ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 6, Issue 11, November 2017

Green House Monitoring and Controlling Using Programmable Logic Controller (PLC) and LABVIEW

Shalini V N[1], Sujatha B C[2], H Prasanna kumar[3]

M.E Student (C&I), Dept. of EE, UVCE, Bangalore, Karnataka, India[1]

Associate Professor, Dept. of EE, UVCE, Bangalore, Karnataka, India[2]

Assistant Professor, Dept. of EE, UVCE, Bangalore, Karnataka, India[3]

ABSTRACT: Greenhouse forms an important part of the agriculture.Existing system is difficult to maintain the plant growth so, there is a need of automation in greenhouse. Automatic controlling of the environmental factors such as temperature, light intensity and soil moistureusing PLCis proposed in this system. Theseparameters play a vital role in the proper growth of crops.Here the constant temperature is maintained frequently by turning ON & OFF the light & fan. Temperature and soil moisture is controlled using PLC. Smoke detection is monitored and controlled using Lab View.The purpose of this work is to design a labour free, sensor based greenhouse monitoring & controlling system which is fully automated.The output signal is generated from different sensors, which in turn sent to the PLC for appropriate action. This results in proper growth of plants in greenhouse.

KEYWORDS: PLC, Sensors, LABVIEW, GREENHOUSE EFFECT

I .INTRODUCTION

Agriculture has been one of the primary occupations of man since early civilization and even today. Hard work of human being using simple and conventional tools is being observed in agriculture. To avoid human errors and hard end efforts there is a need of automation. That's how wastage of labour force is avoided and farming is made convenient and efficient. Humans cannot predict the exact conditions of weather,so to give accurate result about different activity performed in green house in different environment conditions this system is used. By using greenhouse automation,productivity will be increased.

The important environmental factors such as Temperature, Light intensity,co_2 concentration, etc., affect the growth of crops and its development. Thegreenhouse system is composed of heating system, lighting system, ventilation system and automatic sprinkling system [1].

This system is based on continuous monitoring and controlling the parameter which plays important role in green house. When the temperature reach a certain threshold value, the temperature sensor will send the information to controller, the controller will process that signal and perform appropriate actions. This system is designed in such a way that it automatically controls the different parameters such as temperature, intensity of light, soil moisture etc. Thissystem reduces the manual overheads of monitoring different parameters and in process it reduces the percentage of the errors occurring due to the manual operations.

Green houses are climate controlled. Green Houses have a variety of applications. The major application is being, off-season growing of vegetables, fruit crop and plant breeding [5].The structure of greenhouse range in size from small sheds to industrial-sized buildings. A miniature greenhouse is called as a cold frame. The interior of a greenhouse exposed to sunlight becomes significantly warmer than the external ambient temperature and it protects its contents during cold weather. Many commercial glass greenhouses or hothouses provide high tech production facilities

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 6, Issue 11, November 2017

for vegetables and flowers. The glass greenhouses are equipped with screening installations, heating, cooling, and lighting. It may be controlled by a computer to optimize conditions for plant growth [5]. The environmental parameters temperature, moisture and smoke are sensed by sensors and transmitted to the PLC (Programmable Logic Controller) and arduino.

II.OBJECTIVE

To design Greenhouse Environment monitor and controlling using PLC and smoke detection using LABVIEW and develop a prototype of greenhouse environment monitor and controlling using PLC and smoke detection using LABVIEW and Verify the effectiveness of this system through testing on real time demand.

