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# Control Structure for Single-Phase Automatic Power Generation with Support Solar Energy

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***Abstract***—The operation of a self-loop system consisting 12V d.c motor coupled with 24V d.c alternator and a solar panel system (75W) of photovoltaic cells is used with a system for storing energy in battery. In order to balance power, quality energy device are required. The proposed model of the entire system is achieved, including d.c motor and d.c alternator with photovoltaic cells and storage system in battery. In the proposed system power observed by the load can be effectively delivered and supplied, subject to control method the main purpose is to supply 500W to domestic applications through a single phase inverter. The hardware result shows good calculation of the electrical parameter waveforms. The result confirms the stability of the supply.

***Index Terms***—Solar panel,self-loop system, Energy storage space, real-time control, variable-speed permanent-magnet generators.

## 1. INTRODUCTION

The research into the use of renewable energy sources (RESs) are many sources of energy that are renewable and consider being environmentally sociable and harnessing natural processes. Renewable technologies are also suited to small off-grid applications, sometimes inside rural and remote areas, where energy is often crucial in human development. Such as wind, photovoltaic, and hydropower plants, for electricity generation has been the subject of increased attention. So In the case of wind energy transfer systems, the interest is also focused on small units, used to provide electricity supply in remote area that are away from the reach of an electric power grid or cannot be economically connected to a grid and here is no fuel cost. Several electrical machines can be used to implement the electromechanical energy conversion and control, each one of which presents different advantages and disadvantages. For small-power wind systems operating in remote and isolated areas, the study of (PMSGs) has been the subject of much research. PMSGs are particularly interesting within low-power wind energy applications, due to their small size and high power density. So the utilization of an energy storage device such as a battery is able to significantly enhance the reliability of a small stand-alone wind system. In the independent system, the wind power converter may be operated to maximize the wind energy converted into electricity. The capture energy is supplied to the load directly, the difference between the wind power generation and user consumption being directed en route for or supplied by the battery energy storage device connected via the power electronic interface.

### 1.1 Lead–Acid Batteries (LABS)

The lead–acid batteries are the dominant energy storage technology, with their advantages of low price, high unit voltage, stable performance, and a broad range of operating temperature. The LABs hence constitute an exciting challenge, as main components in the development of the stand-alone wind energy systems.

## 2. EXISTING SYSTEM

### 2.1 Stand-Alone Wind Turbine System Configuration

The stand-alone wind power system supplies single-phase consumers at 230 V/50 Hz. It is designed for a residential location, in addition to it is based on a 2-kW wind turbine. Equipped with the following: 1) a direct-driven PMSG;2) an ac/dc converter (diode rectifier bridge + boost converter) for the track of the maximum power from the available wind resource; 3) a LAB storage device; 4) an inverter; 5) a transformer; and 6) resistive loads. The wind power is converted into the mechanical rotational energy of the wind turbine rotor.

Theoretically, only 59% of the wind power could be utilized by a wind turbine, but for the 2-kW wind turbine system analyzed in this paper, the real power coefficient is 39%.

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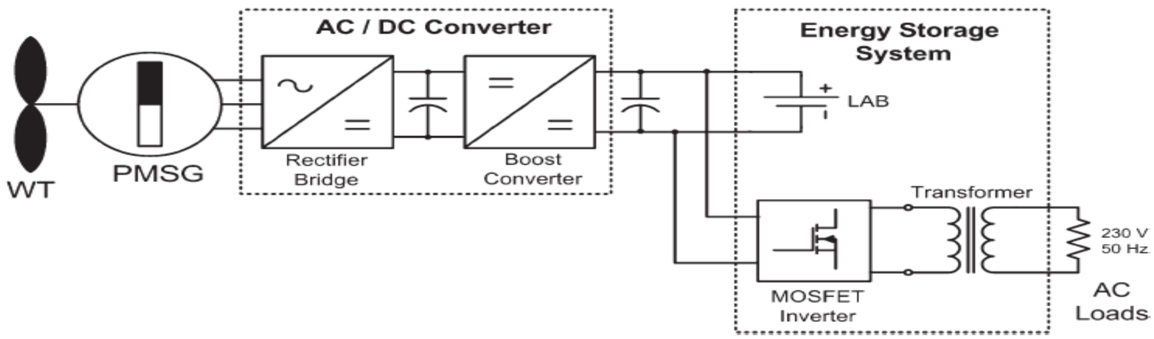


Fig. 1. Wind turbine configuration.

The wind turbine rotor is connected to the wind generator, thus converting the mechanical energy into electrical energy. The generator's ac voltage is converted into dc voltage through an ac/dc converter. Christo Ananth et al. [13] proposed a system, this fully automatic vehicle is equipped by micro controller, motor driving mechanism and battery. The power stored in the battery is used to drive the DC motor that causes the movement to AGV. The speed of rotation of DC motor i.e., velocity of AGV is controlled by the microprocessor controller. This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degrees of automation. The operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.Furthermore, this voltage is applied to a single-phase transformer, which boosts up the voltage to 230 V. The inverter controls the power transfer.

