

ICT Based Smart Power Agri Pumping System

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Abstract— In Modern agriculture, the pump plays important role and to make it more efficient, the automation for pump is required. This project can reduced stress on power system as agriculture application can be operated on renewable energy as well as on grid. This Project helps farmers to use pump automatically. In this project, the various sensors are implemented to monitor parameters and use this data to control the pump automatically as per the farmer's requirement. The automation of the system is done by arduino and can control through GSM module. This Project helps to decrease the running cost of motor by feeding power to pump by renewable energy sources. In this project, solar and wind energy is use as renewable energy sources and alternative power source is from utility.

Keywords— Arduino, GSM module, Solar panel, Wind turbine, Charge Controller, Sensors.

I. INTRODUCTION

In the agriculture field, use of appropriate method of irrigation is very important because the main reason is the lack of rains & lack of land reservoir water. The continuous extraction of water from earth is reducing the water level due to which lot of land is coming slowly in the zones of un-irrigated land. Another main reason of this is due to unplanned use of water due to which a significant amount of water goes waste. For this purpose; we use this Automatic pumping system. The system derives power from solar photo-voltaic cell and wind energy using a Generator motor. So, dependency on non-renewable commercial power is not required. If Emergency of power occurs, then the system can draw the power from the Utility system such as MSEB.

In this project we use solar and wind energy which is used to run the irrigation pump. The circuit comprises of moisture sensor part built using op-amp IC. Op-amp's are use here as a comparator. Two copper wires are inserted in the soil to check whether the soil is properly wet or dry. The Atmega328 arduino is used to control the whole system by monitoring the sensors and when Moisture sensors sense dry condition of soil, then the microcontroller will send command to relay driver IC the contacts of which are used to switch on the motor and it will switch off the motor when the soil is in wet condition. The microcontroller does the above job as it receives the signal from the sensors through the output of the comparator, and these signals operate under the control of software which is stored in ROM of the controller.

In village areas, sometimes the problem of stealing of control panel occurs. So to tackle the problem of intruder, the PIR sensor use to detect any intruder which can harm the circuit or it also use as anti-theft purpose.

II. OPERATION

A. Hybrid Power System:-

Hybrid power system is the efficient and smart way to generate and provide power to the agriculture pump Using renewable energy sources like solar and wind energy. Charge controller is use to manage the output of the hybrid power system and charge the battery from that power. Controller use to maintain the voltage level to charge the battery at constant voltage. This battery further use to supply power to Pump and other control circuits.

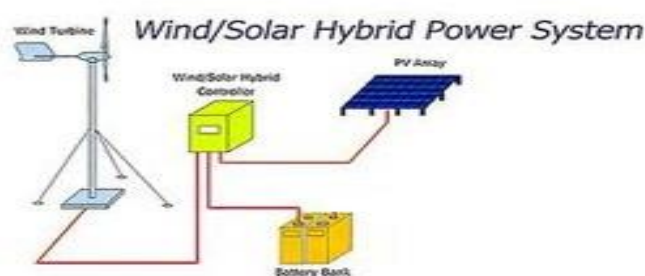


Fig. 1: Solar and Wind hybrid power system

Charge controller manage the power of Solar panel and wind turbine. Battery gets charge by both sources. The powers of both sources gets add and deliver to the battery. This system helps farmer to reduce running cost of motor to zero. The whole system depends on the hybrid power of renewable energy sources. Also this project operated on the MSEB supply when renewable energy not in operation. For that operation DPDT switch is used. This switch operated on MSEB supply or either Renewable Energy Source of supply.

In this project we have implemented sensors which detect the humidity in the soil (agricultural field) and supply water to the field which has water requirement. The project is AVR (ATmega328P) microcontroller based design which controls the water supply and the field to be irrigated. There are Sensors present in each field which are not activated till water is present on the field. Once the field gets dry sensors sense the requirement of water in the field and send a signal to the microcontroller. When Water not available, then water level sensor through pump is not operated and also Pump Protected. (Pump not runs in Dry condition) Also motion sensor interfaced with Microcontroller for PIR Alert Function.

