



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 5, May 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

Design and Implementation of Hybrid Power Monitoring System Using Solar and Helical Wind in Highways

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ABSTRACT: Many parts of Libya have the potential to develop economic energy production, so the location on the map was used to identify where wind and solar potential is high. Wind and solar power are becoming popular due to the abundance, availability and ease of use of energy to generate electricity for hybrid light. This project is designed with a spiral-shaped spiral wind turbine to recover wind energy from highway vehicles and generate hybrid renewable energy. Hybrid energy is considered to be the fastest growing clean energy source, but it is limited by variable natural wind, especially in winter the wind will be strong. Highways can provide a significant amount of wind to drive a helical wind turbine due to high vehicle traffic. This energy is unused. Helical Wind Helical Wind Turbines and Solar will be located on the medians; therefore the design will consider fluid flow from both sides of the highway. We are also implementing a solar system during summer days to consume energy from sunlight, with this solar energy the energy will be accumulated during the summer season. We are introducing a method where we can store energy in both summer and winter. In winter, energy can be taken from the wind and in summer from sunlight. Furthermore, since the wind source will fluctuate, the generated energy storage system will be designed to distribute and maintain a constant source of energy.

KEYWORDS: Hybrid system, combination of solar and wind, renewable energy and spiral wind turban.

I. INTRODUCTION

One of the biggest problems or challenges facing humanity today is climate change. According to current figures, this challenge will significantly affect the growth of the economy. Increased use of non-conventional or renewable energy sources is one of the best ways to address these issues. Natural processes are constantly producing these unconventional resources. Solar energy, wind energy and other renewable energy sources are used to generate electricity. Renewable natural resources are used to generate energy, including sunlight, wind, rain, waves and geothermal energy. Hybrid solar-helical wind power provides a better alternative to conventional solar PV systems and helical wind turbines. A hybrid is an artificial structure that resembles a natural hybrid and has branches on which solar modules or helical wind turbines are mounted. Hybrid energy can be considered as a hybrid producing electricity from renewable energy.

II. OBJECTIVE

- For selection of spiral wind turban and generator.
- Create a sustainable, innovative and eco-friendly electricity generation model and reduce pollution during winter and summer days using a hybrid system.
- The turbines will mainly use wind power generated by vehicles and solar energy on the highway to generate electricity.
- The main objective of this project is to power the load lights in winter and summer season using hybrid renewable energy. The goal is to offset the amount of pollution created by burning fossil fuels by introducing a potential source of clean energy.

III. LITERATURE SURVEY

[1] The concept of small wind energy production using a car alternator explained. The objective of this article to evaluate the feasibility by using a claw pole automotive alternator generator. [2] This is a proposed circuit. The Maximum Charged Battery Selection function consists in determining the maximum amount of electrical energy stored in individual batteries.

Maximum Charged Batter Selection is usually wired inside the inverter circuit. Sothe inverter block surrounds the Maximum Charged Battery option. [3] There are no alternatives to the use of renewable energy sources to build a better world without pollution. Renewable resources can be successfully implemented for the production of electricity. [4] Biomass energy, on the other hand, is still not as famous as solar or wind, but it has great potential to be used as a sustainable solution for electricity. Biomass is abundant especially in remote areas from animal husbandry, agriculture, etc., which can be easily used as a source of energy. Biomass energy is relatively stable and more convenient for transportation and storage.[5]

IV. EXISTING SYSTEM

- The Hybrid energy generation system is to supply power to ICT infrastructures, hospitals and other places in far-off and rural areas that have no connection with National Grid Power Supply.
- In this method the power will be stored and monitored for furtherreference, this can be attained by the connection of the hybrid system with the grid to get fluctuation free electrical energy.
- In existing model, the solar panel receives input from the sun radiation and produces electrical energy as output. Here, solar panels are acting as a medium between the conversions processes of solar energy into electrical energy. The power produced will be transferred to the battery and might be stored inside for further usages.
- As the system doesn't contain any controller action, therefore, the circuit design is complex.

V. PROPOSED SYSTEM

The wind motor is connected to an Atmega16 microcontroller. When vehicles travel at high speed on the highway, atmospheric pressure is created from the force of the vehicle, which acts on objects on the roads.

- Here the spiral wind turban is placed by the road, the atmospheric pressure makes the spiral wind turban rotate.
- The motor rotates, the amount of electricity produced is transferred to the LM2596 device and the XL6009 DC-DC device then to the batteries.
- Battery energy is then stored inside for further use. The battery is gradually connected to the load for use.
- The relay will be controlled by the controller and then activated by the AC load.
- Voltage and current sensor used to monitor solar and wind energy measured and displayed on the LCD.
- In addition, we also saved the hybrid power to a text file using an Android app.

