Green House Automation Using PLC And SCADA Monitoring

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Abstract-*Automatic control and monitoring of greenhouse parameters which are required for smooth maintenance, proper growth of crops or plants using PLC without human interference and including GSM system.Green House Automation using PLC and SCADA includes the different sensors like LM35 for temperature, LDR for light intensity, DHT11 for humidity and Tinyos – YL-69 for soil moisture essential for the crops cultivation. Through signal conditioning the output of the sensors are given to the PLC as input, and the digital output from PLC are connected to relay for driving the controlling components like fan, water spray, light and motor. These components will control the varying parameters like temperature, light intensity, humidity and soil moisture affecting the crops.*

Keywords-Green house, Sensors, PLC

I. INTRODUCTION

Agriculture in India is one of the primary occupations of man since early time till today. Greenhouse form an important part of the agriculture and thus our countries economy majorly depents on agriculture as over 50% population of India earns through farming only . In our country, as they can be used to grow plants under controlled climatic parameters which directly or indirectly govern the plant growth and hence they produce. For maintaining the quality and production of crops under optimum conditions, controlling the different parameters affecting the crops like humidity, temperature, soil moisture, water level and light intensity. Automation is process control of industrial machinery and process there by replacing human operators. Greenhouse automation is an important infrastructure for providing shelter to the plants or crops for their production as well as quality maintenance. Green House Automation using PLC and SCADA includes the different sensors like LM35 for temperature, LDR for light intensity, DHT11 for humidity and Tinyos – YL-69 for soil moisture essential for the crops cultivation.

II. COMPONENTS

1. Temperature sensor(LM35)
2. Light Dependant Resistor(LDR)
3. Humidity sensor(SY-HS-220)
4. Soil moisture sensor(Tinyos – YL-69)
5. DELTA PLC
6. SCADA
7. Fan, bulb, sprinkler and motor

III. SENSORS

Temperature sensor (LM35)

LM35 is a precision IC temperature sensor gives output with respect to temperature (in °C).It is calibrated to an accuracy of 1 °C. Temperature can be measured more accurately than with thermistor. Its measurement range from -55 ° C to 150 ° C. The output varies by 10Mv in response to every °C rise or fall in ambient temperature.

The LM35 does not require any additional circuitry to measure the output. The low output impedance, its precise calibration and linear output gives proper combination to measure accurate output. This sensor if it is connected to one but an overall gain and output is obtained as it has 3 terminals Vcc, output and ground. The Vcc supply given normally 5V and the output obtained is between +6V to -1V. Due to low supply current of self-heating effect is produced gets reduced which increases efficiency of circuitry.

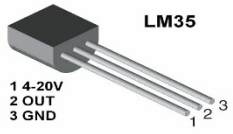


Fig 1. Temperature sensor

Light Dependant Resistor (LDR)

A Light Dependent Resistor (LDR) also known as photo resistor or a cadmium sulphide (CdS) cell. It is basically a photo cell that works on the principle of photo conductivity. LDR is made of high resistance semiconductor that absorbd photons and depends on frequency and quantity of absorbed photons the semiconductor material give electrons enough energy to jump to conduction band. The free electrons conducts electricity resulting in lovering resistance of LDR. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This optoelectronic device is commonly used in light varying

sensor circuit and other applications include camera light meters, street lights, light beam alarms, outdoor clocks and reflective smoke alarm. The equation to show the relation between resistance and illumination can be written as

R = A.E^a
Where E–Illumination (lux)
R- Resistance
A, a – constants

The value of 'a' depends on the CdS used and on the manufacturing process. Values mostly range between0.7 and 0.9.

Fig 2. LDR sensor

Soil moisture sensor (Tinyos – YL-69)

Soil moisture sensors commonly used to measure the water content in soil. Measuring soil moisture is important in agriculture to manage plant growth by maintaining irrigation systems more efficiently. Soil moisture sensor used in this project is Tinyos- YL-69 as shown in the below figure. This sensor measures the soil moisture when the two terminal probe inserted inside the soil layer which consist of sensory part given signal through supply circuitry. We have used Tinyos – YL-69 as a soil moisture sensor. This soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acts as a variable resistor. The more water in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher signal out. It consists of three terminals as R as Vcc, W as input and B as ground which form supply part to the probes inserted inside soil. Soil moisture sensors also measures some other property, such as Electrical resistance, Dielectric constant and interaction with neutron.