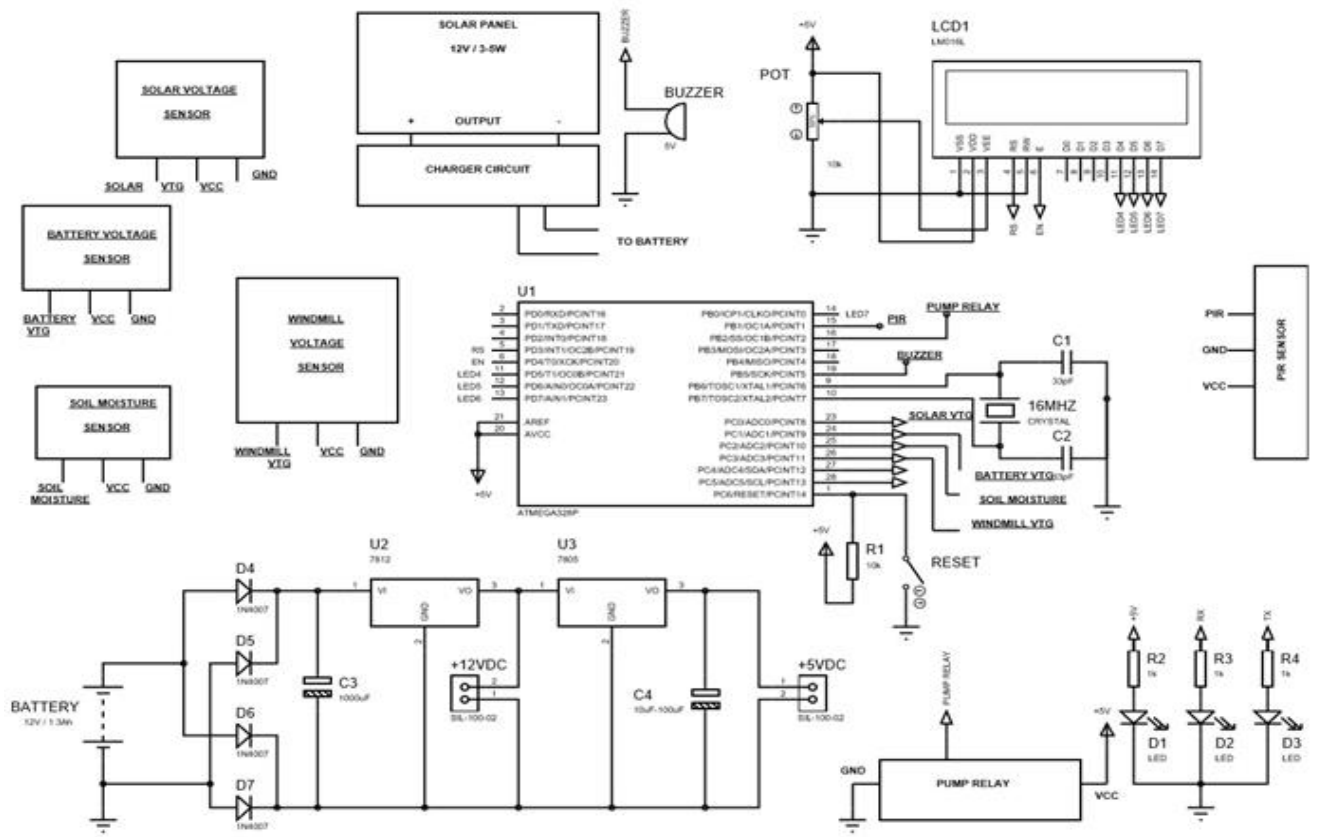


Fig. 2. Circuit diagram of ICT based smart power agri pumping system

B. Arduino Controller:-

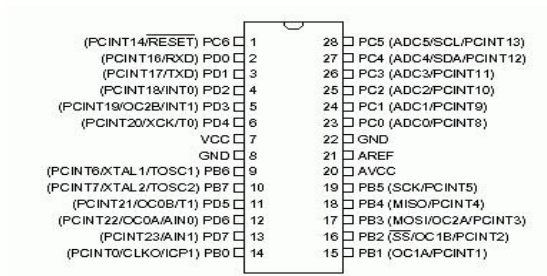


Fig. 3:. Aduino Controller

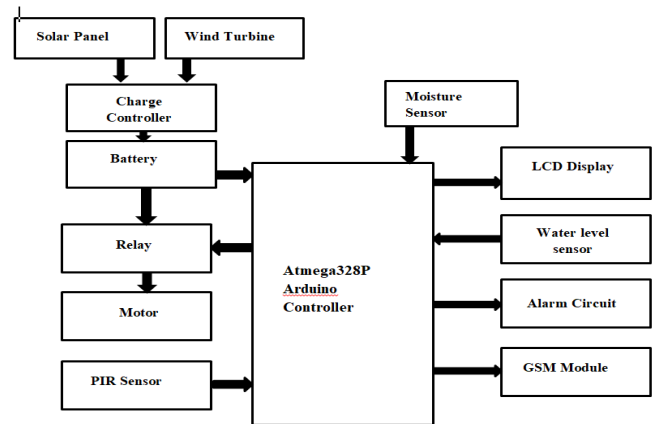


Fig. 4: Block diagram for integrated system for agriculture pump

Arduino controller in system use to control the motor and monitors the sensor and voltages of the solar panel, wind turbine and battery output. The various sensors are connected to the arduino controller such as, Moisture sensor, PIR Sensor and water level sensor. The all sensors gives the output to the controller and controller works according to data and give command to relay of motor. Also give information to monitoring system such as LCD and GSM module.

C. Moisture sensor:-

In a farm, the moisture sensor is installed to monitor the moisture level of the soil. Whenever the moisture level of soil decreases below the requirement to that particular crop, the Moisture sensor gives the signal to arduino controller. Arduino controller send signal to relay which controls the power fed to Pump. When relay gets signal, the relay switch gets close and pump gest switch ON. Water start discharge from pump and land gets fulfilled. After the required level of moisture achived, the moisture sensor again sends signal to system and arduino sends stop signal to the relay and motor gets shut down.



Fig. 4: Moisture sensor

i. Dry run protection of motor

