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HYBRID ELECTRIC VEHICLES USING SOLAR AND WIND ENERGY WITH PIC MICROCONTROLLER

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Abstract - This paper proposes a Hybrid Electric Vehicle (HEV) system which solves the major problems of fuel and pollution. The renewable energy is vital for today's world as in near future the nonrenewable sources that we are using are going to get exhausted. The hybrid electric vehicle is a step in saving these nonrenewable sources of energy. The basic principle of solar car is to use energy that is stored in a battery during and after charging it from a solar panel. Power generated by renewable energy sources has recently become one of the most promising solutions for the electrification of islands and remote rural areas. But high dependency on weather conditions and the unpredictable nature of these renewable energy sources are the main drawbacks. To overcome this weakness, different green energy sources and power electronic converters need to be integrated with each other. The charged batteries are used to drive the motor which serves here as an engine and moves the vehicle in reverse or forward direction. This idea, in future, may help to protect our fuels from getting extinguished.

Key Words: Hybrid electric vehicle, Extinguished, Electronic Converters, Electrification, Pollution, Solar panel.

I. INTRODUCTION

This paper discusses about the usage of solar energy and wind energy to power up the vehicle. In order to achieve the required voltage, the Photo Voltaic (PV) Module may be connected either in parallel or series, but it's costlier. Thus to make it cost effective, power converters and batteries are been used. The electrical charge is consolidated from the PV panel and wind turbine and directed to the output terminals to produce low voltage (Direct Current).An electric vehicle is pollution free and is efficient at low speed conditions mainly in high traffic areas. But battery charging is time consuming. The charge controllers direct this power acquired from the solar panel and wind turbines to the batteries. According to the state of the battery, the charging is done, so as to avoid overcharging and deep discharge. The voltage is then boosted up using the boost power converter, ultimately running the BLDC motor which is used as the drive motor for our vehicle application. In the course work, the characteristic features of the components: solar panel, wind turbine, charge controller, battery, interleaved converter, PIC16F877A and BLDC motor required for the vehicle application were studied in real time and also were modeled individually and the complete hardware integration of the system into meet up the application's requirement.

II. LITERATURE SURVEY

1. A. Adejumobi, S.G.Oyagbinrin, F.G.Akinboro & M.B.Olajide, et al in October 2011 proposed a concept on Hybrid Solar and Wind Power: An Essential for Information Communication Technology Infrastructure and people In rural communities. In today's technology driven world electricity is one of the foremost thing for our day to day life activities. As we all are oblivious of the fact that the renewable sources of energy are depleting at a lightning fast rate. So it's time for us to shift the focus from conventional to non-conventional sources of energy to produce electricity. The output of the electricity produced by non-conventional sources is less than their counterparts. Renewable sources do not have any detrimental effect on the environment. Solar-wind hybrid system is basically an integration of solar plant and a wind energy plant. It will help in providing the uninterrupted power supply.

2. Kavita Sharma, Prateek, Haksar in Jan–Feb, 2012 proposed on "Designing of Hybrid Power Generation System using Wind Energy- Photovoltaic Solar Energy- Solar Energy with Nano antenna" tackling the problem of Fuzzy controller for maximum power point tracking (MPPT) under varying isolation and shading conditions. Under these dynamic changes, most MPPT techniques fail to rapidly locate the global maximum power point and are stuck at global maxima leading therefore to inconsistent power generation and low system efficiency. In order to overcome this problem, we have proposed in this paper to apply the Adaptive Neural Fuzzy Interference System (ANFIS) algorithm in order to achieve global maximum power point tracking in record time. Using this method, the total output power of the solar system and wind system is maximized while minimizing the steady-state oscillations and the tracking time.