III.BLOCK DIAGRAM

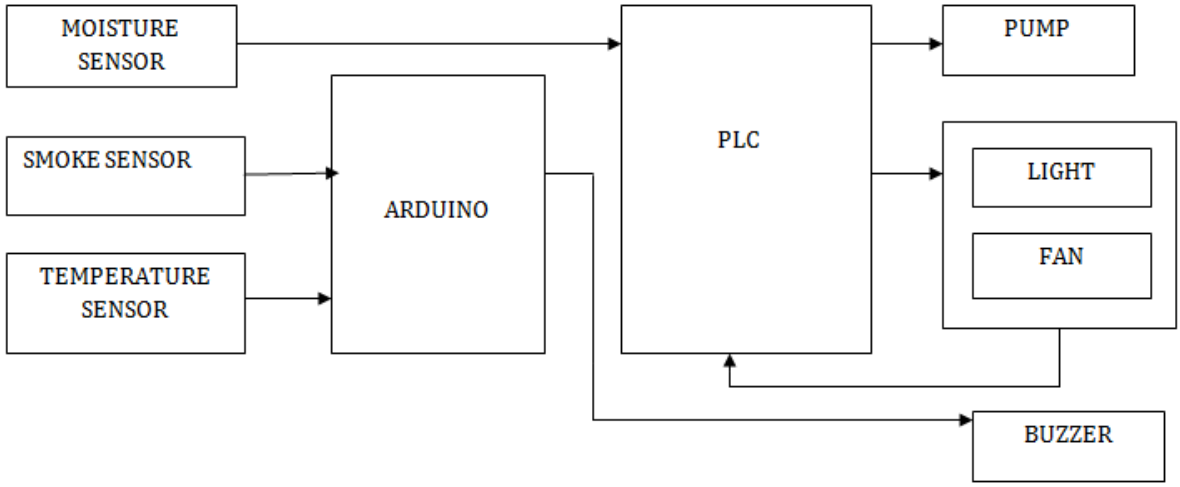

Fig.1 Block diagram

The figure1 represents the complete block diagram of greenhouse monitoring and controlling using PLC.The temperature sensor, soil moisture sensor and smoke sensor is placed inside the greenhouse. These are automatically controlled by PLC.By using the output signal given by different sensor PLC will do the appropriate action for the proper growth of plants in greenhouse.

IV.BLOCK DIAGRAM DESCRIPTION

1. PLC

The PLC is referred as anindustrial computer. It is capable of storing instructions and to implement the control functions such as sequencing, logical,timing, counting, arithmetical, data manipulation and communication. The I/O interfaces provide the connection between the PLC and the information providers (inputs like pushbuttons, sensors) and the controllable devices (outputs like valves, relays, lamps).
S7-1214 DC/DC/Relay PLC has been used. S7-1214 DC/DC/Relay has been shown in Figure1.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 6, Issue 11, November 2017

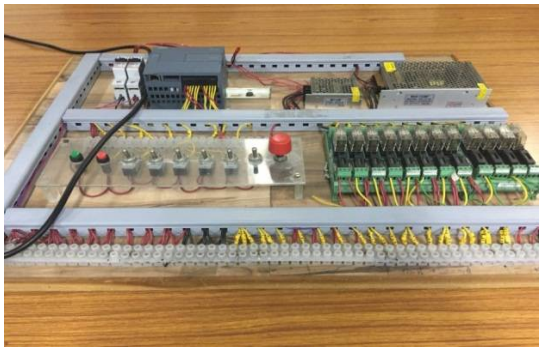

Fig.2 Seimens S7-1214 DC/DC/ RELAY PLC

PLCs are designed to survive the harsh environmental conditions such as shock resistance for the industrial environment. A well designed PLC can be placed in an area with less percent of electrical noise, electromagnetic interference and mechanical vibration.

2. TEMPERATURE SENSOR

The DHT22 (RHT03) is a temperature and humidity measurement sensor. The data obtained from the temperature sensor is fed into a PLC for controlling operations.

3.SOIL MOISTURE SENSOR

Soil moisture is most sensitive to the ambient humidity is generally used to detect the moisture content of the soil. Sensor to reach the threshold value is set in the soil moisture sensor, when the soil humidity exceeds or below the threshold value, the PLC will takes the action accordingly for watering crops using pump.

