"ELECTRICAL VEHICLE BATTERY CHARGING, MONITORING & CONTROLLING"

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ABSTRACT

In the world of electrical technology Electric vehicles play an essential role in energy saving and emission reduction of harmful greenhouse gases. The electrical power industry is under take rapid change and their monitoring system is the core of the automation system of charging stations. In order to ensure the stable and efficientoperation of the battery charging station system

A perfect charging monitoring system is needed to built. This system can monitor, analyze and evaluate the charging power consumption of a charging center at any time, which is convenient for operators to check the charging status and maintenance of each charging station. It is necessary to establish a EV battery charging monitoring & controlling for continue & constant supply to charge the EV battery

KEYWORDS:- *Battery energy monitoring, Electrical vehicleBuzzer,IOT*

1. INTRODUCTION:-

A universal solar battery charging station charges vehicles with monitoring and controlling system of charging station with varying charging capabilities, increasing thedemand for EVs and ensuring reliability.

The easiest way to acknowledge this concept is that the EV battery charging monitoring & controlling mechanism takes to play by simply altering the Current and Voltage to delivera specific power required by the battery for fast charging. The controllers perform controlled power delivery. This model is a scaled-down version of the actual, with the systems working exactly.

The setup is continuously monitored and made sure it is a foolproof setup with no chances of electricity being stolen. The device is an IOT based programmable, secure interface providing customers with a plug in for charge when in need.

Advantages of these project solar panel is used not totally depend on only electricity, lithium battery are also used to save the electricity. We can supply directly from battery but controlling and monitoring system is used for continue and constant supply.

2. LITERATURE REVIEW:-

[1] International Journal of Science andEngineering Application Volume7-

Issue 11,433-436, 2018, ISSN: -2319–7560.
Real-Time Vehicle Tracking System Using microcontroller GPS, Web- Based Technologies.

[2] A Comprehensive Review onPhotovoltaic solar battery Charging Station for Electric Vehicles

From this article we took Charging of EV by using Renewable energy source such as Solar PV cells. If you use renewable energy to recharge your EV, you can reduce your greenhouse gas emissions even further. You could recharge your EV from your solar PV system during the day instead of from the grid. Another idea is to purchase Green Power from your electricity retailer. Then, even if you recharge your EV from the grid, your greenhouse gas emissionsare reduced.

[3] Somudeep Bhattacharjee et all(2017):-

In this paper, selecting the location for installing electric vehicles charging stations is important to ensure EV adoption and also to address some of the inherent risks such as battery cost and degradation, economic risks, lack of charging infrastructure, They suggest some places where charging station can be install like Schools with parking place, Restaurant with parking places, Hotel with parking places, Hospital with parking place. He compared some batteries on the basis of battery capacity and battery cost such as Lead acid(Pbacid), Nickel-cadium (Ni-Cd), Nickel-metal hydride(Ni-MH), Lithium-ion (Liion),Lithium-ion polymer (LiPo), Lithium- iron phosphate (LiFePO4), Lithium- sulfur (Li-S). after comparison he get leadacid battery is suitable for electric vehicle.

3. PROBLEM STATEMENT ANDSOLUTION : -

Why need of control system in chargingstation?

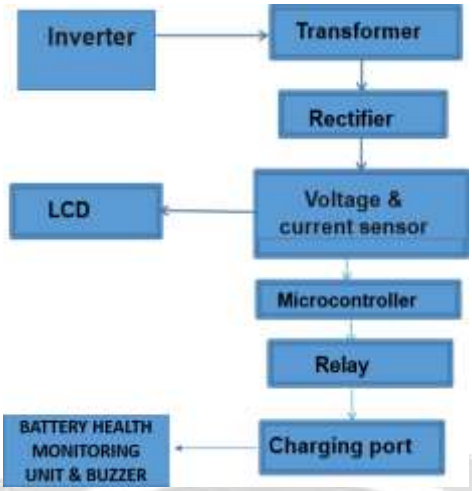
In this project the first part is generate electricity from solar panel & when the absent of solar energy the MSEB supply is used This generated electricity is stored in thelithium battery

The second part is control system it is needed because in first part the generated electricity is in DC form & EV required supply in DC form but we can't give direct supply to EV forcharging

So there are four controlling unit is designed for the purpose of overcharging protection, short circuit protection & it is used to supply the required voltage to the customer And that four socket is designed for the consumption of power and we can't charge without control system because we can't charge more than one EV & for that's purposewe designed four socket

4.BLOCK DIAGRAM ANDMETHODOLOGY:-

B] BLOCK DIAGRAM OF CONTROLSYSTEM:-



The charging of EV will take place outside with a voltage of 220v.Additionally, a solar panel is added, which is used to extract the solar energy and convert it into regulated DC power. The panel has its respective solar charge controller, which regulates the voltage flow into the battery. The vehicle which is to be charged has been scaled down and assumed to be a battery of 12v and 12Ah. The solar charge controller extracts the power from the Sun's solar radiation, steps down thevoltage, and supplies it to the battery accordingly.

