A Review on Dual-Axis Solar Tracking PV System and Wind Turbine

Dr.P.S.Choudhary[1] Mahendra Garad[2]
[1]Associate Professor [2]Scholar
[1,2]Department of Electrical and Electronics Engineering
[1,2]PRMCEAM Badnera, SGBAU Amravati University, Maharashtra, India

Abstract— Renewable energy resources such as solar and wind energies are becoming advantageous compared to the conventional sources of power production. In various thesis presents a renewable energy hybrid power system that based on photovoltaic (PV) and wind, and equips with Diode Clamped Multi-Level Inverter and LC filter. The most suitable hybrid system for environmental friendly and widely available in India are wind and PV energy. However, the hybrid power system that solely depends on the intermittent renewable energy sources will generate a fluctuating output voltage that leads to damage to the machines that operate on a stable supply. In order to satisfy the first goal of high efficiency the device will be tracking path of the sun in the sky to keep the sun rays normal to the surface of a photo-voltaic panel. The Tracker not only follows SUN from EAST to WEST and back to EAST in a cyclic manner. And with wind turbine to energize sources resulting in much more power consumption and continuous use throughout the year.

Keywords: PV Panel, Solar Tracker, Wind Turbine, Charge Controller

I. INTRODUCTION

The recent increase in the price of crude oil has reminded many quarters on the transient nature of fossil fuel. On the other hand, for development of alternative clean sources of energy environmental issues are forcing governments to consider the incentives. Photovoltaic cells are in fact large area semiconductor diodes that convert sunlight into electrical current to produce usable power. They have been long used in situations where electrical power from power station is that cannot be obtained, such as in remote area power systems. A solar array is given the power output in watts. The output power of the solar cell depends on multiple factors, such as sunlight intensity and direction of the cells. In order to reach the maximum power, the solar tracker has been added to this system[2].The Savonius type vertical axis wind rotor was first invented by S. J. Savonius in 1929.To plan and make a drawing of how something will be made was based on the principle of Flettner's rotor. The rotor was formed by cutting a Flettner's cylinder from top to bottom and then moved the two semi-cylinder surfaces sideways along the cutting plane so that the cross-section resembled the letter 'S'. It can be directly placed in flowing stream of water to generate mechanical power from kinetic energy of flowing fluid. Applications of Savonius rotor, in general, includes ventilation pumping water, driving an electrical generator.

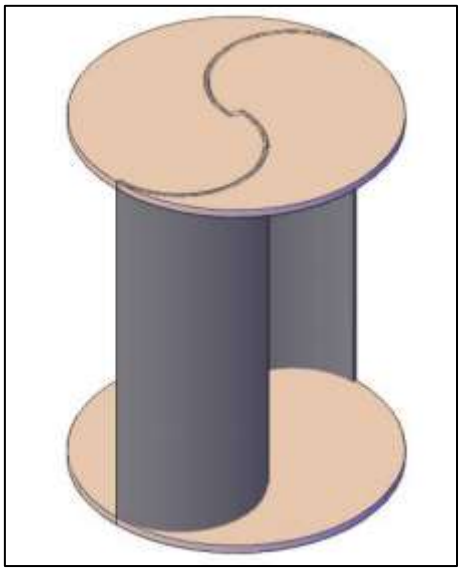

Fig. 1: Savonius Rotor

II. LITERATURE REVIEW

The erawut Jinayim et al. (2007) proposed that system use the dc power generated by fixed solar cells module to energize White LED light sources that are operated by directly connected White LED with current limitation resistors, resulting in much more power consumption. This paper presents the use of white LED as a general lighting application powered by tracking solar cells module and using pulse to apply the electrical power to the White LED. These systems resulted in high efficiency power conversion, low power consumption, and long light of the white LED [11].

Ahmed Yousuf Saber et al. (2008) proposed that system is described Implementation of a Sun Tracker with a Dual-Axis Single Motor for an Optical Sensor-Based Photovoltaic System not wind energy system This paper proposes a novel design of a dual-axis solar tracking PV system which utilizes the feedback control theory along with a four-quadrant light dependent resistor (LDR) sensor and simple electronic circuits to provide robust system performance[3].

J.-L. Menet1 et al. (2012) This is described and applied to the study of a new type of street light using exclusively wind and solar energy and it is more efficient than the simple solar street lamp. A Street light using exclusively 'green energy' could in fact have a greater impact on the environment than conventional street lighting. However, although no optimization has been made, the SOLEOL Street light is globally at the same level than the conventional street lights concerning the environmental indicators used in the present study. It is clear that optimizations are necessary and that they will lead to a better positioning of the SOLEOL prototype [12].

Patel C.R., Patel et al. (2013) Hydropower from the river is one of the best renewable sources. Hydro power source is predictable compared to wind or solar energy.

For generation of electricity using the kinetic energy of natural water resources, Savonius rotor is one of the best types of turbine. The Savonius turbine is more popular as wind turbine. However, in present work, attempt is made for use of Savonius rotor as hydro turbine application[2].

Jing-Min Wang and Chia-Liang Lu et al. (2013) the proposed system uses a unique dual-axis AC motor and a stand-alone PV inverter to accomplish solar tracking. The control implementation is a technical innovation that is a simple and effective design. In addition, a scaled-down laboratory prototype is constructed to verify the feasibility of the scheme. The effectiveness of the Sun tracker is confirmed experimentally [13].