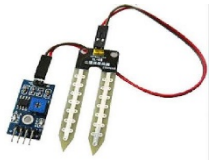


Fig 3. Soil moisture sensor

Humidity sensor (SY-HS-220)

Humidity sensor measure the atmospheric condition i.e. the relative humidity in air inside the green house. SY-HS-220 uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin. Its Fairly simple to use, but requires careful timing to grab data. The only real downside of this sensor is we can only get new data from it once every 2 seconds, so when using our library, sensor reading can be up to 2 seconds old.

Fig 4. Humidity sensor

IV. PLC

The PLC is an industrial computer. It is capable of storing instructions to implement control functions such as sequencing, timing, counting, arithmetic data manipulation and communication. The I/O interfaces provide the connection between the PLC and the information providers (inputs like push buttons, sensors) and the controllable devices (outputs like valves, relays, lamps). PLCs specifically designed to survive the harsh conditions of the industrial environment. A well designed PLC can be placed in an area with substantial amounts of electrical noise, electromagnetic interference, mechanical vibration and non-condensing humidity. The hardware interfaces for connecting field devices are actually part of the PLC itself and are easily connected. There are different types of PLC like Delta, Allen Bradley, Indra Logic L10, L20,L25, and L65. We have used DELTA PLC. The PLC logic is not a mechanical part of the controller. The PLC logic is software program, which runs on the processor in the PLC.

V. GSM SYSTEM

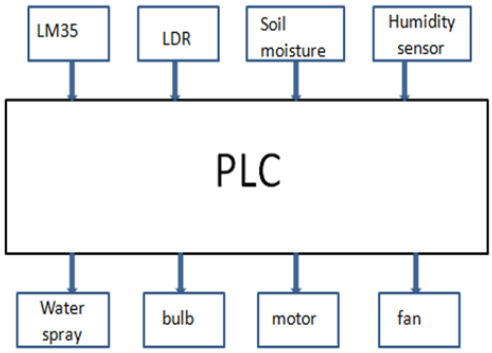
GSM stands for Global System for Mobile communication. It is a digital mobile telephony system uses a variation of time division multiple access(TDMA) and is the most widely used of the three digital wireless telephony technologies. GSM digitizes and compresses data, then sends it down a channel with a two other streams of user data, each in its own time slot. It operates at either the 900 MHz or 1800 MHz frequency band. In this project of Green house automation we have used GSM which gives us the notification if the parameter changes from its set point, like temperature, light intensity, soil moisture and humidity in greenhouse plant.

VI. SCADA

SCADA software used in this project is ellipse SCADA. This SCADA software is programmed to give the overall monitoring of the parameters involving Green house

effect. SCADA monitoring is done on the the live parameter changes and the set point level is set for specific parameter. If the parameter increases or decreases' than the Automatic control action takes places through PLC programming and the level of parameters are maintained and thus attains proper growth of plants under green house.

VII. BLOCK DIAGRAM



Block diagram of greenhouse automation consists of 4 sensors which are used for measuring the parameters and in response to the controlling factor or the device interfaced with the PLC will automatically operate when the greenhouse parameters gets changed.

VIII. SYSTEM DESIGN

A greenhouse is a building or a complex in which plants are grown. A good management scheme is defined by the quality of the information gathered from the greenhouse environment. The main aim of our work is to design an automated green house monitoring and controlling system. We use different sensors and actuators to solve this problem. Different sensors are kept inside the greenhouse which senses any variations Parameters which are being monitored inside the greenhouse and the sensors outputs are with the help of different sensors and actuators using PLC continuously compared with that of the standard conditions required for the greenhouse. The output of the comparator is given to the PLC and the PLC switches on the corresponding actuators according to the program written in it .Thus the parameters required inside the greenhouse are maintained automatically. In this project we have use different sensors like LM35, DHT11, LDR and YL-69 for sensing different parameters like humidity, temperature, soil moisture, water level and light intensity. Output of all sensor is connected to Delta PLC as an input. We get the digital output from PLC which is connected to relay. The relay driver IC ULN2803 is used for operating relay and the components used for controlling the varying parameters affecting the crop production. All the components like water spray, motor, bulb and fan are connected to relay output for controlling green house parameters like temperature, soil moisture, light intensity and humidity respectively.

Result And Conclusion

Automatic control and monitoring of different parameters inside the greenhouse which are required for smooth maintenance using PLC without human interference. The program written using ladder logic and implementation using Programmable Logic Controller (PLC) that help in automatic control and monitoring various parameters like temperature, light intensity, soil moisture and humidity inside a greenhouse and notifying the changes in parameter through GSM system. SCADA system gives continuous monitoring and changes can be made according to the required condition, thus attaining the automatic control and monitoring of greenhouse.

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