The EVCS contains two relays that switch automatically in delivering power. Advantages of these project solar panel is used not totally depend on only electricity, lithium battery are also used to save the electricity. The part 1 is generate electricity from solar panel & charge the lithium battery, We can supply directly to EV from lithium battery of charging station but controlling and monitoring system is used for continue and constant supply.

There are four controlling unit in charging station & there are connected to the inverter, The 1st control unit is give supply from inverter, it convert DC current into AC current that is 12v(AC) then again transformer step down the voltage and fed to the rectifier, it convert AC into DC this controlled dc voltage goes through microcontroller and relay, The voltage and current sensor sense the voltage and current then fed the data to LED display. Display show the measurement.

The controlled DC voltage give to the EV battery through the charging port, And the working of other 3 control unit is similar like that 1st control unit. It is necessary to establish a EV battery charging monitoring & controlling for continue & constant supply tocharge the EV battery

Case 1:- Solar Charging -

The solar charge controller is a voltage and current regulator to keep batteries from overcharging and overheating. **Whenever EV is charging via Solar panel MSEB source gets automatically Cut off.**

Case 2:- Electric grid charging -

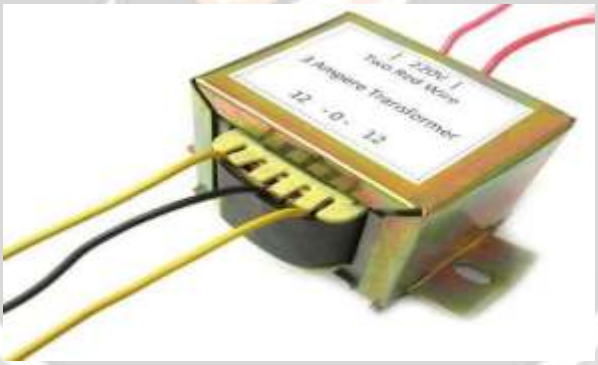
During cloudy whether or during night time solar output is unavailable at this condition as a first backup supply MSEB source is used to charge EV. As Relay only operates at 12V of solar panel but during cloudy area or night time solar output voltage is less then 12V which may not energize relay coils thus providing MSEB source to charge EV When the charging sequence begins, it is ensured that the power is supplied from one source only. When EV is connected to charging ports Micro controller recognizes the user as a trusted source and sends signal to the relay. The relay then closes the circuit as per condition providing power flow. A Analog Volmeter and Ammeter is placed, and which is providing output voltage and current. power consumed is monitored consistently. The consumer's information is recorded and stored in the server, and the number of units consumed along with the per- unit cost is calculated. Once the charging is complete, the circuit is disengaged, and the relay turns off the current flow. The energy meter tracks the power consumption and stores the data, which is later sent to the consumer's phone. After disengaging the supply or completing the charge, the payment gateway is opened, and the transaction is made. This completes the entire process of charging an EV. The charging of the EVs is made easy, hassle-free, and secure. It also ensures that the electricity is not stolen and solely used to charge the respective EVs.

5. HARDWARE:-

5.1 RELAY :-

A relay is an electrical device that is operated as a switch. It consists of sets of input terminals and output terminals for single control signals or multiple control signals and sets of an operating contact terminal. The relay switch can have any number of contacts in many contact forms, such as the normally open circuits and the normally closed circuits or combinations of both the circuits. It can easily be turned (ON) or (OFF) and let the current go through or not, and the relay can also control it with very low voltages of 5Vconnected to a battery provided by the Arduino pins.

