International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 06 Issue: 05 | May 2019 www.irjet.net p-ISSN: 2395-0072

Smart Irrigation System using Soil moisture sensor and PLC

Sudeep Pradhan[1], Ram Sundar Kumar[2], Saksham Tiwari[3], Prof. Deven Vatsal[4]

[1,2,3]Student, Anand Engineering College Technical Campus, Agra, Uttar Pradesh, India
[4]Assistant Professor, Department of Electrical and Electronics Engineering, AEC, Agra Uttar Pradesh, India

---

Abstract – *Over the past two decades, the need is felt to conserve the water thus this project aims to minimize the wastage of water or over flow of water in fields using soil moisture sensors and solenoid valves along with the pump. Eventually the moisture goes down by certain value, pumps will automatically on the supply and fields will get water There is improper supply of water to the land which affects the production. Thus it is necessary to find an automatic system which can provide required water to the farm depending on the crop water demands and the electricity availability timings. Thus this project is concentrated on automation based opportunities that can be utilized in irrigation methods and through that we can get best results out of that.*

Key Words: (soil moisture sensors, solenoid valves, pumps)

1. INTRODUCTION

Water is one of the most fundamental parts of agriculture. But, nowadays the competition for water resources is much more intense. Successful agriculture is dependent upon farmers having sufficient access to water. However water scarcity is already a critical constraint to farming in many parts of the world. Hence controlled supply of water is required to be given to the crops. It helps grow agriculture crops, maintain landscapes and revegetate disturbed soils in dry areas and during periods of inadequate rainfall. In this system two sensors are used which will sense the moisture level in the soil which are placed at different intervals. Sensor will send the data to plc which will compare it with a predefined value and depending upon the analysis the system will perform the task automatically. The main objective of the system is a) Reduce the water consumption in agriculture by using automation strategies.

1.1 LITERATURE SURVEY

1. Prashant .S. Patil author said "There should be modernization in the conventional agricultural practices for better results. Here a microcontroller along with various sensors like soil moisture sensor, water flow meter are used to check the water used and provided to the crops. It states that the system monitors the flow of water and it also provides following aspects a) Detects the level of water. b) Builds such system which enhances crop productivity. c) Handles the system automatically.

2. Santosh Sanket author said, atomizing drip irrigation can save 70% of water. Here a moisture sensor, fire detector, water level sensor, intruder sensor and a vegetable washer are used to provide inputs to the PLC to control the whole system.

3. Chetna V. Maheshwari author said "Due to the affordable prices of PLC it can be used as standalone controllers". Here soil moisture sensors have been used to detect the amount of moisture present in the soil.

4. Here plc is used as a mode of communication with the soil moisture sensors and the solenoid valves. Thus suitable at any climatic condition and even affordable, so it can be utilized for making a good and trustworthy project which can give a profitable outcome.

2. PROPOSED DIAGRAM

It consists of proposed block connection diagram of the project and basically gives a certain idea that how we are supposed to connect the system component

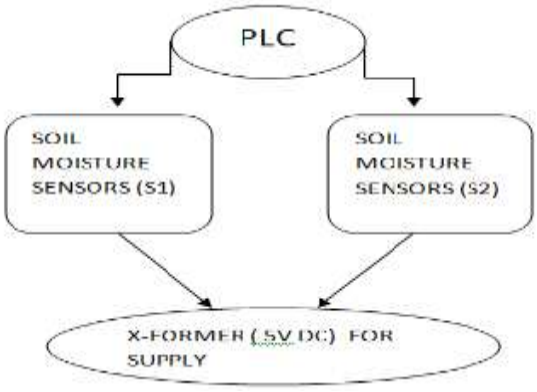

Fig -1: Working diagram

2 (a). DIAGRAM (II)

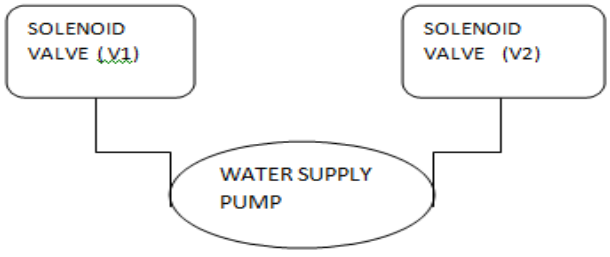

Fig-2(a): Valve working.