VI. BLOCK DIAGRAM

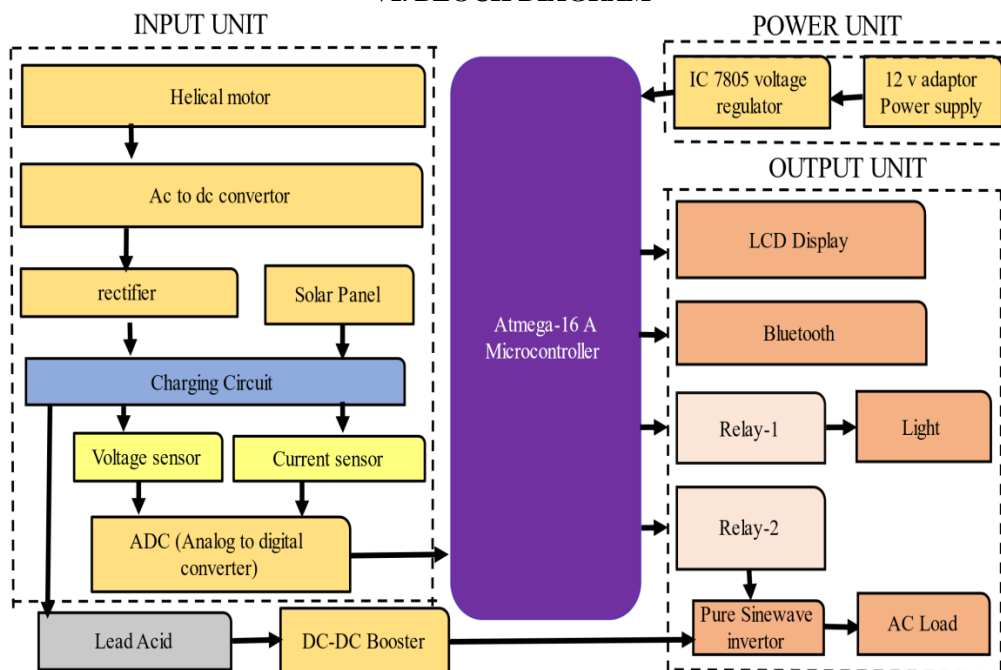


Fig no: 1 Architecture design

A. ANDROID APP DESIGN

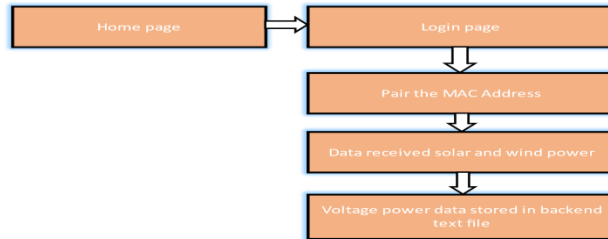


Fig no: 2 Android App

B. CIRCUIT DIAGRAM

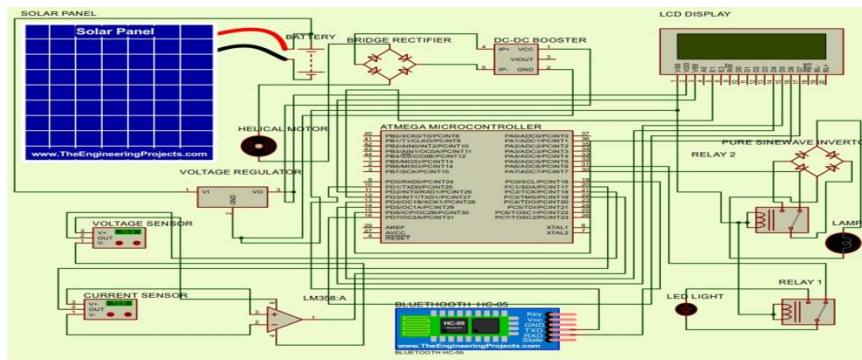


Fig no:3 circuit diagram

VII. HARDWARE COMPONENT

1. LCD Display



Fig no: 8 pin diagram LCD Display

Liquid crystal displays (LCDs) are found in countless electronic devices. Most smartphones have an LCD that is responsible for creating visual images. LCD is also the technology used in televisions. But since there are other photography options available, you may wonder why the LCD is so popular. LCD is a device that uses liquid as pixels. Like all devices, LCDs are made up of tiny cells called pixels.

2. BATTERY

The battery system stores excess solar energy for later use. A BATTERY extends the use of energy generated by a photovoltaic system, providing free, sustainable energy even when the sun is not shining and the panels are not producing power. With a BATTERY, little or no electricity is supplied to the grid and at the same time you avoid buying expensive electricity from the grid later. Due to increased self-consumption, electricity costs fall significantly.