In this project, the level sensor is installed in storage area of water. The sensor works when the water level gets down to rated level and sensor give the signal to the controller. Controller confirms the dry condition and send the signal to relay to stop the motor.

ii. Intruder protection

On the top of the control panel, the proximity sensor is installed. This is a multipurpose infrared sensor which can be used for obstacle sensing, colour detection (between basic contrasting colours), fire detection, line sensing and also as an encoder sensor. The sensor provides a digital output. The sensor outputs a logic one (+5V) at the digital output when an object is placed in front of the sensor and a logic zero (0V), when there is no object in front of the sensor.



Fig. 5: PIR infrared motion sensor

D. Monitoring:-

LCD monitoring: By using calibrations, the Output voltage of solar panel, wind turbine and battery is calculated by arduino controller. The output of the analog reader is in pulse values. To make it user accessible, the data should in engineering parameter such as voltage, some calibration factor is provided and this pulse value is converted into the standard parameter by the arduino controller. This value is directly display on the LCD screen.

LCD also shows the wet or dry condition of soil, person activity, pump ON/OFF condition, Tampering Alert, LCD in which all function are display by the 2-3 sec delay.



Fig. 6: Monitoring using 16x2 LCD Display

Mobile Monitoring: By using GSM module, all the function of pumping system shows on the mobile such as Tampering, PIR alert, Dry run, Moisture level. All the messages are send by the GSM to mobile anywhere and anytime.

