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PLC BASED AUTOMATED IRRIGATION SYSTEM

Vijaykumar S Sandrimani[1], Anand H Unnibhavi[2]

[1]*Vijaykumar S Sandrimani, Department of Electronics and Communication Engineering, Basaveshwar Engineering College Bagalkot, Karnataka, India.*
[2]*Anand H Unnibhavi, Department of Electronics and Communication Engineering, Basaveshwar Engineering College Bagalkot, Karnataka, India.*

Abstract - *One of the most advanced technologies in the field of agriculture and irrigation systems is Drip irrigation. This method which will helps, for saves water and as well as fertilizers by allowing water slowly to the roots of plants, directly onto the root zone through pipes .Using automated drip irrigation we can save more water and increase our economy by increasing production crops with less time and less man power .The most important part is efficient utilization of water for the irrigation .Because, during growth time of plants, the absorption of water is not constant it may be varies depending on the climate conditions that is temperature and humidity etc. Because of that reasons the programmable logic controller develop the automated drip irrigation method for monitoring the drip irrigation method for monitoring the agriculture fields. This project is concentrated on the agricultural system that can be used to monitor and control the agricultural field. An observation by implementing this project work shows efficient use of water to crops.*

Key Words: **Drip irrigation.**

1. INTRODUCTION

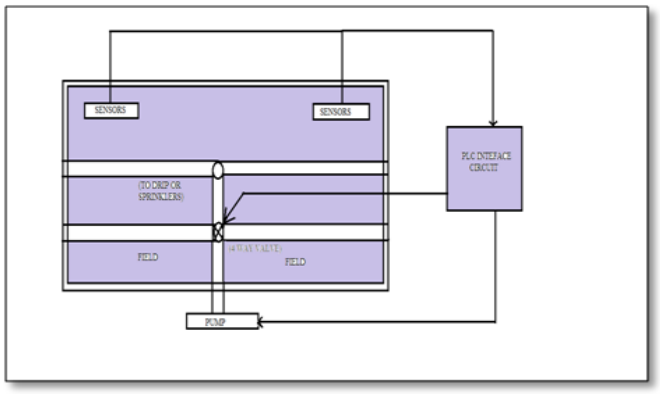
In present days, in the field of agriculture farmers are facing major problems in watering their crops. It's because they don't have proper idea about the availability of the power. Even if it is available, they have to pump water and wait till the field is properly wetted or not, which compels them to stop doing their other activities, which are also important for them and thus they loss their time and efforts. But, there is a solution "An PLC based automated plant irrigation system" not only helps farmers but, also others for watering their gardens as well. Mainly healthy plants can absorb a lot of water, resulting in an increase in the humidity of the soil. A high relative humidity should be avoided because it can increase the incidence of the disease and also plant transpiration. During periods with warm and humid condition humidity inside the green house can be a challenge.

This PLC based automatic irrigation system sense moister content of the soil and automatically switches the pump when the power is on. A proper usage of water in the irrigation system is very important because the main reason is the shortage of land reserved water due to lake of rain, unplanned use of water that may results large amount of water goes waste. For this reason we use this type of automatic plant irrigation system, and this system is very use full in all weather conditions.

In the 20th century, the advent of diesel and electric motors leads to systems that could pump ground water out of major aquifers faster than drainage dasins could re fill them. This can leads to permit loss of aquifer capacity, decreased water quality and other problems.

Apart from other problems there are two main functional components in this project. They are the moisture sensor and the water pump. The function of the moisture sensor is to sense the level of moisture in the soil and motor will pump supplies water to the plants.

2 BLOCK DIAGRAM & WORKING



In this method the system is deign on the bases of soil moisture conditions, such as either dry or wet. If the soil is in dry condition the resistance is high than the plc is automatically turns on and because, of that reason the water may supply directly to the root zone. If the soil is in wet condition the resistance of the soil is low because, of that the plc may automatically turns off the valves, hence the water may directly supplied to the root zone of the plant.

