

Polyhouse Automation Using PLC

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Abstract: Poly-house is basically naturally ventilated climate controlled system. In poly-house various crops are grown under their favourable environmental conditions. Environmental conditions such as temperature within the poly-house, humidity of soil and atmosphere etc. Every crop needs different climatic conditions and to provide that conditions farmers need man power to do labour work. The system we designed and implemented on small working model of poly-house reduces labour and man power. The info about favourable condition and need of plant is provided by the various agricultural universities and agricultural experts. Today we have cheap sensors and more precise and programmable controllers such as PLC available in the market. With the help of temperature, light intensity, humidity sensors and PLC automation of poly-house can be done. With the help of automation minimum and effective use of valuable resources can lead to achieve maximum crop.

Keyword: poly-house, sensors, PLC, automation.

I. INTRODUCTION

Water is one of the most valuable resources currently present on earth. Most of the water goes to irrigation purpose and it is not used effectively. As poly-house is controlled environment it uses all resources at their optimum efficiency and to help poly-house to do so automation is necessary. In poly-house crop friendly weather condition is created and continuously monitored as well as controlled with the help of sensors and controller. Sensors sense the parameters responsible to growth of the crop such as temperature, humidity, light intensity and sends signal to the controller. Controller checks the input signal from the sensors and compares with the set point and takes corrective action. In this way we can grow many crops in a year with great quality and with minimum use of resources.

II. BASIC BLOCK DIAGRAM

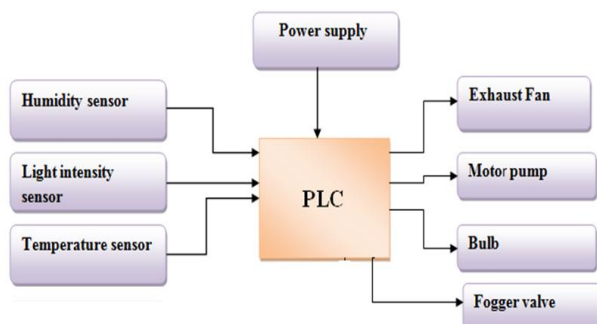


Fig.1: Basic Block diagram

III. IMPLEMENTING THE IDEA

The idea of poly-house automation using PLC is shown in the block diagram no.1

1. BLOCK DIAGRAM DESCRIPTION:

a) Programmable logic controller:

Programmable Logic Controllers evolved as industries sought economical Ways to automate their production

lines. PLC's operate by monitoring input signals from the INPUT DEVICES. When changes are detected in the signals, the PLC SYSTEM reacts through user programmed internal logic to produce output signals. These signals actuate the OUTPUT DEVICES.

a.1) Specification of PLC:

It works on 24V DC power supply. It has analog as well as digital inputs and outputs. It has memory to store the data. Its programming can be changed any time according to the need of crop.



Fig.2: basic PLC structure

b) Input parameter and controlling actions:

1) Temperature:

There are various sensors for temperature sensing available in the market, but according to our temperature range which is approximately 15-60 degree Celsius we chose LM35 IC or k type thermocouple.

The temperature within the poly-house is one of the important parameter to control because it directly affects the crop and varies during the day and night. So when temperature is increases exhaust fan gets on to maintain the temperature. And at night when sometimes temperature drops below set point incandescent lamp gets

activate to maintain the temperature. The LM-35 series is a temperature sensor, whose output voltage is linearly proportional to the temperature in degree Celsius.

2) Humidity:

Humidity is measured in relative humidity inside the poly-house. There are 2 types of humidity present in the poly-house

1. Atmospheric humidity
2. Humidity of soil

The humidity decides an amount of water molecules present in the air of poly-house environment. To evaluate the extent of humidity, amount of water molecules added/dissolved in the air of Poly-house environment, a smart humidity sensor SY-HS-220 is selected for the system. Figure shows an SY-HS-220 humidity sensor. The SY-HS-220 module comprised of sensing unit along with other signal conditioning part of the circuit, such as thermistor for temperature compensation. This is highly precise and reliable. It works with +5V power supply and current consumption is less than 3.0mA. The operating temperature range is 0-60 degree Celsius



Fig 3: Humidity Sensor (SY-HS-220)

The output linearly varies with the relative humidity which would significantly help to calibrate the system more precisely. The humidity sensor is of capacitive type comprising on chip signal conditioner. If the humidity of atmosphere get increased it will be sensed by the sensor and which further turns the fogger valves ON and the fogger will provide water droplets to the atmosphere. When soil humidity gets low drip motor get started to provide water to soil.

3) Light Intensity:

Light intensity play important role in growth of plant. Some areas doesn't get required light due to their external environment so in that area light has to be provided externally. Incandescent lamp or tubes are helpful as the source of light for plants which grow satisfactorily at low light intensities.

IV. RESULT

Using PLC and sensors we were successfully able to maintain the atmospheric condition inside the poly-house. PLC After detecting or sensing the input will took the necessary action according to the ladder logic and then dealt with outputs of Poly-house.

In this way after controlling the conditions of Poly-house we saved human labor as well and increased the productivity of crop. Maximum 1 or 2 persons are sufficient to manage the workplace.

V. CONCLUSION

After completing this project, we came to the conclusion that for controlling the environment parameters we should have a firm understanding or knowledge of the control processes so that we can operate the whole process precisely and in controlled manner. We can automate the whole poly-house using PLC only. As we know very well that growth of crop is very important, so in the same way increase number of poly-houses is one of the better options. This will make a whole new domain of the discipline dealing with the art or science of applying scientific knowledge to practical problems (technology) for the workers or farmers. This project will result in greatly profitable for farmers and even for those who are not from the farming field due to the use of new techniques. This will also increase the knowledge of farmers regarding farming using latest system.

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