

AUTOMATIC DRIP IRRIGATION SYSTEM USING PLC

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Abstract - Over 60 per cent of the country's population, compromising several million small farming households, depends on agriculture as a principle income source and land continues to be the main asset for livelihood. By the use of Drip Irrigation we can save water and fertilizer provided to the crops. By automating it we can save more water and increase our economy with increase in production and reduction in man power. As the timings provided for agriculture are very inconvenient also due to lack of rains and scarcity of land reservoir. 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. This project is concentrated on developing an automatic drip irrigation system using plc which is operated on two modes namely timer mode and sensor mode as per the convenience of farmer .

Key Words: PLC, Soil Moisture Sensor, pump, buzzer.

1. INTRODUCTION

Water is one of the most fundamental part 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. Drip Irrigation is the application of controlled amounts of water to plants at needed intervals. It helps grow agriculture crops, maintain landscapes and revegetate disturbed soils in dry areas and during periods of inadequate rainfall. In drip irrigation limited amount of water is provided to the crops. The plc is used to automate the whole process of irrigation which will work on two different modes. 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. b) Increase productivity. c) Automatic and controlled supply of water and fertilizers to the crops.

2. LITERATURE SURVEY

In [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. The objective of the system is to: a) Water resources b) Handles the system automatically c) Detects the level of water d) Based on the data available, analysis and prediction will be done e) Builds such system which enhances crop productivity. It states that the system monitors the flow of water and based on the available data it does analysis and prediction.

In [2], Chetna V. Maheshwari author said, due to the affordable prices of plc it can be used as standalone controllers. Here a single climatic criteria is considered to adapt with the irrigation process. A temperature sensor is used which calculates the climatic temperature on hourly basis depending on which the water is supplied to the plants.

In [3], 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.

In [4], Shweta Bopshetty author said, the system provides a web interface to the user with the help of which he can monitor the system distantly.

Here Arduino-Uno is used as an embedded Linux board which communicates with different sensors. Here Node MCU is used to monitor all the environmental parameters.

