Electric Vehicle Multiple Charging Station with Hybrid Renewable System

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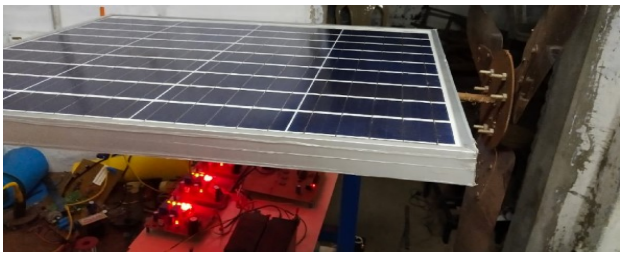
Abstract-Charging station powered by renewable combines both the renewable and electric vehicles, and has much possibility to be a key charging infrastructure. As the number of electric vehicles increase, recharging problem will become urgent and prominent. Still now electric bike and electric cars have separate charging stations and sometimes it does not give chance to the users to charge the vehicles. The main use of our project is to receive power from three sources to charge the electric vehicles. The first source from the electric grid and second from the solar energy and third one from the wind energy. Then the power received from the grid line is given to the transformer and the power is stepped down. The stepped down power from the transformer, power from solar and power from windmill is in the form of ac and it is converted into dc using charging circuit which consists of rectifier. The voltage sensors are connected with these three charging circuits and it measures the amount of voltage coming out from the charging circuits. The power (Voltage) obtained from these sources are fed to the battery for charging. After the charging process is done, the power is given to the buck-boost converter and it steps up and steps down according to our necessity. The power output from the buck boost converter can be varied into four types namely, 12V, 24V, 48V and 60V and the variation depends upon the need of the user. These variations can be sensed by the voltage sensor and the charge is given to the vehicle, but at a time only one vehicle can be charged. These five voltage sensors are controlled by the microcontroller and the amount of voltage obtained from the charging circuit, battery and buck boost converter can be viewed visually using the LCD. The existing charging stations can charge only e-bike or electric cars. But by our project electric bikes and electric cars are charged at the same situation itself and it can be charged easily by varying the amount of charge.

Keywords:Micro controller AT mega328, Transformer, Solar panel, Wind mill,Buck boost converter.

I. INTRODUCTION

The demand for conventional energy like coal, natural gas, and oil is raised, so that the researchers forced towards the development of renewable resources or non-conventional energy resources. Recently, electric vehicles (EVs) are gradually accepted by the public owing to battery technology development. However, it is challenging that the growing number of EVs means huge charging demand and will definitely aggravate the grid load in peak hour. Then more power plants are needed to be built established to provide the extra electric power, which are costly and bring environmental problems. Meanwhile, the exploitation of renewable energy sources has also obtained much progress in recent years. So charging station integrated with renewable energy sources will play a key role in the widespread use of EVs in the near future even including vehicle to grid. Accordingly, the number of e-vehicles and the number of needed charging station pools will continue to grow in the near future. The charging capacity of batteries is steadily increased and the e-vehicle charging time is shorted. According to the design of energy formation and system composition, EVs can be divided into hybrid EVs (HEVs), plug-in HEVs (PHEVs) and EVs. In recent years, industrial countries have actively developed various economic incentives to further promote EV-related industries and research projects. In fact, EV-related industries and their infrastructures have grown rapidly in the past 10 years.

II. HARDWARE DESIGN



III.BLOCK DIAGRAM

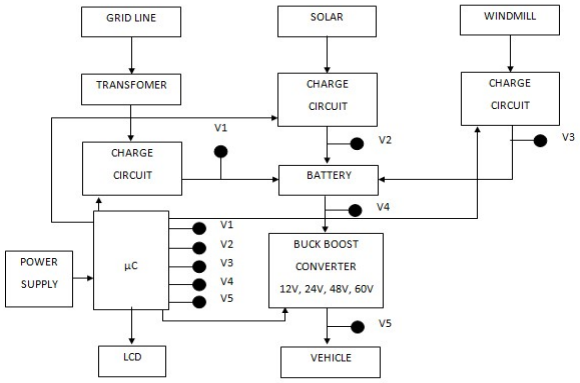


Figure 1 Block diagram of electric vehicles multiple charging station with hybrid renewable system

IV.CIRCUIT EXPLANATION

The circuit consists of an ATmega 328P for a microcontroller operation for displaying of the voltage from the sensor units. The power from the grid lines, windmill and solar panels are stored in the battery. This is transferred via the charge circuit. And from the battery, the charge is boosted by using the buck boost converter. And according to the electric vehicle's charging capacity, the variable voltage is provided to the charging purposes for vehicle.

V.HARDWARE DESIGN

POWER SUPPLY:

The power supply circuits built using filters, rectifiers, and then voltage regulators. Starting with an ac voltage, a steady dc voltage is obtained by rectifying the ac voltage, then filtering to a dc level, and finally, regulating to obtain a desired fixed dc voltage. The regulation is usually obtained from an IC voltage regulator unit, which takes a dc voltage and provides a somewhat lower dc voltage, which remains the same even if the input dc voltage varies, or the output load connected to the dc voltage changes. The block diagram of power supply is shown in fig 2 below.