3. Nahidul Hoque Samrat, Norhafizan Ahmad, Imtiaz Ahmed Choudhury, Zahari Taha in 2015 proposed on "Technical Study of a Standalone Photovoltaic–Wind Energy" Based Hybrid Power Supply Systems for Island Electrification in Malaysia. Energy is one of the most important factors in the socioeconomic development of a country. In a developing country like Malaysia, the development of islands is mostly related to the availability of electric power. Power generated by renewable energy sources has recently become one of the most promising solutions for the electrification of islands and remote rural areas. But high dependency on weather conditions and the unpredictable nature of these renewable energy sources are the main drawbacks. To overcome this

weakness, different green energy sources and power electronic converters need to be integrated with each other. This study presents a battery storage hybrid standalone photovoltaic-wind energy power supply system. In the proposed standalone hybrid system, a DC-DC buck-boost bidirectional converter controller is used to accumulates the surplus hybrid power in the battery bank and supplies this power to the load during the hybrid power shortage by maintaining the constant dc-link voltage. A three-phase voltage source inverter complex vector control scheme is used to control the load side voltage in terms of the voltage amplitude and frequency. Based on the simulation results obtained from MATLAB/Simulink, it has been found that the overall hybrid framework is capable of working under variable weather and load conditions.

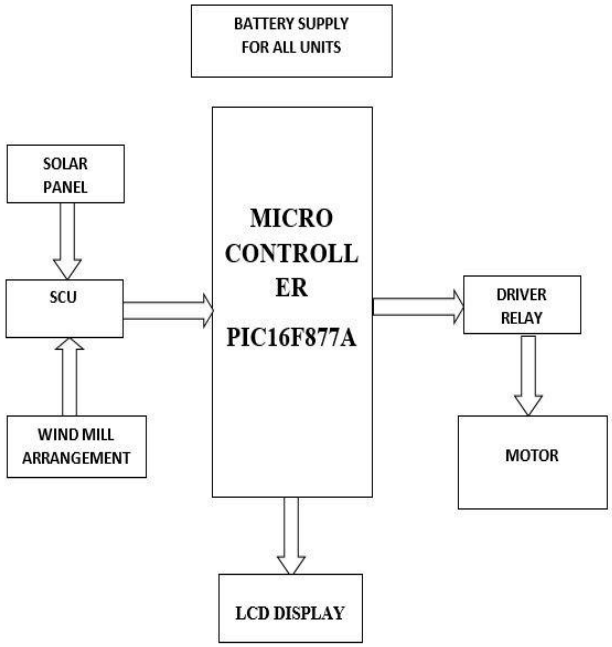
4. Sandeep Kumar, Vijay Kumar Garg, et al in 2013 Inherently variable nature of renewable sources of energy such as solar and wind, are incapable of meeting continuous supply demand. Combining solar photovoltaic (PV) and wind power could offer a feasible solution to the problem of continuous power supply, particularly in those geographical locations where both resources are available in abundance. The present paper investigates the solar and wind energy potential in Indian sub-continent. The feasibility of harnessing renewable energy per sq. meter of land (i.e. energy density) from a combined solar PV-Wind hybrid system in the selected location - Jaisalmer in Rajasthan, is reported. The solar irradiance and wind velocity data for the last three decades for the selected site is collected using PV syst software. A novel design of PV-wind hybrid system is proposed to gauge the better utilization of the existing space, productivity enhancement, and energy/m2 harnessed from the utilized land. The proposed system would pave a way forward towards developing a more sustainable, effective and rugged hybrid renewable energy systems that could cater the energy needs of the Indian sub-continent and similar geographical locations.

5. Samrat NH, Ahmad NB, Choudhury IA, Taha ZB in 2014 Prospect of Wave Energy in Malaysia, in Proceedings of the IEEE 8th International Power Engineering and Optimization Conference. Our earth is a water planet; nearly two thirds of the earth's surface is covered by ocean water. But the shortage of fresh water is a major problem in many areas, especially in rural villages near to the sea or islands. Now, renewable energy-based desalination system is rising around the world due to the adverse environmental effect and high-energy requirements of the conventional fuel-based desalination system. This paper describes the prospect of an off-grid stand-alone wave-powered reverse osmosis desalination system for those areas. A simulation model for the prediction of the wave power delivered for a given value of the wave height and period is adopted. Based on the availability of the wave data, the amount of the water produced at different sites of Malaysia can be calculated in this paper. In addition, this paper deals with an economical analysis of wave energy production for reverse osmosis desalination system.