4. SMOKE SENSOR

A smoke detector is a device that senses smoke, typically as an indication of fire. The Grove - Gas Sensor (MQ2) module is useful for gas leakage detecting. It will detect CO gas.If its reach high state buzzer will get activated to indicate the smoke.

5. FAN

24V fan is used in this work to cool down the temperature inside the greenhouse and to produce the adequate airflow and circulation.

6. BULBS

100 Watts bulb is used inside the greenhouse to keep the crops warm. This will provide the high intensity light when the natural sunlight available is not sufficient to provide optimal plant growth.

V.WORKING

The Temperature sensor, moisture sensor and smoke sensor are placed insidethe greenhouse.These sensor checks the status of the surrounding environment in the greenhouse.The Temperature sensor, moisture sensor frequently monitor the status and send the information to the PLC. Smoke sensor send the information to the arduino controller. Depending upon the status of the temperature sensor the controller will turn ON or OFF the light and fan thereby maintaining the constant temperature.The output of moisture sensor is then read by external control unit PLC that converts sensor ON and OFF state into useable information. Similarly output of the smoke sensor is read by arduino and takes appropriate action.

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 6, Issue 11, November 2017

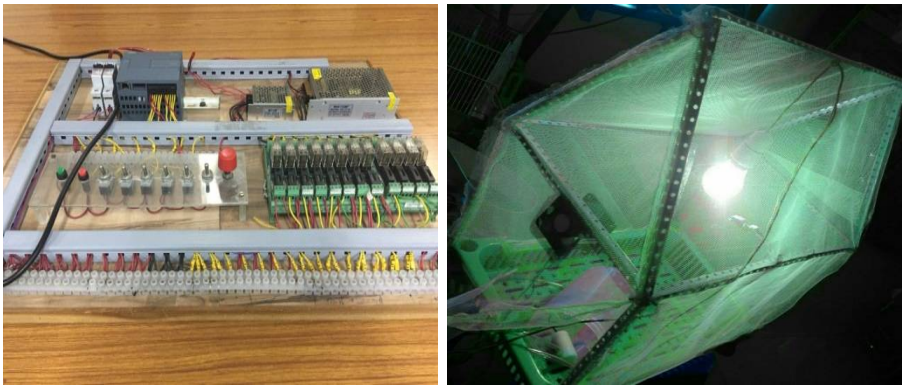

Fig 3:Greenhouse monitoring and controlling system

Fig 3 represents the experimental setup of greenhouse monitoring and controlling system using PLC. This greenhouse automation is done with aim of providing specific consistent environment for crops, crops will damage from the change in environmental conditions. Automation provides efficient output. Thereby protecting the crops from change in environmental conditions

