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# Hybrid Wind-Pv System Connected To Grid Used For Automatic Irrigation

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**Abstract—** ***As we know the pumping is the main issue in irrigation due to lack of electricity. There are many water pumping system such as diesel powered, solar photovoltaic, mechanical windmill exists. But conventional sources are being limited and one renewable source is not sufficient, so we will use a hybrid energy sources along with battery to provide better performance and reliability to the existing system. Also we know there is limited amount of water a better utilization of water is required. In this a wireless sensor network is being used for automatic irrigation system where only required water is provided. Where moisture sensors are being used for monitoring moisture content of the soil in various parts of the cultivation land to maintain the moisture. As when motor is off there is no need of water then power is given to grid.***

**Keywords—** ***Hybrid energy system, Moisture sensor, closed loop system, inverter, Microcontroller.***

## I. INTRODUCTION

In present days, farmers are facing major problems in watering their crops. It's because they don't have proper idea of available power. Even if it is available, they need to pump water and wait until the field gets properly watered, which compels them to stop doing other activities which may be important for them, and thus they loss their precious time and efforts. But, this problem can be solved by using an automatic plant irrigation system which not only helps farmers but also others for watering their gardens as well.

## II. AUTOMATIC IRRIGATION SYSTEM

This automatic irrigation system senses the moisture content of the soil and automatically switches the pump when the power is on[1]. A proper usage of irrigation system is very important as there is shortage of land reserved water due to lack of rain, unplanned use of water as a result large amounts of water goes waste. For this reason, we use this automatic plant watering system, and this system is very useful in all climatic condition. Automation is generally done using a microcontroller. Sensors are used for giving the input. Depending on the input from sensors output signals are decided that motor should be ON or OFF.

## III. HYBRID ENERGY SYSTEM

Renewable energy sources (RES) have attracted considerable interest because their use is one of the fundamental measures to fight against climate change and to reduce the dependence on fossil fuels. Renewable energy source use is promising to cope with the limitations of current patterns of energy generation and consumption, to complement with existing energy production systems, and to contribute to the further modernization of the energy sector. A hybrid energy system [5] consists of two or more renewable energy sources used together to provide increased system efficiency as well as greater balance in energy supply. Hybrid renewable energy source is becoming popular because it is composed of two or more energy sources. This combination of two energy sources is an efficient way of generating energy.

## IV. HYBRID WIND-PV SYSTEM CONNECTED TO GRID USED FOR AUTOMATIC IRRIGATION

This is type of closed loop system. In a closed control loop [3] the operator sets up a general strategy for control. Once the general strategy is defined, the control system takes over and makes detailed decisions of when to apply water and how much water to apply. This type of system requires that feedback be given back to the controller by one or more sensors. Depending on the feedback of the sensors, the irrigation decisions are made and actions are carried out if necessary. It is important to note that in this type of systems the feedback and control of the system is done continuously. Fig 1 shows the elementary components of this type of system.

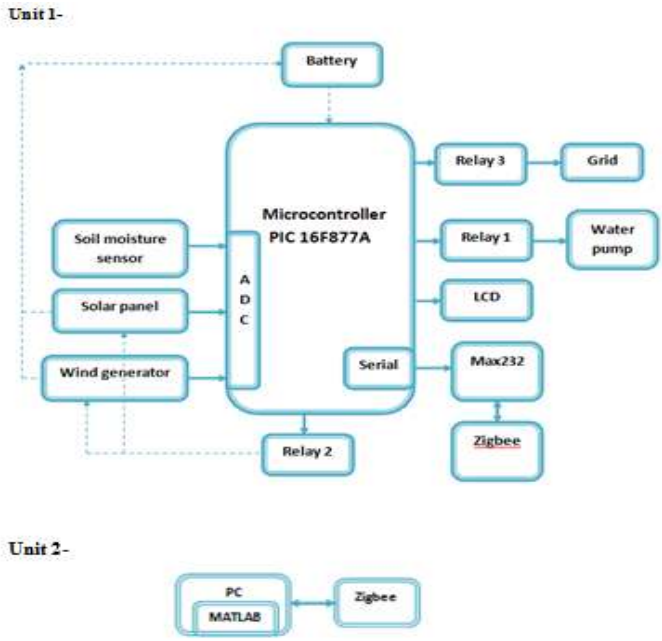


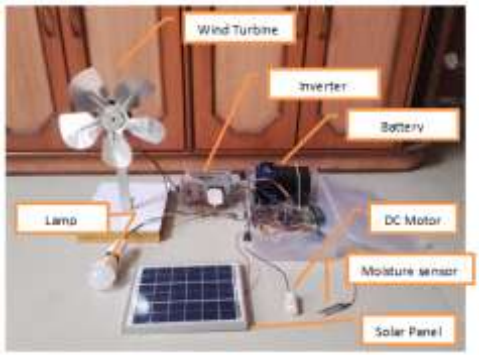

**Figure 1. Block diagram of Hybrid wind-pv system connected to grid used for automatic irrigation**

On the input side there are sensors as shown in the architecture. Soil moisture sensor will check the moisture of the soil as per the crop which is to be cultivated. When the moisture level of the soil goes above or below the set value, it will direct the microcontroller whether it should pump the water or not. The water level sensor will check whether the water in the reservoir or tank is empty or not. LCD display is used to notify what actions is been taken by the microcontroller. The entire system is been monitored with the help of Wireless sensor network(WSN) , thereby making it a close loop system, thus, providing feedback to the farmer on what actions is been taken by the microcontroller[6]. This whole system is supplied by renewable energy.