5.2 STEP DOWN TRANSFORMER:-



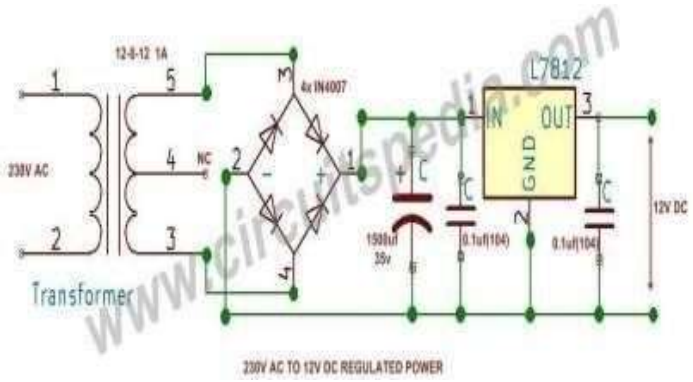
The transformer is a static electrical device that transfers energy by inductive coupling between its winding circuits. A varying current in the primary winding creates a varying magnetic flux in the transformer's core and thus a varying magnetic flux through the secondary winding. 12-0-12 volts 3Amp Center Tapped Step Down Transformer is a general purpose chassis mounting mainstransformer.

Transformer has 230V primary winding and center tapped secondary winding. The transformer has flying colored insulated connecting leads (Approx 100 mm long). The Transformer act as step down transformer reducing AC - 230V to AC - 12V. The Transformer gives outputs of 12V, 12V and0V. The Transformer's construction is written below with details of Solid Core and Winding.

Specifications of 12-0-12 3 Ampere Centre TappedTransformer:-

- Input Voltage:- 230V AC
- Output Voltage:- 12V, 12V or 0V
- Output Current:- 5 Amp
- Mounting:- Vertical mount type
- Winding:- Copper

5.3 RECTIFIER:-



We use the voltage regulator to regulate the voltage supply which maintains constant supply.220/230v ac to 12v/5v/6v DC Regulated Power DC converter Bridge Rectifier as required.Converting from AC to DC is not an easy way. AC has different characteristics with respect to DC, and more risky to humans and any living thing.The first stage is in AC to DC is to take down the voltage as required level using a step down transformer The second stage is the Rectifying the signal, Rectifiers are used to rectifying the signal.The fourth stage is the Regulation, Regulation makes the more stable of any signal to give the circuit to constant supply. A regulator ic or Zener diode is used to make the constant signal.

Components :-

- 12-0-12 1 A transformer
- Diode in 4007-4
- Capacitor 1500uf 25v-1, 0.1uf-2
- LM7805 ic-1,for 5v and 7812 for 12v
- If You need 9v dc then use 7809 and 7805for 5v.

5.4 INVERTER:-

The inverter converts direct current (DC) from the battery into the alternating current (AC) required

The charger performs the same task in reverse: the AC voltage is turned into DC voltage in order to charge the battery in a hybrid plug-in vehicle or an all-electric vehicle

5.5 VOLTAGE & CURRENTSENSOR:-

A current sensor is a device that detects electric current in a wire and generates a signal proportional to that current. The generated signal could be analog voltage or current or even a digital output. Voltage sensors can determine boththe AC voltage or DC voltage level.

Voltage sensors are **wireless tools that can be attached to any number of assets, machinery or equipment**.

They provide 24/7 monitoring, constantly Watching for voltage data that could indicatea problem.

Low voltage may signal a potential issue, while other assets may be in danger when voltageis too high.A current sensor is a device that **Detects and converts current to an easily measurable output voltage**, which is proportional to the current through he measured path. There are a wide variety of sensors, and each sensor is suitable for a specific current range andenvironmental condition

5.6 LCD[Light Crystal Diode]:-

Specification :-

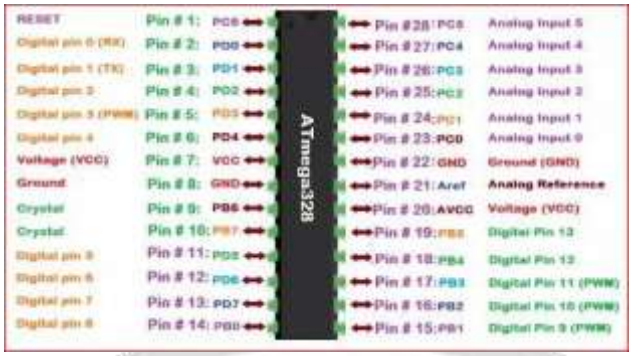
Rating :- 12V 20W

LCD (Liquid Crystal Display) is **a type of flat panel display which uses liquid crystals in its primary form of operation**.