3. FLOW CHART

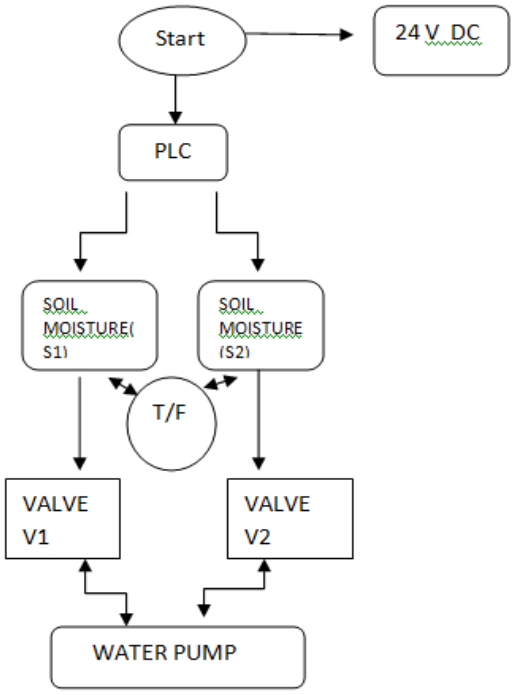

Fig-3: Flow Chart.

4. DESCRIPTION

There are certain components in the project which is clearly stated with the help of block diagram and certain things have been specified with connection. As, we want to implement automization these components need to be controlled automatically with the help of PLC depending upon the program fed in it. Also, for this a climatic criterion is required to control the dripping action of water .In this system we are using the moisture content present in the soil. To determine the moisture content present in the soil we are using the soil moisture sensor.

Thus these things are measured and fed back to plc then this will automatically turn the solenoid valves on and when the moisture reaches to 63 % of the value it will automatically cutoff the water supply and when moisture goes down by 23%(approximated) value it will automatically make the valves turn on and thus it will be a automated project involving PLC as a main module.

5. HARDWARE

5.1. PLC (**Programmable logical controller)**

Fig- 5.1: PLC modules

A Programmable Logic Controller, or PLC for short, is simply a special computer device used for industrial control systems. They are used in many industries such as oil refineries, manufacturing lines, and so on. Where ever there is a need to control devices the PLC provides a flexible way to "software" the components together. The basic units have a CPU (a computer processor) that is dedicated to run one program that monitors a series of different inputs and logically manipulates the outputs for the desired control. They are meant to be very flexible in how they can be programmed while also providing the advantages of high reliability (no program crashes or mechanical failures), Compact and economical over traditional control systems.

GENERAL SPECIFICATIONS OF PLC:

1. Supply voltage: 110V/220V ac or dc.
2. Input circuit voltage: 24V, 48V, 110V, 220V ac or dc
3. Output circuit voltage: 24V, 48V, 110V, 220V ac or dc
4. I/O capacity: 16 I/O or more.
5. User memory size: It may be 885 byte or more
6. Memory type: Normally it is CMOS RAM with battery up. It may be capacitor back up or EEPROM.
7. Counter range: Normally it is 0~9999 counts
8. Ambient temperature: 0~ 60 °C or other values
9. Humidity: 10~95%
10. Input/ Output: The main unit may have one or more input/ output module.

5.2. SOIL MOISTURE SENSORS.

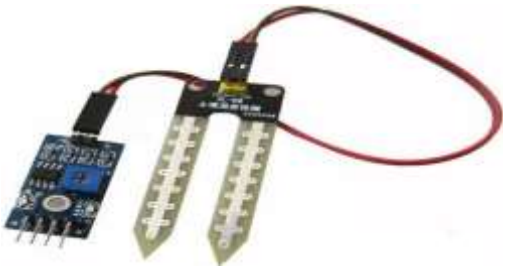

Fig-5.2: Soil moisture sensors.

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. This Soil Moisture Sensor can be used to detect the moisture of soil or judge if there is water around the sensor, let the plants in your garden reach out for human help. Insert this module into the soil and then adjust the on-board potentiometer to adjust the sensitivity. The sensor would outputs logic HIGH/LOW when the moisture is higher/lower than the threshold set by the potentiometer.

5.2.1 SPECIFICATIONS

This sensor has the following specifications:

1. Digital output: easy to adjust.
2. Analog output: 0V-5V.
3. Nickel plating to avoid corrosion.
4. Working voltage: 3.3V-5V.
5. On-board LM393 chip.
6. Dimension of the board: 3. 2cm * 1.4cm.

5.3 WATER PUMP

Fig: 5.3 Water pump.