## 3. PROPOSED SYSTEM

### 3.1Specifications 12v dc motor to 24v dc alternator and solar panel (75w) with battery

The proposed system acts as a single phase power supply it is designed for residential locations of remote areas. It additionally supports up to 75watts through the use of solar panel. The following equipment's are used in the proposed system.1) Switch,2)D.C. Motor 3) Alternator 4)Pulley with belt 5)Base 6) 75 watts solar module 8) Two 12V batteries and 9) Inverter. The mechanical energy converted into electrical energy of the alternator.

Switch:

A device for making and breaking the connection in an electric circuit.

Dc Motor:

The Dc motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. The Dc motor is connected via V-Belt to the 275-amp Dc Alternator, at least 24 inches away from the motor.

- Dc motor voltage: 12v
- Speed rating: 1500rpm

Alternator:

The Dc Alternator charges up a bank of two12-V, deep cycle batteries in series, when the Bank gets below a certain voltage level, bringing it back up to "full." It's best if the Battery bank is not is under load while being recharged by the alternator.

- Amps: 275amps, by Delco
- Voltage output: 24v

Pulley:

The Motor and Alternator are attached via a V-Belt pulley using standard hardware. In his present device, the Motor pulley is approximately 2.5 inches in diameter, and the alternator pulley is approximately 2.75 inches in diameter. The distance between the motor and alternator shafts should be at least 24 inches. If they are closer, the efficiency of the effect drops off rapidly. There needs to be a way to tighten the belt.

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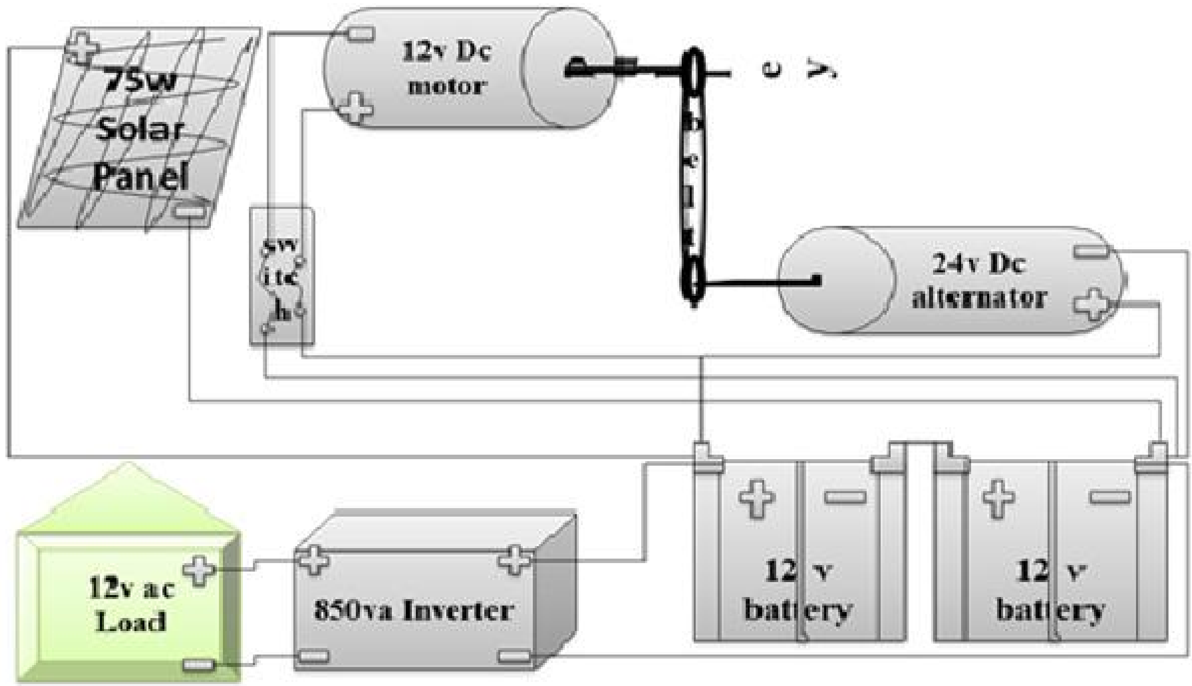


Fig. 2. Automatic power generation configuration.

Base:

The Motor and Alternator are attached to an iron base.

75 Watts Solar Module:

These new 75 watt 12 volts solar panels make by high quality Q-Cell solar cells, and also have a 10 year warranty. They have an aluminum frame. Unlike the Sun Tech modules, this panel does not come with j-box wire leads. We recommend 18-2 Tray Cable.

Features:

- High-quality cells.
- Wide power-range.
- Bypass diode to avoid effect of partial shading.
- Anodized aluminum alloy frame.
- Tempered glass for rugged protection.
- Competitive price-performance ratio.
- Water Proof.

Specifications:

- Normal Power – 60W
- Normal Power Voltage – 17.5 V (±0.5V)
- Normal Power Current (A) – 4.4 A
- Open Circuit Voltage – 21 to 22 V
- Short Circuit Current – 5.3 A
- Weight – 15.0kgs

2-battery bank:

The bank of 2 batteries runs a1500W sine wave inverter.

