Hybrid Power Generation For Rural Electrification And Monitoring Over With Iot

Mr.M.Gangadhara Rao.[1], Mr.D.Srinu[2], Ms.N.Jeeshitha[3], Mr.S.Sai Sravan[4]
[1] Assistant Professor, Dept of Electrical and Electronics Engineering
[2, 3, 4]Dept of Electrical and Electronics Engineering
[1, 2, 3, 4] KommuriPratap Reddy Institute of Technology

Abstract- *The project aims at developing a system which makes use of wind and solar energy for rural electrification. Wind and solar energy is treated as non renewable source of energy. This system also monitors the source availability and power generation on LCD and monitor over IOT (Internet of Things) Application. By using this project we can produce natural energy for rural areas and also we can monitor the power generation and source availability from remote location.Wind and solar energy has been used since the earliest civilization to grind grain, pump water from deep wells, and power sailboats.*

Wind-mills in pre-industrial Europe were used for many things, including irrigation or drainage pumping, grain-grinding, saw-milling of timber, and the processing of other commodities such as spices, cocoa, paints and dyes, and tobacco. Before the U.S. installed an infrastructure of electricity wires, both water-pumping windmills and small wind electric turbines were vital to farming and developing the American Great Plains and west. In recent decades, the industry has been perfecting the wind turbine to convert the power of the wind into electricity. The wind turbine has many advantages that make it an attractive energy source, especially in parts of the world where the transmission infrastructure is not fully developed. It is modular and can be installed relatively quickly, so it is easy to match electricity supply and demand.

I. INTRODUCTION

Energy has always been an important factor for socio-economic development of humans. Most of the energy is generated from fossil fuels in the world. Nevertheless, environmental aspects and depleting of fossil fuels causes increase of renewable energy utilization. The produced energy from renewable energy resources are transferred to grid or used in stand-alone systems. As energy generation depends on environmental conditions, efficiency and energy potential of renewable energy systems changes according to region of hybrid (wind and solar) installation. Hybrid systems arise when the continuous and the discrete meet. Combine continuous and discrete inputs, outputs, states, ordynamics, and you have a hybrid system. Particularly, hybrid systems arise from the use of finite-state logic to govern continuous physical processes (as in embedded control systems) or from topological and network constraints interacting with continuous control (as in networked control systems). This chapter provides an introduction to hybrid systems, building them up first from the completely continuous side and then from the completely discrete side. It should be accessible to control theorists and computer scientists alike.

The wind turbine can operate with maximum aerodynamic efficiency, and the power fluctuations can be absorbed as an inertial energy in the blades. In some applications, the wind turbine may be augmented by an additional power source, usually a diesel generator. The systems are called wind–diesel systems and may be used to supply electricity energy to stand-alone loads, e.g., small villages that are not connected to the main utility. Most diesel generation systems operateat a constant speed due to the restriction of constant frequency at the generator terminals. However, diesel engines have high fuel consumption when operating with light load and constant speed. In order to improve the efficiency and avoid wet stacking, a minimum load of about 30% to 40% is usually recommended by the manufacturers .Variable-speed operation can increase the efficiency, where the fuel consumptioncan be reduced up to 40%, especially when operating with a light load. Moreover, the life expectancy can increase with a lower thermal signature. To avoid the frequent start/stop of the diesel generator, an energy storage system is often used. Topologies of the power electronic converter for maximum power point tracking (MPPT) and voltage conversion are studied in this project. The maximum power point of photovoltaic (PV) array is variation, so a search algorithm isneeded according to the current–voltage (*I*–*V*) and power–voltage (*P*–*V*) characteristics of the solar cell. The perturbation and observation (P&O) MPPT algorithm is commonly used, due to its ease of implementation. It is based on the observation that if the operating voltage of the PV array is perturbed in a given direction and the power drawn from the PV array incareases, which means that the operating point is moving toward the MPPT, so the operating voltage must be further perturbed in

