Indian J.Sci.Res. 14 (1): 263-266, 2017
ISSN: 0976-2876 (Print)
ISSN: 2250-0138 (Online)

REAL TIME IMPLEMENTATION OF DRIP IRRIGATION USING PLC

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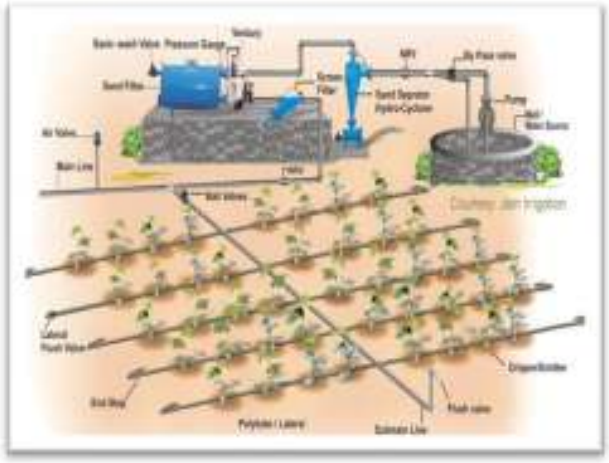
ABSTRACT

This project aims to develop the automated drip irrigation using PLC and biosensors for monitoring and managing the agriculture field. Drip Irrigation is a progressing technology in the field of Agriculture and irrigation. It is an irrigation method that saves water and fertilizer by allowing water to drip slowly to the roots of plant, through a network of valves, pipes and emitters. Automatically water will irrigate 4hrs/day at near the root of the plant through emitters using biosensors and also fertilizers are supplied to the plant 3 days once. By using drip irrigation the water will be maintained at the constant level i.e. the water will reach the roots drop by drop. In this paper the design of a PLC combined GPS based drip irrigation system is proposed, which is a real time feedback control system for monitoring and controlling all the activities of drip irrigation system more efficiently. Agro motor is automatically ON and OFF during irrigation time based on PLC. In addition, GPS and CCTV camera is used to the monitor and control the land.

KEYWORDS: PLC, GSM

Irrigation is the most important cultural practice and most labor task in daily agriculture sector. To do this automatically, sensors and methods are available to determine when plants may need water. Automation involves improving the speed of production, reduction of cost, effective use of resources. The main objective of this paper is to develop a PLC system to irrigate the plant automatically. This project is also to send a short message service (SMS) to farmer and motor ON and OFF condition. Many sensors are used in our project. There are temperature sensor, soil moisture sensor and bio electrodes. By using these sensors, we can find whether the soil is wet or dry. If it is dry, pumping motor will pump the water. Bio electrodes are used to measure the nutrient content of plant. In this system, the main controlling device is PLC. The pumping motor will pump the water into the field by until the field is wet which is continuously monitor by the PLC. A PLC is a control system that continuously monitors the state of input device and makes decision based upon the program to control the state of output devices. PLCs are "Programmable Logic Controllers" that are being used in manufacturing processes. As already mentioned the project of this research is to develop an economical PLC based irrigation controller that automatically adapts the actual weather conditions, using simple sensors and carries out the irrigation accordingly.

OVERALL DESIGN



For our automated irrigation system, we are implementing 3 types of sensors. The sensors to be used are a temperature sensor, soil moisture sensor and bio electrode. The sensor circuit will be done to make sure that all the sensors are working accordingly. These sensors will be connected to a PLC which will function as the main control unit. The sensors will send signals to the PLC and the PLC will respond the signals and determine if the input is within the preset range. For instance, if the preset temperature range is from 20°C to 25°C, the PLC will make sure that the field temperature is within this range. As for the soil moisture sensor, it will detect a change in moisture levels of soil and send a signal to the PLC. If the moisture level is not within the required range, the water supply will be turned on or off. The PLC will be the central processing unit which will respond the input signals from the sensors and turn on or off the

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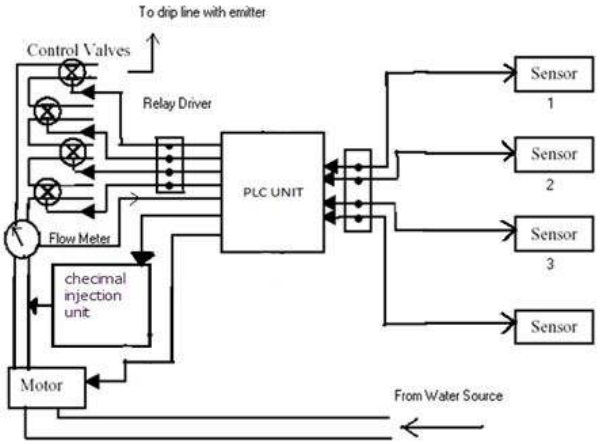
necessary devices to maintain the system at the preset levels.