III. EXISTING SYSTEM

In this existing system, Due to scarcity of fossil fuel in future and its detrimental effect on the environment, an alternative energy has to be discovered. The hybrid system has been designed and installed to generate power which combines solar panel. Also the sun is probably the most important source of renewable energy available today. The hybrid model system is renewable energy system, which helps conserve energy by reducing the use of fuel in vehicle. Hence developing a new method for the economical evaluation.

IV. BLOCK DIAGRAM

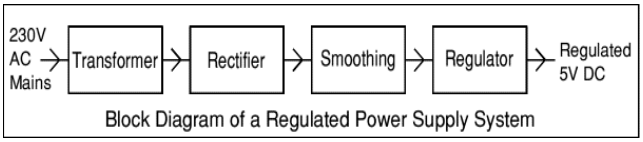


Block Diagram of Proposed model

V. HARDWARE DESCRIPTION

i)POWER SUPPLY:

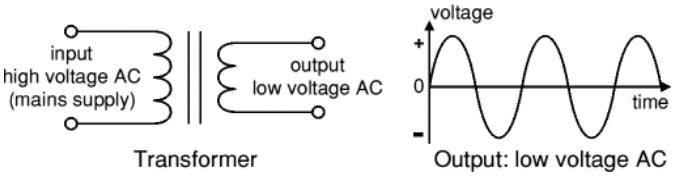
Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient, but will be more complex.



Block Diagram of a Regulated Power Supply System

ii) TRANSFORMER:

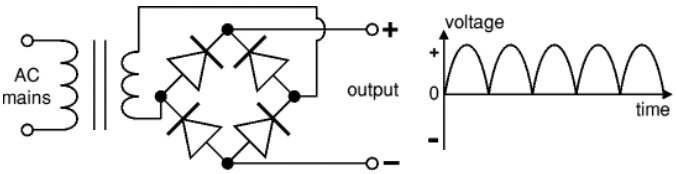
Transformers convert AC electricity from one voltage to another with little loss of power. Transformers work only with AC and this is one of the reasons why mains electricity is AC. The input coil is called the primary and the output coil is called the secondary. There is no electrical connection between the two coils; instead they are linked by an alternating magnetic field created in the soft-iron core of the transformer. The two lines in the middle of the circuit symbol represent the core.



Transformer Output: low voltage AC

iii)RECTIFIER:

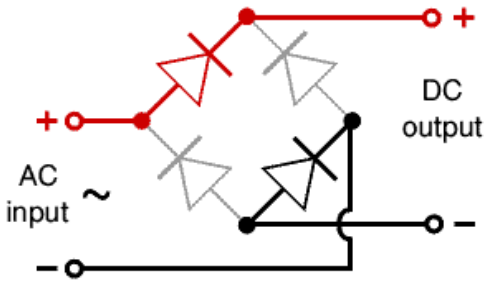
There are several ways of connecting diodes to make a rectifier to convert AC to DC. The bridge rectifier is the most important and it produces full-wave varying DC. A full-wave rectifier can also be made from just two diodes if a centre-tap transformer is used, but this method is rarely used now that diodes are cheaper. A single diode can be used as a rectifier but it only uses the positive (+) parts of the AC wave to produce half-wave varying DC.