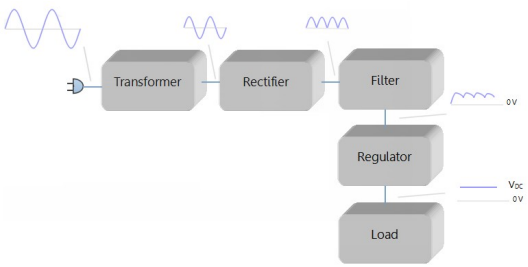


Figure 2 Block diagram of power supply

TRANSFORMER

Fig 3 showing a transformer is a device which transforms high voltage AC into low voltage AC or vice versa. Our goal is to convert high voltage AC into low voltage DC. So there is absolutely no reason to use step-up transformer. The transformer that is used in power supply is step-down transformer, which *steps down* the input AC voltage. The magnitude by which transformer steps down the voltage depends on the turn's ratio of primary and secondary winding. Observe the magnitude of

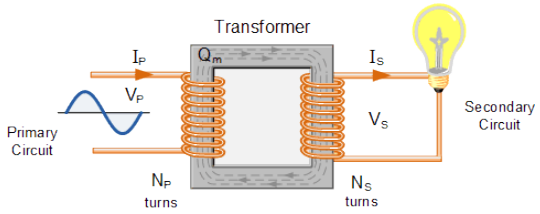


Figure 3 Transformer

Sinusoidal signal before the transformer block. Its magnitude is quite high as compared to that of the signal after the transformer block diagram. This indicates that that the signal was *stepped down* by the transformer. There arises an obvious question as to why transformer is used in this system.

BATTERY

The principles of operation haven't changed much since the time of Volta. Each cell consists of two half cells connected in series through an electrolytic solution. One half cell houses the **Anode** to which the positive ions migrate from the **Electrolyte** and the other houses the **Cathode** to which the negative ones drift. The two cells are may be connected via a semi permeable membranous structure allowing ions to flow but not the mixing of electrolytes as in the case of most primary cells or in the same solution as in secondary cells.

The energy released during accepting an electron by a neutral atom is known as electron affinity. As the atomic structure for different materials are different, the electron affinity of different materials will differ. If two different kinds of metals or metallic compounds are immersed in the same electrolyte solution, one of them will gain electrons and the other will release electrons. Which metal (or metallic compound) will gain electrons and which will lose them depends upon the electron affinities of these metals or metallic compounds. The metal with low electron affinity will gain electrons from the negative ions of the electrolyte solution. On the other hand, the metal with high electron affinity will release electrons and these electrons come out into the electrolyte solution and are added to the positive ions of the solution. In this way, one of these metals or compounds gains electrons and another one lose electrons. As a result, there will be a difference in electron concentration between these two metals. This difference of electron concentration causes an electrical potential difference to develop between the metals. This electrical potential difference or emf can be utilized as a source of voltage in any electronics or electrical circuit. This is a general and basic **principle of** battery .

SOLAR POWER SUPPLY

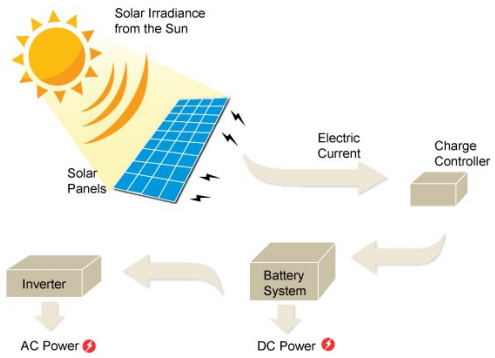


Figure 4 solar power supply

Fig 4 showing a solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solar cells. The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.

CHARGE CONTROLLERS

Fig 5 showing most stand-alone solar power systemswill need a *charge controller*. The purpose of this is to ensure that the battery is never overcharged, by diverting power away from it once it is fully charged. Only if a very small solar panel such as a battery saver is used to charge a large battery is it possible to do without a controller. Most charge controllers also incorporate a low-voltage disconnect function, which prevents the battery from being damaged by being completely discharged. It does this by switching off any DC appliances when the battery voltage falls dangerously low.

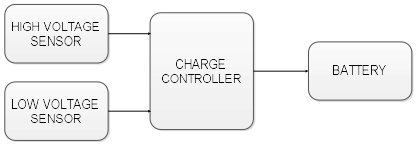


Figure 5 Charge Controllers

The principle behind a solar charge controller is simple. There is a circuit to measure the battery voltage, which operates a switch to divert power away from the battery when it is fully charged. Because solar cells are not damaged by being short or open-circuits, either of these methods can be used to stop power reaching the battery.

3.6 WIND ENERGY

If the mechanical energy is then converted to electricity, the machine is called a wind generator Wind turbine are mounted on a tower to capture the most energy.

V.ATMEGA-328 IC:

ATMEGA-328 integrated chip consists of 28 pins. It consists of 6 analog inputs that are shown in the pin diagram. Analog inputs can be represented as PC0 to PC5. These analog input pins posses the continuous time signal which acts as an analog input for the system. Further it also consists of 12 digital inputs.

It can be represented as PD1 to PD11 which act as a digital input ports based on pulse width modulation (PWM). These PWM, which transmits the signal in the form of discredited form. Both analog and digital input ports can be used for various applications for the input power supply, VCC and GND pins are used. Pins PB6 and PB7, which acts as a crystal to generate a clock signal. By using these crystals, we can generate the clock signals and by these clock signals, we can use this clock signals for input sources.

PC6 pin are the one where it can be used for the reset option. Resetting the program can be done by using this PC6 pin.

CONCLUSION

Controllable loads are needed in distribution systems and EV charging stations are continuously growing in numbers. High EV charging powers feature charging power peaks endangering the distribution system. Charging station is a good way to realizes integration of the three objects. This paper firstly constructed a charging station model that involves the renewable, battery storage, grid-tied system and electric vehicles. And a non-cooperative game based charging power dispatch method was developed to solve the charging challenge. In the future real behavior of drivers should be included in the research in order to better assess the power curve flattening

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