the same direction. Otherwise, with the operating point moving away from the MPP, the direction of the operating voltage perturbation must be reversed. By using the P&O method, impedance matching is conducted between a boost converter and PV array in order to realize the MPPT function.
The general requirements of MPPT are: simple, low cost, quick tracking when condition changes and small output power fluctuation. The traditional methods are simple and low cost without good tracking performance, such as hill climbing, P&O, and incremental conductance, etc. Novel methods are developed with higher accuracy but complex process, such as the optimum gradient method, fuzzy logic control, neural networks (NN) & Adaptive Neuro Fuzzy Interfacing system(ANFIS) .These technique could also be costly, difficult to implement, and may not be stable enough.Now a day, the growth of wind and PV power generation systems has exceeded the most optimistic estimation .In this project, a stand-alone hybrid energy system consisting of wind &PV is proposed with the battery for energy storage. Wind and PV are the primary power sources of the system to take full advantages of renewable energy. The dynamic modeling and control of the system was studied. The concept and principle of the hybrid system with its supervisory control were delineated. Classical techniques of maximum power tracking were applied to PV array and the wind-turbine control.The ultimate objective of the project is to generate the maximum power and as a alternate source of power in requirement of demand. Here both the wind power and photovoltaic (PV) power generation techniques and their maximum-power-point tracking (MPPT) methods.A new stand-alone wind–PV hybrid generation system is proposed for application to remote and isolated areas. An Adaptive Neuro Fuzzy Interfacing system (ANFIS) is employed effectively as a controller for hybrid power generation system.Theproject experimental results confirm thatthe proposed hybrid generation system can provide maximum power generation, harmonic reduction, better voltage &current control.

II. COMPONENTS EXPLANATION

POWER SUPPLY

The ac voltage, typically 220V rms, is connected to a transformer, which steps that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also remains the same dc value even if the input dc voltage varies, or the loadconnected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

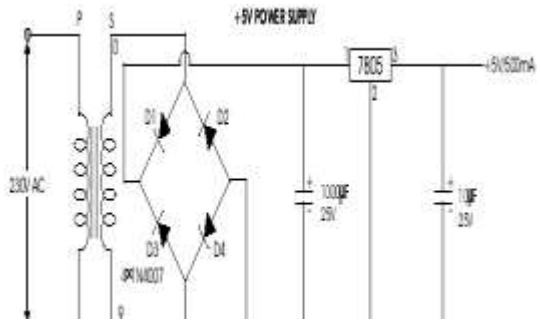


Fig No.1

III. TRACKING MOTOR(SERVO MOTOR)

A servo motor is an electrical device which can push or rotate an object with great precision. If you want to rotate and object at some specific angles or distance, then you use servo motor. It is just made up of simple motor which run through servo mechanism. If motor is used is DC powered then it is called DC servo motor, and if it is AC powered motor then it is called AC servo motor. We can get a very high torque servo motor in a small and light weight packages. Doe to these features they are being used in many applications like toy car, RC helicopters and planes, Robotics, Machine etc. Servo motors are rated in kg/cm (kilogram per centimeter) most hobby servo motors are rated at 3kg/cm or 6kg/cm or 12kg/cm. This kg/cm tells you how much weight your servo motor can lift at a particular distance. For example: A 6kg/cm Servo motor should be able to lift 6kg if the load is suspended 1cm away from the motors shaft, the greater the distance the lesser the weight carrying capacity. The position of a servo motor is decided by electrical pulse and its circuitry is placed beside the motor.

IV. MPPT

A typical solar panel converts only 30 to 40 percent of the incident solar irradiation into electrical energy. Maximum power point tracking technique is used to improve the efficiency of the solar panel.According to Maximum Power Transfer theorem, the power output of a circuit is maximum. When the Thevenin's impedance of the circuit (sourceimpedance) matches with the load impedance. Hence our problem of tracking the maximum power point reduces to an impedance matching problem. In the source side we are using a boost convertor connected to a solar panel in order to enhance the output voltage so that it can be used for different applications like motor load. By changing the duty cycle of the boost converter appropriately we can match the source impedance with that of the load impedance.