The PLC is connected to soil moisture sensor through the solenoid valves (control valves).The soil moisture sensor takes a reading of amount of water present in the soil and uses the information to open or close the control valves.

The dripping of water is based on the two conditions as follows,

1) If the soil is dry the resistance of the soil is "HIGH" and moisture sensor senses this condition and sends command

to plc to open the control valves and thus the dripping process starts.

2) If the soil is wet the resistance of the soil is "LOW" and moisture sensor senses this condition and sends command to plc to close the control valves and thus the dripping process stops.

2.1 MOISTURE SENSOR

Moisture sensors measure the water content in the soil. A soil moisture sensor probes are made up of multiple soil moisture sensors. That sensors includes,

1) Utilize the moderate properties of the water for neutrons.

2) Electrical resistance to the soil.

3)

In this automated irrigation system, we will use the moisture sensor which can be inserted into the soil, in order to measure the moisture content of the soil.

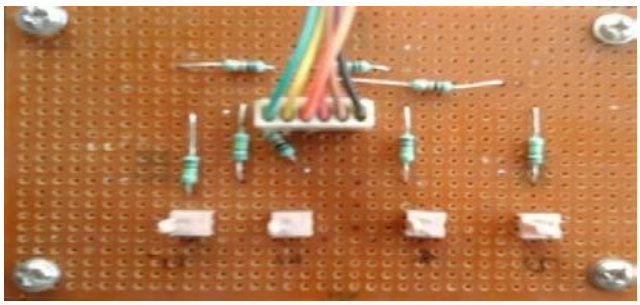


Fig 2.1.1. Moisture Sensors.

The electrical conductivity of the soil is measured using two metal conductors in the soil except that dissolved salts greatly alert the water conductivity and confound the measurements. In our project we will use a little bit inefficient but cheap method by measuring the voltage between the conductors in the soil conductors.

When the potential difference between these two wires is low that means that there is less amount of water is present for the plants and when potential difference is more than that means water is lacking in plants.

We can set the voltage level at which the water will be given to the plant. For the plant that does not need so much of water we can set the voltage level to a high value. And for the plant which is sensitive to dryness and require water timely we can also set the lover values of voltage difference between the wires of conductors in the soil.

When water comes between the two conductors than the voltage difference between the two wires reduces and when water does not come in contact of both wires then the potential difference between the two wires increased as compared to previous conditions.

2.2 WATER LEVEL SENSOR

Fig .2.2.1 Water level sensor/detectors

Overhead tank is used to supply water throughout the field. It senses two levels such as high level and low level of the water. When it senses water at low level it transfer the signal to PLC interface circuit, this sends signal to 12v relay, the output generated by this relay is fed as input to plc.PLC generates an output and 24v relay turns on the motor as soon as PLC interface circuit detects the water in overhead tank at high level the motor is turned off because, of this reasons the water is also utilized hence, it also helps the wastage of water.

2.3 WATER PUMP

The water pump is commonly used to supply the water for a particular land area. It can be electronically controlled by the PLC interfacing circuits. It can be triggered ON/OFF by sending the signal to the plc interfacing circuits. This process of supplying the water is communally called as pumping. Among many varieties of water pumping we can use small water Pumping technique.

The pumping of water of the water is a basic and fundamental practical technique, far more practical than scooping it up with one hand or in bucket. This is true whether the water is drawn from a source or used for irrigation for evacuating water from an undesirable location. All other processes depend either from water descending from higher elevation or some pressurized plumbing system is required for supplying the water to the land area.

2.4 LADDER LOGIC

For the representation of the PLC inputs the ladder logic may be used. In this project four inputs are normally open and two intermediate inputs are normally closed. And in active input close the contact and allows for the power supply and that's plc will turned automatically on and water may automatically supplied to the root zones of the plants ,hence that may be represented by some ladder input logic as shown bellow.