The principle behind the LCDs is that when an electrical current is applied to the liquid crystal molecule, the molecule tends to untwist. This causes the angle of light which is passing through the molecule of the polarized glass and also causes a change in the angle of the top polarizing filter. As a result, a little light is allowed to pass the polarized glass through a particular area ofthe LCD

5.7MICROCONTROLLER

[Atmega328P]:-



ATMEGA328 is used similar to any other controller. All there to do is programming. Controller simply executes the program provided by us at any instant. Without programming controller simply stays put without doing anything.As said, first we need to program the controller and that is done by writing the appropriate program file in the ATMEGA328P FLASH memory. After dumping this program code, the controller executes this code and provides appropriate response. ATMEGA328P programming can be done in ARDUINO ID. In this project 3 micro controllers are used i.e for MPPT , for Auto changeover unit and for GSM module.

5.8 Battery Health Monitoring & Buzzer :-

The LM3914 IC is the brains of this battery level indicator circuit. This IC uses an analog input voltage to drive 10 LEDs linearly in accordance with that input voltage. Because the IC controls the current in this circuit, resistors do not need to be connected in series with the LEDs. This circuit's LEDs 10 LED show the battery's capacity .The potetiometre resistor regulates the LEDs' brightness. Here, calibration is done using pot RV1. This circuit doesn't require any external power sources.The circuit is intended to monitor DC voltages of 10V to 16

A buzzer will alert when the battery is fully charged

6.RESULT:-

we have Considered EV battery pack is ofthree batteries connected in parallel of 12V 1.5Ah.
Total rating EV battery pack=12V 4.5Ah.Solar panel =18V
Note – MPPT steps down & provides constant voltageof 12V to charge EV.
Power rating of battery
P=12*4.5

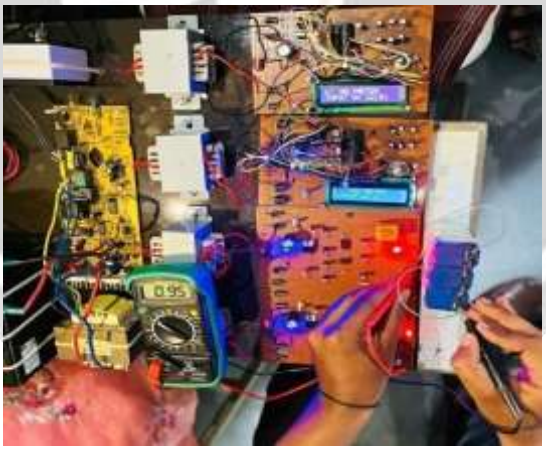
P=54W

Charging current required for 4.5Ah battery in 2 hrs is 4.5Ah/2 = 2.25 A

we have successfully charged EV battery with following observation .

Sr.No	Voltage	Current	Time (PM)
1.	11.43	0.95	1.35
2.	11.50	0.45	1.50
3.	11.55	0.16	2.05
4.	11.76	0.08	2.20
5.	12.05	0.07	2.35
6.	12.16	0.06	2.50
7.	12.34	0.054	2.55
8.	12.35	0.04	3.05
9.	12.38	0.05	3.20
10.	12.41	0.03	3.35

Reading1:-



Reading 2:-

6. CONCLUSION :

This Research paper concludes that the project Hybrid EV Charging Station can provide hassle free 24/7 hrs charging to customer and as solar pads are used there is 100% reduction of fossil fuel and reduces dependance on power station . Overall energy consumption is monitored and also smart battery monitoring system is used which keeps battery at safevoltage and current maintaining Life cycle of battery.

ADVANTAGES:-

1. 24 hr charging supply.
2. Optimize charging time.
3. Consumption of power .
4. Protection from short circuit & over charging.
5. Give required voltage as per consumerrequirement.
6. As per demand of EV we can extend the chargingstation.

REFERENCE :-

[1] Hybrid Solar-Wind Charging Station forElectric Vehicles and Its Simulation Author-Jagruthi Gowardhan,, Paper id - IJRASET46497,publish date- 2022-08-27 **ISSN** 2321-9653

[2] A Comprehensive Review on PhotovoltaicCharging Station for Electric Vehicles : Vol.8, Issue.2, pp.45-49, June (2021,Author- ramvara Prasad,published date - 17/Jun/2021, E-ISSN: 2348-635X

[3] Remote Electric Vehicle Battery Monitoring & Life Cycle Management SystemPublisher: IEEE, Authors-Sangeetha R.G Hemanth. C; Naveen Kumar Marati, **INSPEC Accession Number:** 22482248