulation results of a battery charging system present in PHEV.

3. Simulation output

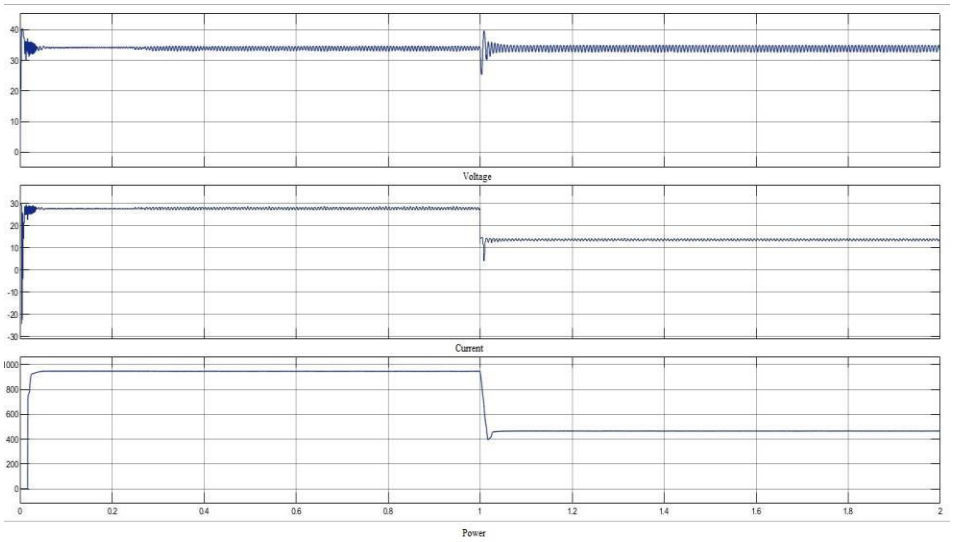

Fig4: - Output voltages, Current & Power of PV Panel

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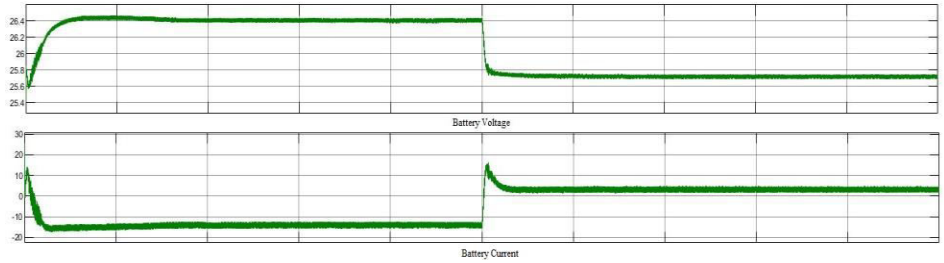

Fig5: -Output voltage &currents of battery

The above figures (Output voltages, Current & Power of PV Panel&Output voltage & currents of battery) show the simulation results of charging and discharging of a battery.The battery is charged automatically with the help of the PV panel even though the vehicle is in rest position or it is in off condition. So whenever the vehicle is not in use the battery gets charged and helps to travel in the vehicle when it is required [10-14].

Value	Voltage	Current	Power
0	0	30	0
0.2	35	28	980
0.4	35	28	980
0.6	35	28	980
0.8	35	28	980
1.0	35	28	980
1.2	34	13	442
1.4	34	13	442
1.6	34	13	442
1.8	34	13	442
2.0	34	13	442

Table1:- PV panel output

The above table shows the numerical values of the simulation output of a PV panel. The power that comes from the PV panel is started at ‘0.025’ until that point voltage is ‘0’. Slowly the voltage starts increasing and the power is increased gradually. At the point of ‘1.025’, the battery is charged fully, so the current is decreased and the voltage will be constant.

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Value	Battery Voltage	Battery Current
0	25.8	0
0.2	26.5	-15
0.4	26.5	-15
0.6	26.5	-15
0.8	26.5	-15
1.0	26.5	-15
1.2	25.7	4
1.4	25.7	4
1.6	25.7	4
1.8	25.7	4
2.0	25.7	4

Table2:- Output voltage & currents of the battery

The above table shows the numerical values of the simulation output of anoutput voltage & currents of the battery. The battery is discharging when the vehicle is started until the battery gets input voltage/current to charge. At the point of '1', the battery is started charging so the voltage is gradually decreased and the current is increased to their rated levels.

4. Conclusion

Hence, by using this system, the battery is charged very quickly and the battery can be charged while traveling (without stopping and taking the charge). This project explains the increase of efficiency of battery and overall efficiency percentage. By using a Li-ion Nickel Cobalt Aluminium oxide (NCA) battery 2-5% of efficiency can be increased. The battery can be charged (by using a PV panel) without stopping the vehicle and recharging the battery while traveling in a car, and running costs will be reduced.

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