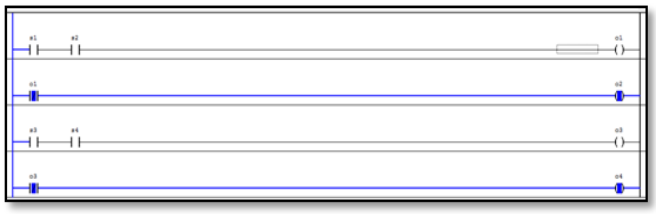


Fig 2.4.1 Ladder logic diagram

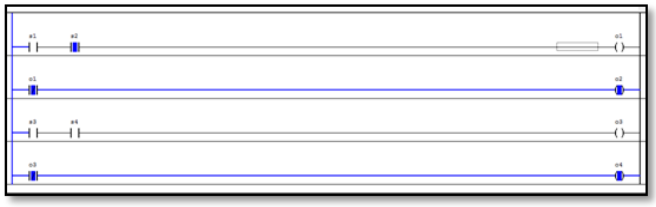


Fig 2.4.2 Ladder logic diagram

The ladder diagram of an PLC automated irrigation system works as follows,

1) If the soil is dry the resistance of the soil is "HIGH" and moisture sensor senses this condition and sends command to plc to open the control valves and thus the dripping process starts.

2) If the soil is wet the resistance of the soil is "LOW" and moisture sensor senses this condition and sends command to plc to close the control valves and thus the dripping process stops.

Ladder logic truth table

SENSOR 1	SENSOR 2	PLC OUTPUT VALVE 1
0	0	1
0	1	1
1	0	1
1	1	0

Based on this above truth table the sensor works, when sensor 1 and sensor 2 both are in dry conations the plc automatically triggered on the pump it results water may supply to entire land area. Similarly, when it's in wet condition means both sensors are in wet the plc triggered off hence, this may be turned off the pump. Because, of this reason the sucefficient amount of the water may be supplied to the land area.

SENSOR 3	SENSOR 4	PLC OUTPUT VALVE 2
0	0	1
0	1	1
1	0	1
1	1	0

In this truth table the sensor 1 and sensor 2, sensor 3 and sensor 4 are the moisture sensors. The function of this sensors is to identifies the soil moisture content if it's in dry condition the pump will automatically turns on, if it's in wet condition the pump will automatically turns off hence, because of this sensors the sucefficient utilization of the water may supply to the land area.

3. WORKING PRINCIPLE

The main working principle behind this system is in connecting the soil moisture sensor, which was previously embedded into the plant, which is also connected to other electronic components in active input close the contact and allows for the power supply and that's plc will turned automatically on and water may automatically supplied to the root zones of the plants.

Based on the ladder logic If the soil is dry the resistance of the soil is "HIGH" and moisture sensor senses this condition and sends command to plc to open the control valves and thus the dripping process starts. And similarly, if the soil is wet the resistance of the soil is "LOW" and moisture sensor senses this condition and sends command to plc to close the control valves and thus the dripping process stops.

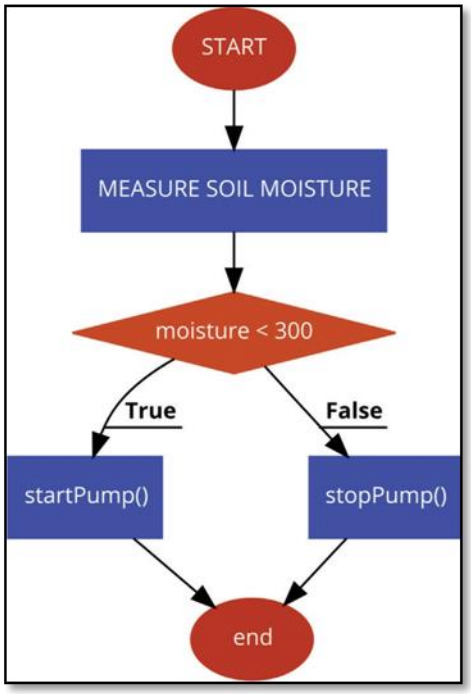


Fig.3.1.1. Flow chart diagram of Irrigation system

4. RESULTS

The below figure shows the overall representation of our tested plc based automated irrigation system. The system has been designed and also tested in the land with successful manner. Also, the both functionality of the plant and the system has been observed in one month and the results were great as we expected. Whenever a need for water was recognized by the moisture sensor and this we supplies the signals to the plc to the pump will start watering to the plant or overall land until enough quantity of water was not delivered.