Fig no: 9 power supply

3. ATMEGA MICROCONTROLLER

A professional microcomputer integrated into a small chip is called an AVR microcontroller. It contains a microcontroller, a processor, programmable I/O peripherals, and memory. AVR microcontrollers are suitable for any electrical, automotive or mechanical, plant, miscellaneous equipment, electronics, etc. Provides digital control. These microcontrollers are available in 8-bit, 16-bit and 32-bit ICs.



Fig no: 10 Atmega 16 - A microcontroller

4. ELECTROMAGNETIC RELAY

A simple electromagnetic relay, like the car in the first picture, is a modification of the electric motor. It consists of a coil around a soft metal core, a metal yoke that provides a low-reluctance path for magnetic flux, a movable metal armature, and one or more contacts; two in the relay shown here. The armature is hinged to the yoke and mechanically connected by one or more contacts

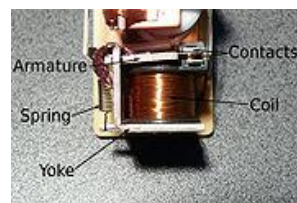


Fig no: 10 Relay

5. VOLTAGE AND CURRENT SENSOR

A Sensor is a device that can detect or recognize and react to some kind of electrical signal or some optical problem. Electrical and electronic current and electric current equipment has become the best for measuring current and voltage. In this article, we can discuss voltage and current sensors in detail. Voltage and current sensors identify, monitor and measure electrical equipment. It can measure AC level and/or DC voltage level. The input of voltage and current sensors is voltage itself, and the output can be analog voltage signal, switch, buzzer, analog current level, frequency or FM output.



Fig no: 11 voltage regulator

6. AC WIND MOTOR



Fig no:12 motor

Geared DC motors can be defined as an extension of DC motors, the visual details of which have been clarified here. The speed of the body is measured by the number of revolutions per minute of the shaft, called RPM. Gear assembly helps increase torque and reduce speed. With the right power combination in the gearmotor, its speed can be reduced



to the desired number. The idea of shifting gears to reduce the car's speed but increase its power is called downshifting.

7. POWER SUPPLY

This section describes the operation of the power supply designed using filters, power supplies, and power supplies. Stable DC voltage is obtained by starting from the AC voltage, rectifying the AC voltage, then filtering it to the DC level, and finally controlling it to obtain the desired DC voltage. The rule is usually derived from the IC voltage regulator unit, which takes the DC voltage and supplies a small DC voltage that remains constant even if the input DC voltage changes or the output load is connected to the DC voltage change.



Fig no: 13 power supply

8. SOLAR PANEL

Solar Panel Technology has developed rapidly, becoming more efficient and cheaper, which has led to further imagination. However, despite technological developments, the structure of solar panels has not changed over the years. Most solar panels have an array of silicon crystal cells sandwiched between a glass front and an aluminum polymer plastic back support. Once installed, solar panels will be severely damaged over their 25+ year lifespan. Changes in temperature, humidity, and wind and UV radiation can cause serious stress on solar panels.



Fig no:14 solarpanel

9. WIFI DEVICE

Each ESP8266 module comes pre-programmed with AT commands to set the firmware; this means we can easily connect it to our Arduino and get more WiFi functionality like the WiFi Shield has. The ESP8266 module is a great value card with a large and growing community. Thehas enough onboard performance and memory to enable integration with sensors and other custom devices via its GPIOs, with minimal development and uptime.



Fig no: 15 wifi device

10. HC – 05 DEVICE

Bluetooth is a wireless technology for sharing information between two devices placed over a short distance using short wavelengths such as ultra-high frequency radio waves such as 2.400 to 2.485 GHz for research, business and medical radio frequency. It is also used for houses and apartments with special connections. It is similar to Wifi that works on a wireless radio. An alternative communication model specifically designed for low-power devices.

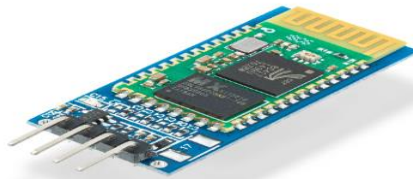


Fig no:19 HC-05 device

VIII. RESULT

- In this project the hybrid power generation using helical and solar which is measured using voltage and current sensor here the voltage and current supply stored in battery, 12v DC supply converted into AC 230v.
- Then the data from sensor is connected with android application with is successfully completed.



Fig no: hardware device

XI. CONCLUSION

Solar and helical wind turbine hybrid power concept is rapidly gaining popularity as it can produce more energy while consuming less land. Lack of information, high shading loss and need for more equipment are the main problems that negatively affect their general acceptance. The main reason for the low cost of current hybrid power generation is the high demands on construction materials. One of the purposes of this review is to reveal the models and uses of different energy sources in the world.