Inverter:

The inverter converts the d.c to a.c and produces 500w pure sine wave at the output. Any DC appliances in the home, such as computers, could be powered directly from this battery bank. The inverter also powers a

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battery charger. This system does not require an external power supply instead the power gets supply from the battery and the battery gets charged from the alternator and the solar panel.

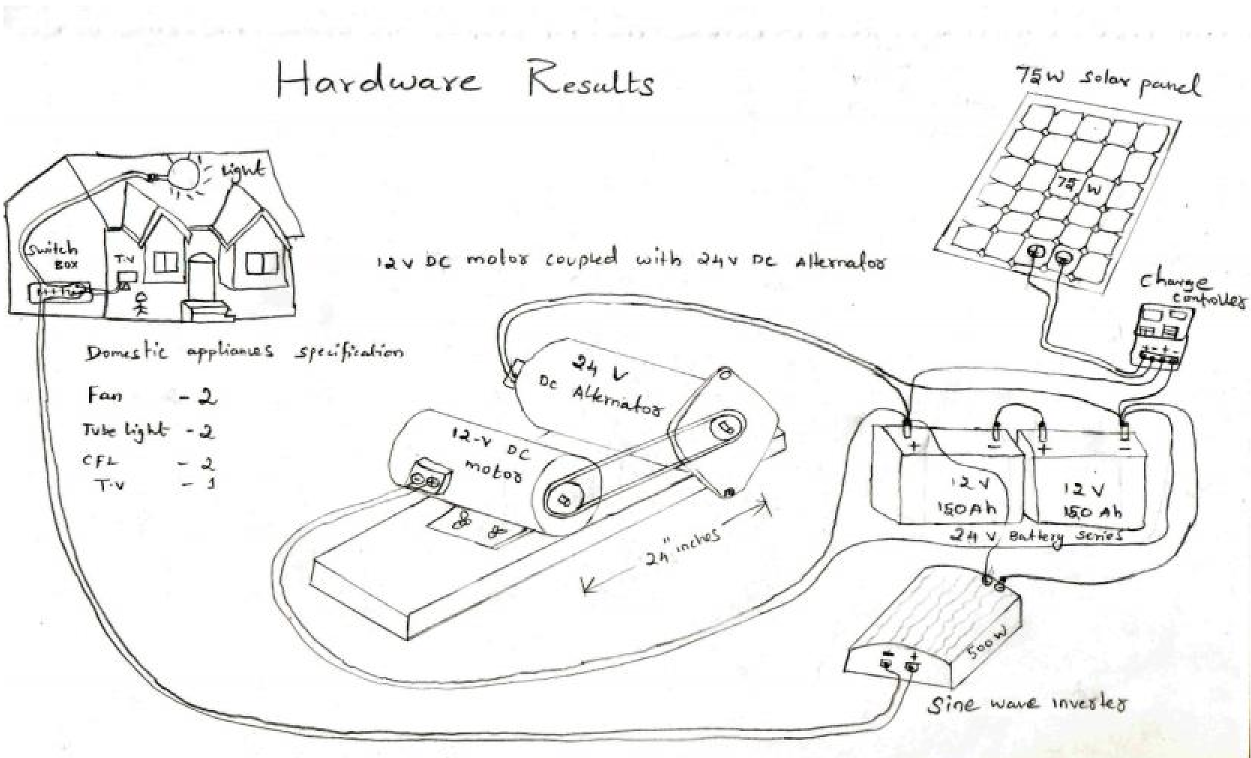


Fig. 3. Hardware decryption

Hardware results and applications:

Household appliances and equipment account for about one-third of energy consumption and about 45% of greenhouse gas emissions in the average household.

Appliances and equipment including refrigeration and cooking.

The Self looping system generates about500Watts as output from which the following devices were operated.

- FAN – 2 NOS
- CFL – 2 NOS
- T.V – 1 NOS
- TUBE LIGHTS – 2 NOS
- PERSONAL COMPUTER – 1 NOS
- MOBILE PHONE – 1 NOS
- LOW WATTS BULP – 3 NOS

## CONCLUSION

In the proposed system, two 12V batteries are connected in series. The batteries will initially have some power. Then batteries are connected to a 12V d.c motor, controlled by a switch, also the d.c. motor iscoupled to a 24V DC alternator via pulley through belt. The 12V d.c motor gets power from the battery to start and then as it

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is connected to a d.c alternator, 24V is produced at the output of the alternator. This power gets stored in the battery. Additionally a solar panel (75W) supports to balance the load in the battery.

The inverter which converts direct current to alternating current is connected to the 12V batteries. From the inverter the power of about 680 watts is utilized for the domestic appliances. The proposed system is independent of the power supply, it automatically generates the power from the battery, if at all in case of overload additional power is supplied from the solar panel.Thus, the analysis performed and the case studies considered lead to the conclusion that the proposed system can effectively provide reliable and good quality power to the customers in the autonomous power system.

This paper highlights the reliability and efficiency of the control system developed and no fuel cost.

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