SOLAR-WIND BASED REAL-TIME AGRICULTURE SYSTEM

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Abstract: *For farmers and ranchers, providing adequate volumes of clean, environmentally safe water for cattle remains a key concern. In remote areas, abundant water is essential to guarantee that grasses are grazed equitably. A solar-powered water pumping system has been designed for remote places. Solar water pumping devices employ direct current. A solar power system's output varies during the day and according on the weather. A photovoltaic module is used to power solar pumps since it has no moving parts, requires no maintenance, and can endure for decades. Properly constructed solar pumping systems are efficient, simple, and trustworthy. Water distribution for towns and cities, livestock watering, and irrigation are the three main uses for solar- powered pumping systems. We want everything around us to be automated in today's digital world, decreasing human labour. Electronic circuits are becoming increasingly common, making living in today's society easier and simpler. Scarcity of energy and water are two big difficulties that everyone is facing these days.*

Key Words*: PIR SENSOR, RECTIFIER, SOLAR PANEL, SOIL MOISTURE SENSOR, WIND TURBINE.*

INTRODUCTION: To design, develop, and implement a real-time solar-wind agriculture system, integratevarious sensors, and monitor crops for increased yields Taking Advantage of a Smart Operating System and to address the problem of power being unavailable at all times and in remote locations, hybrid solutions are being developed. In a hybrid power system, different methods of producing electricity are combined to provide a consistent power supply. A hybrid energy system is one that combines two or more generating technologies, such as a wind turbine or a diesel generator, with a solar panel system. The hybrid generation system chosen for this project utilizes both renewable solar and wind energy sources. In this project we implemented Automated irrigation system along with farm security system using Internet of things.

METHODOLOGY: Because the amount of water required for irrigation systems fluctuates throughout the year, solar-powered pumping systems must adjust accordingly. Peak demand is frequently more than twice the usual demand during irrigation system seasons. Solar irrigation pumps are so unused throughout the most of the year. The mechanism for distributing irrigation water and applying it to crops should be carefully considered. The irrigation pumping system should reduce water losses while not adding a significant quantity of head to the system. It should also be inexpensive. Wind turbines, windmills, generators, solar arrays, and hand-powered pumps are some of the technology options for giving power or lift to groundwater systems. Regional feasibility, water demand, system efficiency, and initial and long-term costs are the most important elements to consider while choosing the right technology. The necessity for power and water reserves in the form of batteries is another common concern. Solar-powered systems are frequently preferred over other kinds of alternative energy in developing countries because they are long-lasting and provide long-term economic benefits.

1. **SYSTEM REQUIREMENTS :** The following are the basic analogue components that must be employed inthe circuit design:

1.1 Wind turbine : To gather energy from the wind and turn it into electrical power, we need a Wind Turbinesystem that can convert mechanical power into electrical power. The blades of the wind turbine are coupled to the generator set's rotor, which is mounted on the turbine via gearing. The turbine blades are turned by wind at a speed of 5 km/hr. or more. The mechanical power provided by the blades is turned into electrical power using a generator set.

1.2 Voltage Regulator: The voltage regulator 7812 is used to supply the circuit with a constant 5 volts DC. The greater voltage may harm the circuit if there is no voltage regulation. Its purpose is to ensure that the circuit receives no more than 5V and that any excess voltage is converted to heat and dissipated through the regulator [1].

Fig-1: 7812 voltage regulator

1.3 photovoltaic panel: The photovoltaic panels account for the majority of the system's cost (up to 80%).The size of the PV system is directly proportional to the pump's size, the amount of water required (m3/d), and the amount of solar irradiation available. A panel's power output is measured in watts. Under Standard Test Conditions, the SPV water pumping system should be operated with a PV array capacity of 200 Watts peak to 5000 Watts peak (STC). To achieve the desired PV array power output, a sufficient number of modules in series and parallel could be used. Individual PV modules utilised in the PV array shall have a peak power output of at least 74 Watts under STC, with enough margin for measurement errors. PV modules with a higher power output should be used.

Fig-2: Solar Panel

1.4 Diode 1N4007: A PN junction rectifier diode, the 1N4007 rectifies AC signals from transformer freewheeling diodes and other sources. Because these diodes only allow energy to travel in one way, they're perfect for converting AC to DC [3]. 1N4007 stands for single junction semiconductor and 4007 stands for the individual diode number, according to the naming convention.