3. FLOW CHART

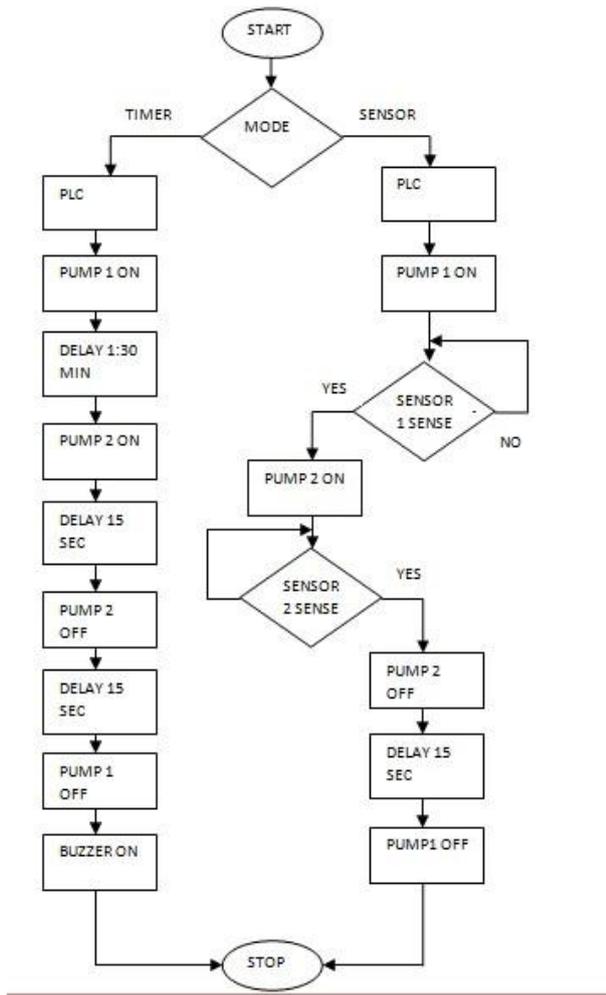


Fig-1: Flow chart

4. PROPOSED SYSTEM

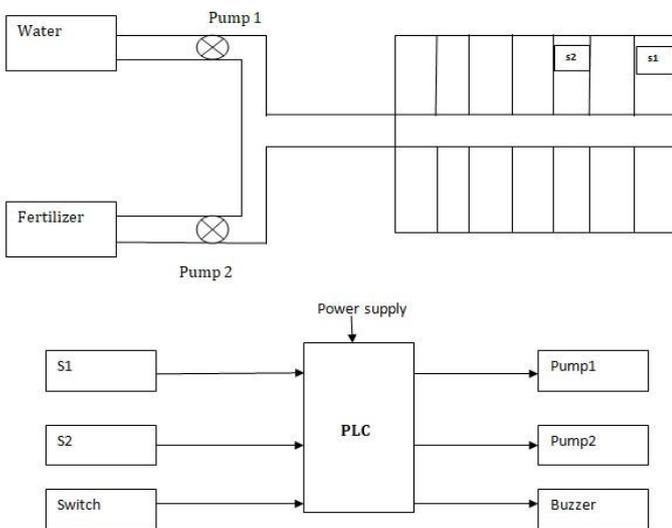


Fig-2: Block diagram

4.1 DESCRIPTION

In the conventional system the components like motor, main valve A , control valve B needed to be controlled manually. As, we want to implement automatization 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. The PLC continuously monitors the inputs and the controls the outputs depending upon the changes in the inputs and the program fed in it. The output of the soil moisture sensor is used as an input to the PLC. The soil moisture sensor detects the amount of water present in the soil and converts it into a value and provides it to the PLC. A threshold value is provided into the PLC program .Now if the value of the water content present in the soil is less than this threshold value , it means that the soil is dry then, the PLC send a control signal to turn on the motor, and open the main valve A and the respective control valve .so that the dripping of water starts. Whereas, if the value of the water content present in the soil is greater than this threshold value , it means that the soil is wet then, the PLC send a control signal to turn off the motor, and close the main valve A and the respective control valve .so that the dripping of water stops .

5. HARDWARE DETAILS

5.1 PLC



Fig- PLC

A programmable logic controller is unit of hardware used to control and automate the number of processes. It has many "input" terminals, through which it interprets "high" and "low" logical states from sensors and switches. PLCs are used in many machines, in many industries. It consists of many output terminals, through which output goes high and low for making the device turn ON and OFF. Here we are using DVP16ES2 delta plc which has 8 digital input and 8 digital output to control our system.

5.2 SOIL MOISTURE SENSOR

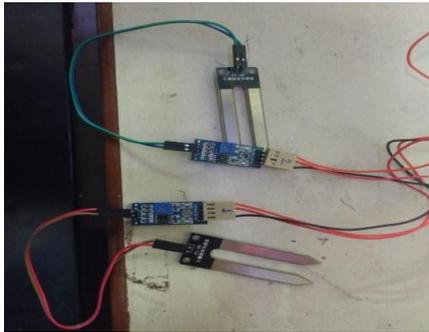


Fig- Soil moisture sensor

Soil Moisture Sensor measures the water content in the soil. In this project the soil moisture sensor is used to manage the irrigation system more efficiently. The module uses LM393 comparator to compare to soil moisture level with the preset threshold when the soil moisture deficit module outputs a high level and vice versa

5.3 PUMP



Fig- Pump

Water pump is a device which is used to pull out the water and the fertilizers from the water tank and fertilizer tank respectively. Here two pumps are used, one to provide water and other to provide fertilizer. The turning on and off of both the pumps are controlled by the plc.

5.4 BUZZER



Fig-Buzzer

Buzzer is an electrical device which makes a buzzing noise. Here in this project when one entire sequence of the PLC will be completed the buzzer will turn ON. It indicates that the water and fertilizers are provided to the field.

6. SOFTWARE DETAILS

6.1WPLSoftV2.41 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.

6.2Ladder logic

Ladder logic is a programming language in which program is made by a graphical diagram based on the circuit diagram of relay logic hardware. In this language resembles ladders, with two vertical rails and a series of horizontal rungs between them. In this project we are using ladder logic for programming our PLC in two different nodes. Namely Timer and Sensor.

7. 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.

8. ACKNOWLEDGEMENT

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