Karim Mousa et al. (2014) ,In this paper, we develop an optimal design for a hybrid solar-wind energy plant, where the variables that are optimized over include the number of photovoltaic modules, the wind turbine height, the number of wind turbines, and the turbine rotor diameter, and the goal is to minimize costs. Simulation studies and sensitivity analysis reveal that the hybrid plant is able to exploit the complementary nature of the two energy sources, and deliver energy reliably throughout the year[4].

Medugu et al. (2014) A hybrid power system consisting of PV-arrays and wind turbines with energy storing devices (battery bank) and power electronic device was designed and constructed in this paper. The system is aimed at the production and utilization of the electrical energy coming from more than one source, provided that at least one of them is renewable. The efficiency of the designed power electronic device is about 95% and 73% for capacitive and resistive loads respectively. The integration of the hybrid is to electrify a residential house and its surrounding in order to reduce the need for fossil fuel leading to an increase in the sustainability of the power supply. This approachis techno-economically viable for rural electrification[1].

Ashish S. Ingole et al. (2015) now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this the combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance[5].

Vaibhav J. Babrekar et al. (2017) Energy today, is the need of 21st century. The renewable energy resources therefore are used in tremendous amount as they are easily available and cost free. But these energies in standalone forms have disadvantages such as unpredictability, availability in all time etc. which can be overcome by hybrid energy systems. They are basically consists of combinations of number of renewable energy resources. They provide efficient response against voltage and frequency fluctuations, harmonic measures and power issues in standalone systems. Hybrid power system provide reduction in complexity, maintain lowest unit cost, energy fluctuations due to DPSP (deficiency of power supply probability), with the help of proper design, advanced fast response, good optimization and control feasibility. This paper provides review of hybrid solar and wind power system. The technical feasibility of PV wind hybrid system in given range of load demand was evaluated and economical evaluation of standalone PV, standalone wind and PV wind hybrid system have been developed using the model[7].

Emmanuel Karabo Mpodi (2019)This paper investigates dual axis solar tracking systems from two dimensions. Firstly, a review of extant literature was conducted to draw up a trajectory of where we are in the efficiency map, Therefore it was found that the current efficiency of dual axis tracking configuration is about 35-43%. Secondly, from the above review, a generic functional model of how an efficient and effective tracking system should be is presented [14]

Bhagwan Deen Verma(2020) It is evident from the above study the use of solar trackers will certainly increase the efficiency of SPV systems but proper care is required while installing solar trackers with these systems. Problems such as failure of solar tracker also need equal attention while installing them. Whether to install active or passive solar trackers is also a question which needs to be explored further. This study also tried to analyze all the important factors which are required for the optimization of solar trackers.[15]

III. PURPOSED METHODOLOGY DUAL-AXIS SOLAR TRACKING PV SYSTEM AND WIND TURBINE

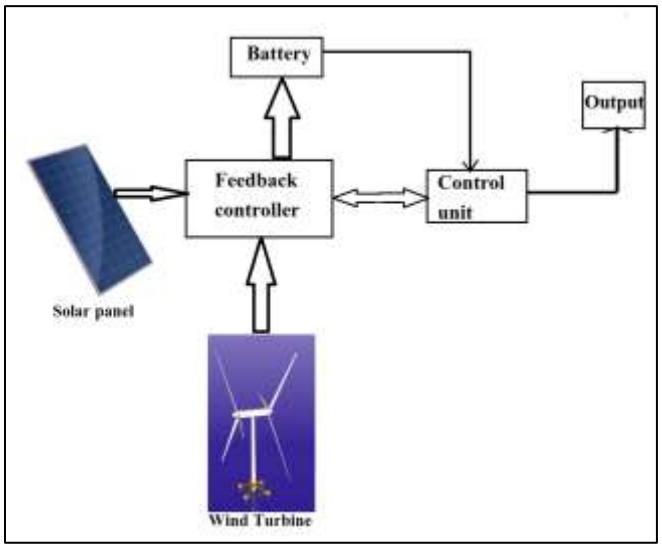

Fig. 2: Block diagram purposed Model dual-axis solar tracking PV system and Wind Turbine

The block diagram of the developed closed-loop solar tracking system is illustrated in Figure 1, describing the composition and interconnection of the system. For the closed-loop tracking approach, the solar tracking problem is

how to cause the PV panel location (output) to follow the sunlight location (input) as closely as possible. The sensor-based feedback controller consists of the LDR sensor, differential amplifier, and comparator. In the tracking operation, the LDR sensor measures the sunlight intensity as a reference input signal. The unbalance in voltages generated by the LDR sensor is amplified and then generates a feedback error voltage. The error voltage is proportional to the difference between the sunlight location and the PV panel location. At this time the comparator compares the error voltage with a specified threshold (tolerance). If the comparator output goes high state, the motor driver and a relay are activated so as to rotate the dual-axis (azimuth and elevation) tracking motor and bring the PV panel to face the Sun. Accordingly, the feedback controller performs the vital functions: PV panel and sunlight are constantly monitored and send a differential control signal to drive the PV panel until the error voltage is less than a pre-specified threshold value.

IV. CONCLUSION

In various proposal need to TRACKER not only follows SUN from EAST to WEST and back to EAST in a cyclic manner(Horizontal Motor Module),but also tracks the Angular Movement of the SUN with respect to its ZENITH ANGLE to the Horizon. To derive maximum Solar Energy is VERSATILE quality for which the TRACKER could easily be used in conjunction with Solar Panels.S-shaped if viewed from above of the The Savonius turbine .This needs to drag-type VAWT turns relatively slowly, but yields a high torque. It is useful for various purpose stright light, pumping water grinding grain, and many other tasks, but its slow rotational speeds.

V. REFERENCES

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