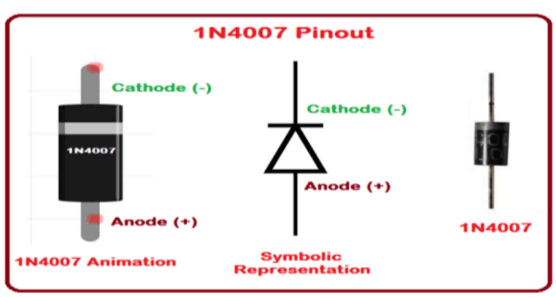

Fig-3: 1N4007

1.5 Relay: A relay is a switch that is controlled by electricity. Between the pole of the relay and the neutral terminal of the AC mains, the appliance to be controlled is attached. (1) Coil, (2) Coil, (3) Com, (4) Normally close, and (5) Normally open are the five terminals. This relay is used to connect two circuits together. It can also be used to operate appliances in a different way. When current travels through the coil, it creates a magnetic field, which attracts the lever, allowing the switch contacts to be changed. In a nutshell, a relay is a type of switch that is used to control a circuit.

Fig-4: Relay

2. SENSORS:

2.1 SOIL MOISTURE SENSOR: A soil moisture sensor measures the volumetric water content of soil. Soil moisture sensors indirectly measure the volumetric water content by using another property of the soil as a proxy for the moisture content, such as electrical resistance, dielectric constant, or neutron interaction, because direct gravimetric measurement of free-soil moisture necessitates the removal, drying, and weighing of a sample.

2.2 PIR Sensor: A PIR Sensor is an electrical sensor that detects infrared (IR) light generated by objects within its visual range. Motion detectors with a PIR sensor are the most typical place to find them. In security alarm systems and automatic lighting systems, PIR sensors are commonly used. PIR sensors detect general movement but do not reveal who or what moved. This will necessitate the use of an imaging infrared sensor. The letters "PIR" or "PID" stand for "passive infrared detector" and are used to refer to PIR sensors.

3. Implementation: It is more necessary to implement the circuit on the Arduino uno board, which is used to link electronic components using pathways and traces and soldered properly with greater effort, to check its existence in real time.

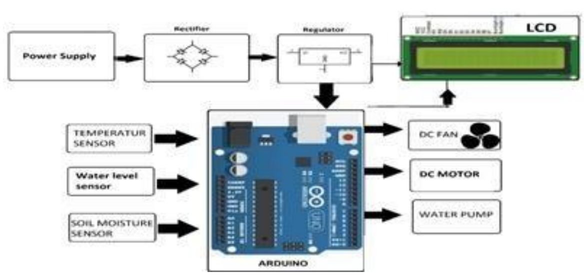

Fig 5: System implementation

4. RESULT: After completing the circuit design and execution, we discovered that when the soil moisture sensor detects a soil moisture content below the soil moisture threshold, it activates the Water motor, which then turns off when the soil moisture level above the threshold value. Infrared motion is also detected by the PIR sensor, which triggers the alarm system.

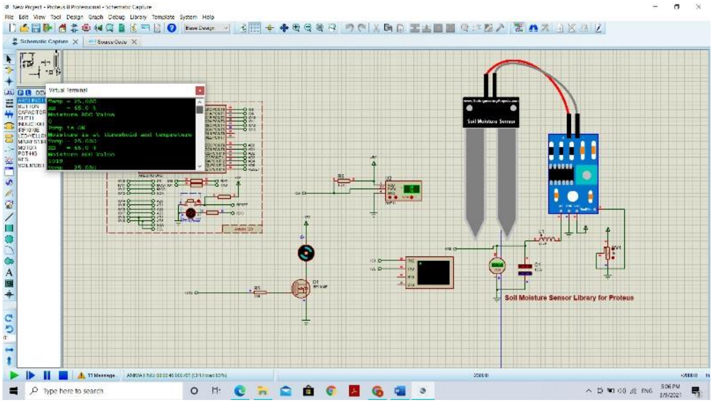

Fig-6: Prototype Model

5. CONCLUSION: Solar-Wind Hybrid Systems are the most cost-effective solution to lower electricity bills while avoiding the high costs of extending utility power lines to rural areas, reducing power outages, and providing a non-polluting energy source. By increasing the operating and design characteristics of hybrid systems, there is a clear need to minimize the cost of hybrid systems. Cost optimization is utilized in this study to lower the cost of a Wind-Solar hybrid system for drip irrigation pumping. The fundamental advantage of a wind-solar hybrid energy system is that when both are employed at the same time, it improves the system's reliability. The major goal of this system was to automate farming systems and provide farm security utilizing an Arduino Uno and an IOT-based cloud server (Thing speak server) that could be accessed from anywhere inthe world. This approach is especially beneficial to individuals who live a long distance from the farm.

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