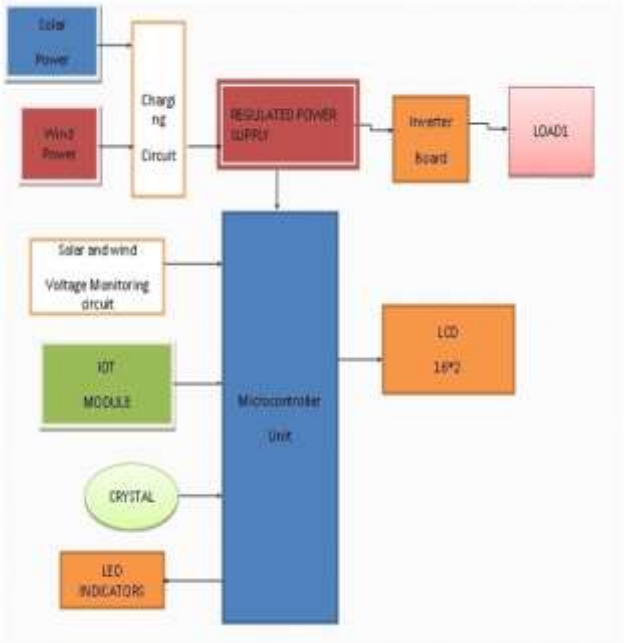
V. STEPUP TRANSFORMER

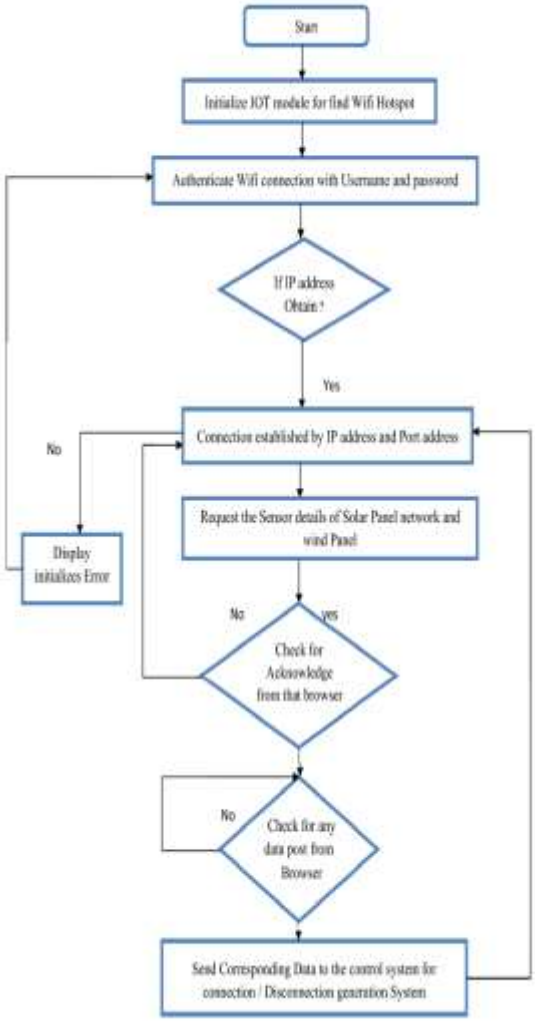
A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Electromagnetic induction produces an electromotive force within a conductor which is exposed to time varying magnetic fields. Transformers are used to increase or decrease the alternating voltages in electric power applications. It is a step up transformer in which the primary winding is more than secondary winding. Due to this windings it can able to step up the voltage. A Transformer changes electricity from high to low voltage or low to high voltage using two properties of electricity.

VI. DC TO DC CONVERTER

A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) arenormally added to such a converter's output (load-side filter) and input (supply-side filter).

Flow Chart





ANALYSIS

The hardware of Solar PV Wind hybrid energy system is implemented and the output is fed to the load. The current and voltage values from the wind turbine, solar panels, battery group and load are measured in the implemented system. Production and consumption of power for each module are calculated. Solar-Wind hybrid Power system is the combined power generating system by wind mill and solar energy panel. It also includes a battery which is used to store the energy generated from both the sources.

Using this system power generation by windmill when wind source is available and generation from PV module when light radiation is available can be achieved. Both units can be generated power when both sources are available. By providing the battery uninterrupted power supply is possible when both sources are idle.

VII. CONCLUSION

In the present work a Solar PV Wind Hybrid Energy System was implemented. A portion of the energy requirement for a private house, farm house, a small company, an educational institution or an apartment house depending on the need at the site where used has been supplied with the electricity generated from the wind and solar power. It reduces the dependence on one single source and has increased the reliability. Hence, we could improve the efficiency of the system as compared with their individual mode of generation.

REFERENCES

[1] Kalaiarasi.D, A.Anusha,D.BerslinJeni and M.Monisha, "ENHANCEMENT OF HYBRID POWER SYSTEMS USING IOT",International Journal of Advanced Research Trends in Engineering and Technology (IJARTET),Vol. 3, Special Issue 19, April 2016.