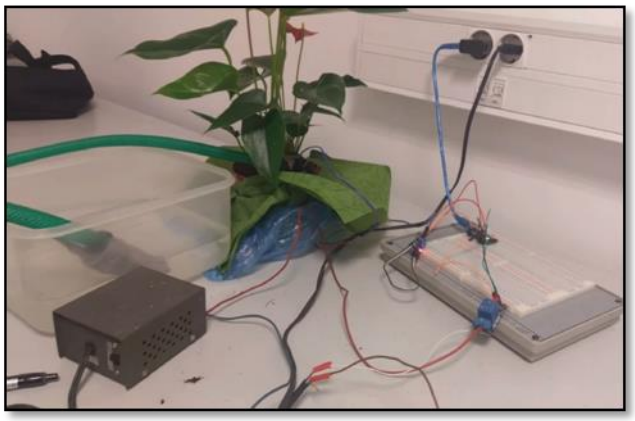


Fig.4.1.1. Testing the PLC Based automatic irrigation system.

The expected results of our experiments were concluded from the fact that our plant has successfully avoided the de-hydration and kept growing without any problems, this is because of the moisture sensors that are embedded within the plants measuring the soil moisture level and also controlling the water pumping. The main system works on the principle of soil moisturizing level it means the sensor technology which in turns to control the water pumping with the help of PLC in order to provide the plant enough amount of the water to the plant root zone.

Therefore by using this system peoples are able to irrigate automatically and cultivate famous plants such as weeping fig, ferms etc, which will contribute the reduction of dangerous toxic air pollutants, like CO, CO_2, benzene etc. And other problem addressed are time consuming process like manual watering of plants and also overuse of water can be reduces. Hence, because of this type of the system the main water may be utilized.

Finally, Atomizing drip irrigation can save up to 70% of water. Manual power cannot take care of all things thus automation saves manual power, time and ensures profit rather than the loss. Productivity is increased and PLC is efficient, reliable, less maintenance cost and one time expenditure.

5. CONCLUSION

Thus the "PLC Based Automated Irrigation System" has been designed and tested successfully. And the system has been tested automatically and the moisture sensor measures the moisture level of the different plants. If the moisture level is found to be desired level, the moisture sensor sends the signal to the plc interfacing system in which triggers the values to ON condition and supply the water to desired plant, if moisture level is high the sensor automatically sends the signal to plc, this will triggers off hence, the water pumping is stop. The drip irrigation would bring revolution in farming techniques.70% amount of water is saved, improves quality, increasing productivity of crops.

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AUTHORS

Mr.VIJAYKUMAR S SANDRIMANI Obtained his B.E degree in Electronics and Communication Engineering from the Basaveshwar Engineering College Bagalkot. Pursuing Master degree in Digital Communication from Basaveshwar Engineering College Bagalkot. His area of interest includes PLC, Digital signal processing, MEMS, Piezoresistive Pressure sensor.

Prof. ANAND H UNNIBHAVI Completed his Master degree from Malanad College of Engineering Hassan. He is pursuing his Ph.D in the area of Speech Processing. Presently he is serving as, Assistant Professor, Department of Electronics and Communication Engineering, Basaveshwar Engineering College, Bagalkot, Karnataka, India, He has published 7 papers in national and international conference and journals. His area of interest includes PLC, Antenna theory and Design, Statistical Signal Processing, Speech Processing.