Water pumps move water that does not contain suspended solids or particulates. These pumps are not so much a type of pump as they are a classification based on the media being transferred.
Nearly every pump type that is defined by either a complementary application (fountain water pumps, submersible water pumps) or by motive type (such as centrifugal, cantilever, or hand water pumps) can be used in water service applications. See the main pumps page for links to pumps classified by motive force.

5.3.1 POWER SOURCE

There are a variety of power sources that are used to operate water pumps. Power source comes down to availability, safety. If the pump is not supplied with a power source the pump mechanism is the only power source. Typically, a drive shaft for connection of motor or other power source is provided.

1. AC voltage
2. DC voltage
3. Compressed or pneumatic air source
4. Gasoline or diesel engine
5. Hydraulic system
6. Manual
7. Natural gas
8. Solar powered
9. Steam
10. Water

5.4 SOLENOID WATER CONTROL VALVE

A solenoid valve is an electromechanically operated valve. The valve is controlled by an electric current through a solenoid: in the case of a two-port valve the flow is switched on or off; in the case of a three-port valve, the outflow is switched between the two outlet ports. Multiple solenoid valves can be placed together on a manifold. Solenoid valves are the most frequently used control elements in fluidics. Their tasks are to shut off, release, dose, distribute or mix

3. SOFTWARE DETAILS

3.1 WPLSoftV2.41 Software

Normally-closed contacts are equivalent to a NOT gate (inverter).Parallel contacts are equivalent to an OR gate. Series contacts are equivalent to an AND gate and plc used is OMRON PLC which consist of onscreen display which do not need wiring for certain programming and setup do not face any kind of connection errors.

4. PROTOTYPE MODEL OVERVIEW

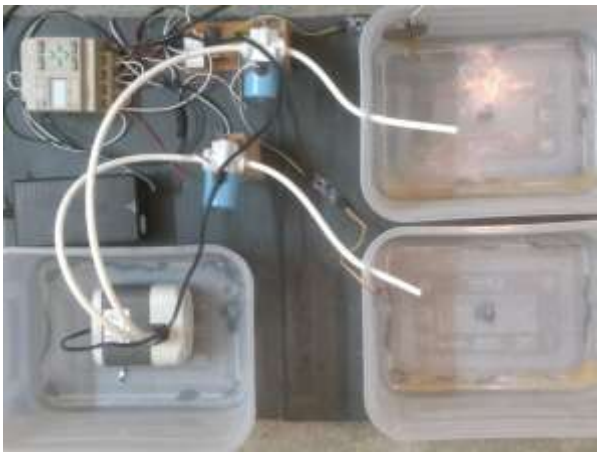

Fig : 4 Model 1.(front panel)

Fig: 4(a) Model 1(side view)

Fig: 4(b) Model 2(PLC unit)

5. CONCLUSION

We conclude that the system reduces water Consumption and hence minimizes the wastage of water. In this system as we provide controlled supply of water and fertilizers to the crop it improves the Productivity. Also due to an automated system the manpower is reduced. By implementing such a system using plc and sensors we can increase Agricultural yield and upgrade Indian economy.

6. ACKNOWLEDGEMENT

We would like to express our sincere thanks to Prof.Deven Vatsal for his valuable guidance, great Support and encouraged us to work hard. And we Also want to thanks Electrical and Electronics Engineering department and our college.

7. REFERENCES

[1] Prashant S. Patil, Shubham R. Alai, Ashish C. Malpure, Prashant L. Patil, "An Intelligent and Automated Drip Irrigation System Using Sensors Network Control System", International Journal of Innovative Research in Computer and Communication Engineering, 2014.

[2]Chetna V. Maheshwari, Dipal Sindha, "Water Irrigation system Using Controller", International Journal of Advanced Technology in Engineering and Science, 2014.

[3] Santosh, Sanket, Shriyo, Sugandha, Sakina, Priyanka harsha, Anuradha Desai, "Plc Based Automated Drip Irrigation", International Journal of Current Research in Multidisciplinary (IJCRM), 2016.

[4] Shweta Bopshetty, Mrunali Yadav, Rithvika Rae, Sheril Silvister, Prof. Parth Sagar, "Monitoring and Controlling of Drip Irrigation using IOT with Embedded Linux Board", International Journal of Advanced Research in Computer and Communication Engineering, 2017.

[5] Vaishnavi mantra, Namrata mohite, Aishwarya Patil, Prof. Yadav NC. "Automatic Drip Irrigation Using PLC", International Research Journal of Engineering and Technology (IRJET) 2018