[2] Ali Dehgani, MojtabaHakimzadeh, Amir Habibi, NavidMehdizadehAfroozi, "Small Signal Stability Enhancement for Hybrid Power Systems By SVC" World Academy of Science, Engineering and Technology International Journal of Electrical, Computer, Energetic, Electronic and Communication Engineering Vol:8, No:10, 2014.

[3] JaehakByun, Sooyeop Kim, Jaehun Sa, Sangphil Kim, Yong-Tae Shin and Jong-Bae Kim, "Smart City Implementation Models Based on IoT Technology", Advanced Science and Technology Letters Vol.129 (Mechanical Engineering 2016), pp.209-212.

[4] Sambeet Mishra, HardiKoduvere, Dr. Ivo Palu, Dr. ReeliKuhi-Thalfeldt, "Modelling of solar-wind hybrid renewable energy system architectures", Energy Conference (ENERGYCON), April 2016 IEEE International, pp.1-6.

[5] R. Caso, R. Garroppo, S. Giordano, G. Manara, A. Michel, P. Nepa, L. Tavanti, M. Magnarosa, G. Nenna, "Antennas and Photovoltaic Panels: Toward a GreenInternet of Things", Internet of Things (WF-IoT), IEEE 2nd World Forum on dec 2015, pp.128-131.

[6] PranitNagare, RammohanShettigar, Arnav Nair, and Pratibha Kale, "Vertical axis wind turbine", International Conference on Technologies for Sustainable Development (ICTSD-2015), Feb. 04 – 06, 2015 IEEE.

[7] SaraswatiSaha; AnupamMajumdar. "Data centre temperature monitoring with ESP8266 based Wireless Sensor Network and cloud based dashboard with real time alert system" , 2017 Devices for Integrated Circuit (DevIC), 23-24 March, 2017, pp.307-310.

[8] PallaviRavindra Joshi1 and Prof. M S khan, "IOT Based Smart Power Management System Using WSN", International Journal of Advanced Research Trends in Engineering and Technology, Vol: 04, Issue: 06, June -2017.

[9] Leo Louis, "Working Principle of Andruino and Using It as a tool for study and research", International Journal of Control, Automation, Communication and Systems (IJCACS), Vol.1, No.2, April 2016.

[10] PuttaSindhuja and M. S. Balamurugan, "Smart Power Monitoring and Control System through Internet of things using Cloud Data Storage", Indian Journal of Science and Technology, Vol 8(19), August 2015.

Mr.M.GangadharaRao.

He Received the B.Tech (Electrical and Electronics Engineering) degree from the Jawaharlal NehruTechnological University, Hyderabad in 2010 at *Nishitha College of Engineering* & Technology, Hyderabad and M.Tech (Electrical Power Engineering) from Jawaharlal Nehru TechnologicalUniversity Hyderabad in 2013 at Scient Institute of Technology Hyderabad. Currently he is an AssistantProfessor, HOD in the Department of Electrical and Electronics Engineering at the KommuriPratapReddy Institute of Technology, Ghanpur, Ghatkesar, and R.R.District. His area of interest in the field of Electrical Circuits, Power Systems and Control Systems.

Mr.D.Srinu

He is pursuing B.Tech (Electrical and Electronics Engineering) degree from the Jawaharlal Nehru Technological University, Hyderabad from year 2016-2019 at *KommuriPratap Reddy Institute of Technology, Ghanpur* and Diploma (Electrical and Electronics Engineering) from *JN Govt Polytechnic Ramanthapur, Hyderabad* (SBTET) in Year 2016.

Ms.N.Jeeshitha
Sheis pursuing B. Tech (Electrical and Electronics Engineering) degree from the Jawaharlal Nehru Technological University, Hyderabad in 2015-2019 at *KommuriPratap Reddy Institute of Technology, Ghanpur.*

Mr.S.SaiSravan
He is pursuing B.Tech (Electrical and Electronics Engineering) degree from the Jawaharlal Nehru Technological University, Hyderabad from 2016-2019 at *KommuriPratap Reddy Institute of Technology, Ghanpur* and Diploma (Electrical and Electronics Engineering) from *Govt Polytechnic Mahbubnagar* (SBTET) in Year 2016.