REFERENCES

- [1] I.A. Adejumobi., S.G. Oyagbinrin., F.G. Akinboro., 2019. Hybrid Solar and Wind Power: An Essential for Information communication Technology Infrastructure and People in Rural Communities.
- [2] Irfan, M.; Zhao, Z.-Y.; Ahmad, M.; Mukeshimana, M.C. Solar Energy Development in Pakistan: Barriers and Policy Recommendations. *Sustainability* 2020, 11, 1206.
- [3] A Yasir., Irfan Yousuf., IRENA (2018), Renewable Readiness Assessment: Pakistan, International Renewable Energy Agency (IRENA), Abu Dhabi.
- [4] M. Dali, J. Belhadj, and X. Roboam, "Hybrid solar-wind system with battery storage operating in grid-connected and standalone mode: Control and energy management –Experimental investigation" *Energy*, 2021.
- [5] Khare, V.; Nema, Dr. S. and Baredar Dr. P.; "Power Quality Disturbances in Grid Connected Solar System & Its Prevention", *International Journal of Engineering and Innovative Technology (IJEIT)*, May 2022.
- [6] A.A. Sahito., I.A. Halepoto., 2022. Analyzing the Impacts of Distributed Generation Integration on Distribution Network: A Corridor Towards Smart Grid Implementation in Pakistan. *Wireless Personal Communications*.
- [7] Y. Ma, Y. Chen, X. Chen, F. Deng, and X. Song, "Optimal dispatch of hybrid energy islanded microgrid considering V2G under TOU tariffs," *E3S Web of Conferences*, EDP Sciences, vol. 107, article 02007, 2019.



- [8] M. FatinIshraque, S. A. Shezan, M. M. Ali, and M. M. Rashid, "Optimization of load dispatch strategies for an islanded microgrid connected with renewable energy sources," *Applied Energy*, vol. 292, article 116879, 2021.
- [9] M. F. Ishraque, S. A. Shezan, M. S. Rana et al., "Optimal sizing and assessment of a renewable rich standalone hybrid microgrid considering conventional dispatch methodologies," *Sustainability*, vol. 13, no. 22, 2021
- [10] M. Petrollese and D. Cocco, "Techno-economic assessment of hybrid CSP-biogas power plants," *Renewable Energy*, vol. 155, pp. 420–431, 2020.
- [11] S. A. Shezan, M. F. Ishraque, S. M. Muyeen et al., "Effective dispatch strategies assortment according to the effect of the operation for an islanded hybrid microgrid," *Energy Conversion and Management: X*, vol. 14, article 100192, 2022.
- [12] M. F. Ishraque, S. A. Shezan, J. N. Nur, and M. S. Islam, "Optimal sizing and assessment of an islanded photovoltaic–battery–diesel generator microgrid applicable to a remote school of Bangladesh," *Engineering Reports*, vol. 3, no. 1, article e12281, 2021.
- [13] R. Shi, C. Sun, Z. Zhou, L. Zhang, and Z. Liang, "A robust economic dispatch of residential microgrid with wind power and electric vehicle integration," in *2016 Chinese Control and Decision Conference (CCDC)*, pp. 3672–3676, Yinchuan, China, May 2018.
- [14] X. Fang, S. Misra, G. Xue, and D. Yang, "Smart grid — the new and improved power grid: a survey," *IEEE Communications Surveys & Tutorials*, vol. 14, no. 4, pp. 944–980, 2019.
- [15] S. A. Shezan, "Optimization and assessment of an off-grid photovoltaic–diesel–battery hybrid sustainable energy system for remote residential applications," 2019.
- [16] S. A. Shezan and M. F. Ishraque, "Assessment of a micro-grid hybrid wind-diesel-battery alternative energy system applicable for offshore islands," in *2019 5th International Conference on Advances in Electrical Engineering (ICAEE)*, pp. 457–462, Dhaka, Bangladesh, Septemeber 2019.
- [17] L. Qi, P. Zheng, X. Wu, W. Duan, L. Li, and Z. Zhang, "A hybrid wind-photovoltaic power generation system based on the foldable umbrella mechanism for applications on highways," *Solar Energy*, vol. 208, pp. 368–378, 2020.
- [18] N. Bizon and P. Thounthong, "Energy efficiency and fuel economy of a fuel cell/renewable energy sources hybrid power system with the load-following control of the fueling regulators," *Mathematics*, vol. 8, no. 2, p. 151, 2020.
- [19] T. Salameh, M. A. Abdelkareem, A. G. Olabi, E. T. Sayed, M. Al-Chaderchi, and H. Rezk, "Integrated standalone hybrid solar PV, fuel cell and diesel generator power system for battery or supercapacitor storage systems in Khorfakkan, United Arab Emirates," *International Journal of Hydrogen Energy*, vol. 46, no. 8, pp. 6014–6027, 2021.
- [20] V. A. Ani, "Development of an intelligent power management system for solar PV-Wind-Battery-Fuel-Cell integrated system," *Frontiers in Energy Research*, vol. 9, p. 31, 2021.



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