## V. **WORKING PRINCIPLE**

The project consists of two units. First unit consists of Microcontroller along with soil moisture sensor, solar panel, and wind generator, battery, relays, and Zigbee module, LCD and power supply. The first unit is implemented in the farm area. We have used PIC16F877A microcontroller for all controlling and monitoring actions. Moisture sensor has analog output. Thus, we have connected it to ADC pin of microcontroller, which converts analog value to digital. Same is displayed on 16X2 LCD. Power is generated through environmental resources like, solar and wind. Selection of the source is made by microcontroller as per their availability and output efficiency. For selecting the source we have used relay. The moisture data is sent to second unit which has Zigbee module and PC along with MATLAB on it. Data is sent serially out through Zigbee. At the PC terminal, through MATLAB GUI, crop selection is made and timer value is set. As per the received data of moisture, motor ON OFF signal is passed to microcontroller unit through Zigbee. Water pump motor gets ON/OFF through relay. It stays ON/OFF till it gets next signal from MATLAB. When motor is off or power is not needed it is given to the grid. Process continues till it gets interrupted.

## VI. **COMPLETE HARDWARE OF PROPOSED SYSTEM**




**Unit 1**


**Unit 2**

**Figure 2. Complete Hardware of proposed System.**

This system consists of moisture level sensors, PIC microcontroller, relay, solar panel, wind turbine, inverter and battery. Supply is given through hybrid wind-pv system whichever has the high generation it is to be taken as supply source if no wind and solar energy is present then stored energy is used from battery. At the field station, the sensors are buried inside the soil which sends the signal to the microcontroller. The microcontroller converts analog signal to digital. This value is compared with a minimum value and then signal send to relay allow water flow into the farm or vice-versa. This is helpful for the irrigation whenever required as well as to save energy. Every procedure of scheduling is controlled by the program inside the microcontroller.

## RESULT

- LCD display the soil moisture data and also the voltage produce at that time by solar and wind generator as shown in figure 3.


Figure 3. LCD display showing soil moisture value and solar and wind generated voltage.

- Also displays the source which is being used according to availability. If solar is high then solar used or if wind is high then wind is used. Battery is being displayed as default is shown in figure 4.




**Figure 4. LCD display for power supply**

- By using PIC microcontroller we can automatically run the system.

- At field station the soil moisture sensor can sense the soil moisture and send to the microcontrollers shown in figure 5.

**Figure 5.Window of moisture sensor status at base station**

- This signal is analog hence ADC converts it into a digital signal and sends it to the base station using zigbeemodule.
- At the base station we can select a different crops using MATLAB code as shown in figure 6.

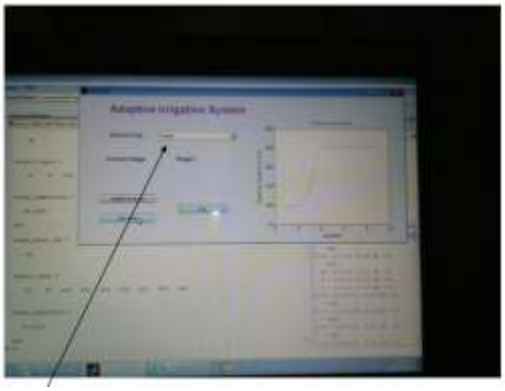


**Figure 6.Window of different Crop Selection at base station using MATLAB code.**

- At the base station the received signal is compared with the threshold value of different crops of their crop stages by using MATLAB.
- At base station MATLAB code defines different crops water requirement depending upon their growing stages required for proper irrigation as shown in figure 7.

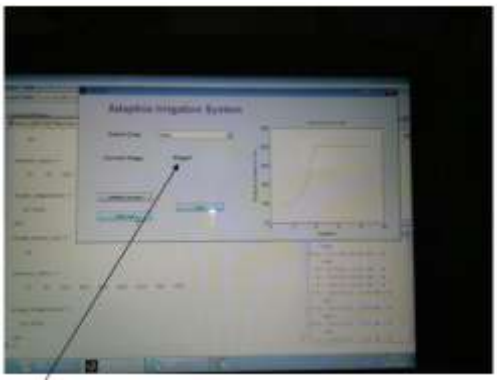


**Figure 7.Snapshot of selection of different crop stages using MATLAB code.**

- After selecting a crops, sensor shows the moisture content present in soil.

- If moisture content is less than required temperature then make the motor ON.
- And if moisture content is more than required value then motor is off and power is supplied to grid.
- Figure 8 shows the output of soil moisture sensor at base station

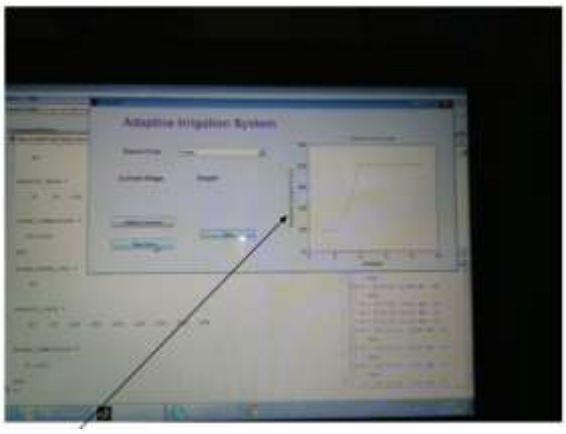


**Figure 8.Snapshot of output of soil moisture sensor at base station**

## CONCLUSIONS

The main conclusions are this system saves water as motor starts only when moisture is less than required value .As this system is automatic no human interference is required time is save. By using more than one source of renewable energy its more reliable and no need to depend on government for supply. When there is no requirement of power that can given to grid.

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