BLOCK DIAGRAM



Water is taken from nearest water sources through motor. Every day water is flows to plants and every four days only fertilizer is mixed with water to increase crop production.4 liters of water is required to one plant. Fertilizers are used on 60 kg/ha each of P2O5 and K2O. Flow meter is used for to known the how much amount of water is taken by plant. Temperature sensor to measure the temperature. The sensor signal is input to the PLC system.PLC is controller of this project. PLC is detects to the plants surface is wet or dry and its control the all functions. If the plants surface are wet, Control valve is automatically opened otherwise the control value is will not open. The control valve is open water is flows through emitter line. Emitter is emitting the water drip by drip. Fertilizers are mixed with water flows through same emitter line.

SYSTEM IMPLEMENTATION

Temperature Sensor

Temperature Sensor has been used for sensing the temperature. Here we are used to LM35 transistor type of sensor. The output of temperature sensor is given to PLC. Supply voltage:5V (+35V to -2V) V_{cc}, Output voltage: (+15V to -15V),Ground: (0V).

Soil Moisture Sensor

The moisture sensor just senses the moisture of the soil. The copper plate act as the sensor probes. The change in moisture is proportional to the amount of current flowing through the soil. They work on the principle of change in resistance. Basically, moisture sensor is a metallic strip. Resistance of metallic strip changes according to moisture level in soil. If moisture is high, resistance will be low and if moisture in soil is low, resistance will be high. Because moisture increases the conductivity of metallic strip. Low self-heating and does not cause more than 0.1 ^{o}C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every ^{o}C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ ^{o}C.

Bio Electrode

Bio electrode is used to measure the nutrients content in soil and the plant. In our project 3 days once fertilizers mixed with water flows to plants. This sensor measure difference between nutrient content of soil and plant, calculate the needed nutrient in percentage. It differs to based on plant and soil. The amount of fertilizers mixed with water and flows to plant through pipes. Its only considers the flow of mixed water level not the amount of fertilizers or water. Because the concentration of water and fertilizers.

Programmable Logic Controller (PLC)

Here we are use Allen Bradley (AB) PLCs programmed with software had data files to store I/O and other internal values. These different data files could only hold one data type. This PLC made it easy for using instructions, it provided a challenge for logically grouping different data types together according to function. For instance, in machine control, a motor may have a start, stop, speed and alarm code each with its own data type. This projects point of view Allen Bradley PLC is the best because of the presence of Scale block which complete the program in less no. of rungs due to which less complexity occur in the program and the program become more accurate. We will use PLC uses 24V dc power supply. Actual programming is stored in the PLC.

Ladder Logic

A ladder diagram features an excellent graphical representation based on well-understood circuit design concepts. Basic programming skills are developed quickly. Excellent debugging tools. Modern online debugging tools available in a ladder diagram. This makes it very easy to understand the diagram logic and to debug faults.

Rung Input: Checkers (Contacts)

- —[ ]— Normally open contact, closed whenever its corresponding coil or an input which controls it is energized. (Open contact at rest)
- —[\]— Normally closed ("not") contact, closed whenever its corresponding coil or an input which controls it is not energized. (Closed contact at rest)
- Rung Output: Actuators (coils)
- —( )— Normally inactive coil, energized whenever its rung is closed. (Inactive at rest)
- —(\)— Normally active ("not") coil, energized whenever its rung is open. (Active at rest)

GPS and GSM

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network.

RESULTS AND CONCLUSION

The automatic of drip irrigation is very beneficial approach for farmers. This system reduce the extra manpower is needed to the farmer for his farm like supplying water to plants. This system uses different sensors like temperature, soil moisture, bio electrode etc. and according to this sensor parameters farmer can control drip farmer can control drip component from anywhere. This approach is very beneficial for increasing crop production. This system can be use in area where water resources are less. This type of application we can use for large area farms. These manual cultivation for one acre of a land requires money of around Rs. 15000 – 17000 but due to this technique we reduces the cost and is nearly Rs.9000-10000 only and also the yield is high when compared to normal one. The results were very satisfactory indicating an 70% water saving, along with some increase in crop yield, when compared to irrigation with a fixed water depth using a standard irrigation controller.

ADVANTAGES

- High water application efficiency and lower labor costs
- Minimized fertilizer/nutrient loss due to localized application and reduced leaching
- Ability to irrigate irregular shaped fields. Leveling of the field not necessary
- Allows safe use of recycled (waste) water
- Moisture within the root zone can be maintained at field capacity and minimized soil erosion
- Soil type plays less important role in frequency of irrigation
- Highly uniform distribution of water i.e., controlled by output of each nozzle
- Usually operated at lower pressure than other types of pressurized irrigation, reducing energy costs

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