Transformer Rectifier Output: varying DC

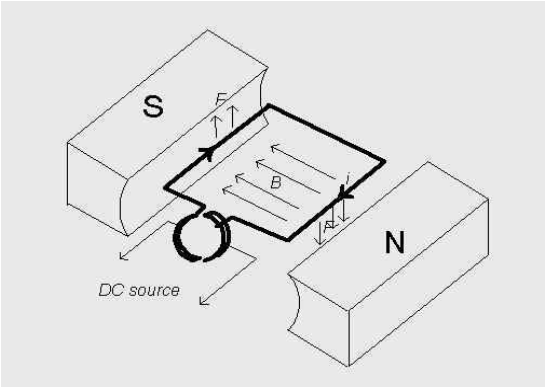
iv) BRIDGE RECTIFIER:

A bridge rectifier can be made using four individual diodes, but it is also available in special packages containing the four diodes required. It is called a full-wave rectifier because it uses the entire AC wave (both positive and negative sections). 1.4V is used up in the bridge rectifier because each diode uses 0.7V when conducting and there are always two diodes conducting, as shown in the diagram below. Bridge rectifiers are rated by the maximum current they can pass and the maximum reverse voltage they can withstand (this must be at least three times the supply RMS voltage so the rectifier can withstand the peak voltages).



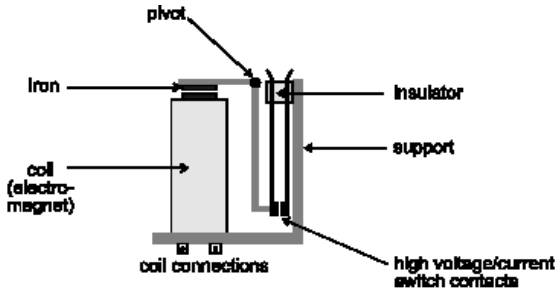
Representation of Bridge Rectifier

v) DC MOTOR:



When DC electric current flowing in the coil in accordance with the direction of the arrow, while the direction of the magnetic field B is from north to south pole, the coil will be driven by the force F in the direction as shown in Figure 1. This condition occurs continuously so will result in rotation on the axis of the coil. The direction of the electric current in the coil is fixed, because of the split ring on the end of the coil.

vi) RELAY DRIVER:



A relay is an electro-magnetic switch which is useful if you want to use a low voltage circuit to switch on and off a light bulb (or anything else) connected to the 220v mains supply.

vii) GSM MODEM:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile

operator perspective, a GSM modem looks just like a mobile phone.

The term GSM modem is used as a generic term to refer to any modem that supports one or more of the protocols in the GSM evolutionary family, including the 2.5G technologies GPRS and EDGE, as well as the 3G technologies WCDMA, UMTS, HSDPA and HSUPA.

GSM MODEM

V. SOFTWARE DESCRIPTION

MPLAB IDE SOFTWARE

MPLAB is a proprietary freeware integrated development environment for the development of embedded applications on PIC and DSPIC microcontrollers, and is developed by Microchip Technology.

MPLAB X is the latest edition of MPLAB, and is developed on the Net Beans platform. MPLAB and MPLAB X support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB is designed to work with MPLAB-certified devices such as the MPLAB ICD 3 and MPLAB REAL ICE, for programming and debugging PIC microcontrollers using a personal computer. Pick it programmers are also supported by MPLAB.

MPLAB 8.X is the last version of the legacy MPLAB IDE technology, custom built by Microchip Technology in Microsoft Visual C++. MPLAB supports project management, editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB only works on Microsoft Windows. MPLAB is still available from Microchip's archives, but is not recommended for new projects.

HI-TECH C compiler for PIC10/12/16 MCUs (PRO)

* This compiler has been discontinued and is no longer supported. This compiler has been replaced by the MPLAB® XC8 PRO (SW006021-2).

* HI-TECH C Compiler for PIC10/12/16 MCUs - PRO fully implements the optimizations of

* Omniscient Code Generation™ - a whole-program compilation technology - to provide denser code and better performance on PIC MCUs. This ANSI C compiler integrates into Microchips MPLAB(R) IDE and is compatible with Microchip debuggers and emulators.

VI. REFERENCES

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