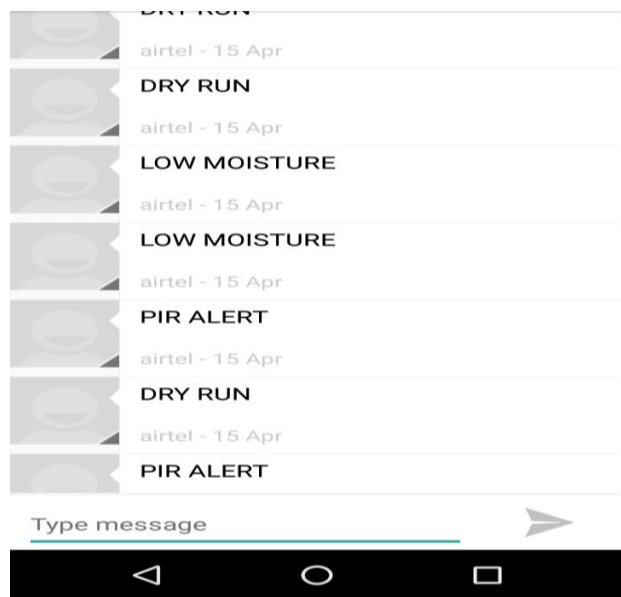


Fig. 7: Monitoring using Mobile

Hardware:-

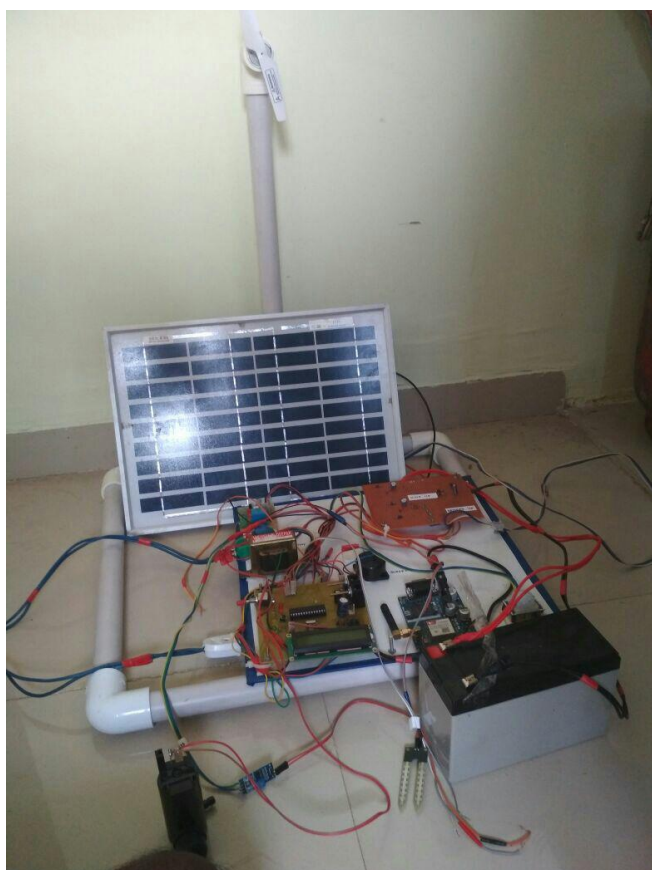


Fig. 8: Model of ICT based smart power agri pump system

III. RESULT

This project will revolutionize farming in the nation by automating the traditional farming practices through developing indigenous advancements and equipment. It aims at automatic pump system by using the various sensors. Remote monitoring can also be added to the farm with the help of GSM technology used in mobile phones. The system will notify the farm owners on their mobile phones, and allow them to control the automated system. The benefits include minimize the running cost of agriculture pump by using the renewable energy sources, saves the wasted water due to over-pumping or unplanned pumping and avoid the dry run condition of the pump. This make system more reliable and cost effective. The system becomes dysfunctional on power failure which can be overcome by incorporating alternative energy from the utility like MSEB. The estimated cost of automation at basic level will be Rs 5000.

IV. CONCLUSION

This project has attempted to introduce automation of pumping system. It has incorporated automation into various aspects of the pump. The primary applications for this project are for farmers and gardeners who do not have enough time to water their crops/plants. It also covers those farmers who are wasteful of water during irrigation and use the power from renewable energy sources using hybrid system of 2 or more sources. Charge controller helps to manage this hybrid power system.

As water supplies become scarce and polluted, there is a need to irrigate more efficiently in order to minimize water use and chemical leaching. Recent advances in soil water sensing make the commercial use of this technology possible to automated pumping system for Farming. However, research indicates that different sensors types perform under all conditions such as tempering, water level, soil moisture.

A GSM module is interfaced to connect all aspects of the modern automated pumping system. The farm owner has easy access to the system and can monitor through his mobile phone.

V. REFERENCES

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