VI. RESULTS AND ANALYSIS

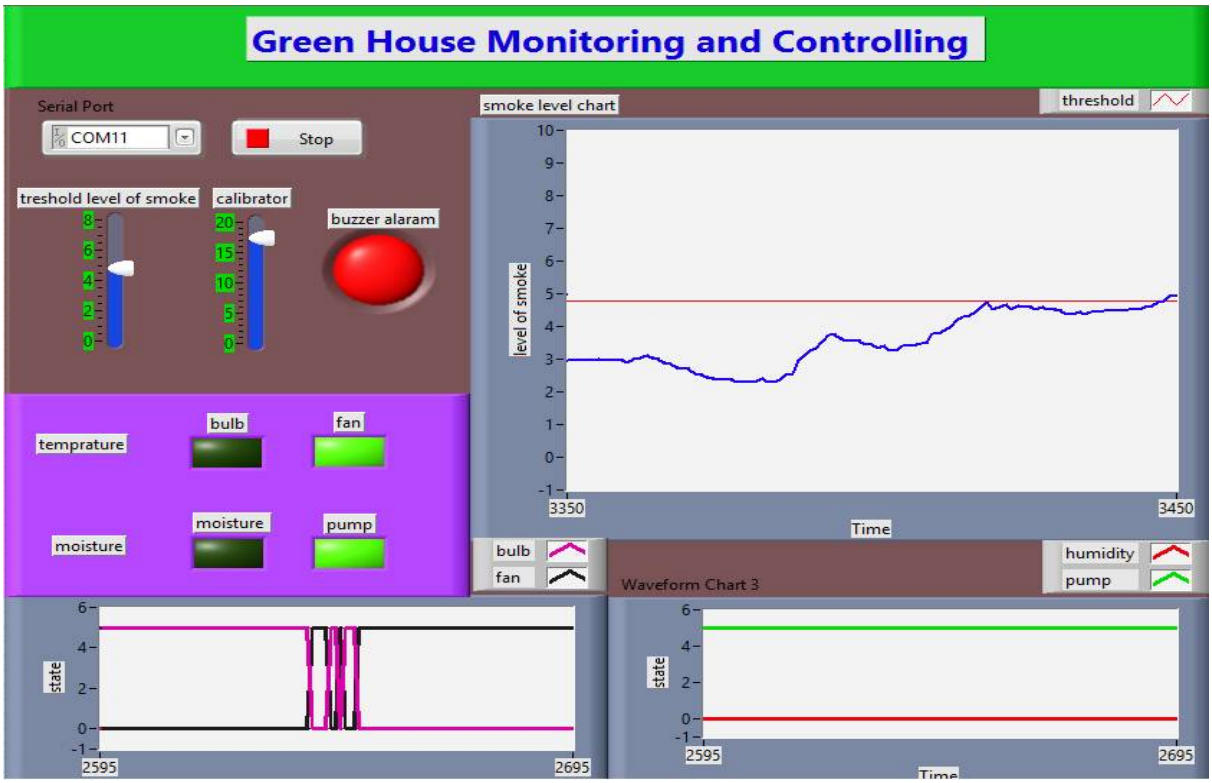

Fig 4: Experimental results using LABVIEW

ISSN (Print) : 2320 – 3765
ISSN (Online): 2278 – 8875

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Website: www.ijareeie.com

Vol. 6, Issue 11, November 2017

Fig.4 shows the experimental result and shows the program logic to control different parameter in the greenhouse using LABVIEW. This is used to control the, temperature & moisture and smoke detection in the green house.The temperature of green house is continuously monitored by temperature sensor. To maintain a constant temperature the light and fan are made to change their status continuously. If the temperature exceeds the limit that is set as threshold, the light will be turned OFF to reduce the temperature and fan will be turned ON to reduce the temperature further. Similarly if the temperature is less than the threshold value light is turned ON and the fan will be turned OFF.Soil moisture sensor measures the water content in the soil. If moisture level is more the sensor turns low and pump will be turned OFF. If moisture level is less the pump will be turned ON.Smoke sensor checks the presence of smoke(if any) and makes the buzzer ON.

TABULATED RESULTS

SENSORS	STATUS OF SENSOR	LIGHT	FAN	PUMP	BUZZER
TEMPERATURE SENSOR	HIGH LOW	OFF ON	ON OFF	NA	NA
SOIL MOISTURE	HIGH LOW	NA	NA	OFF ON	NA
SMOKE SENSOR	HIGH LOW	NA	NA	NA	ON OFF

VII. CONCLUSION

The Proposed work is an advanced alternative solution to replace the manual method of monitoring and controlling the growth of crops with a PLC and LABVIEW based Greenhouse monitoring and controlling system. This system completely eliminates the human work for farming the crops. It provides a high speed monitoring system that automatically controls the environment parameters using sensors, hence this will reduce the labour work. The PLC and arduino are used as a controller in this system, makes the entire system as a user friendly and highly reliable that carries out control functions of many types and levels of complexity.

REFERENCES

[1] Zhou Xiaobo,WangChengduan,Lanhong-"The research and PLC application of fuzzy control in greenhouse environment", 6thinternational conference on fuzzy systems and knowledge discovery,2009.
https://en.m.wikipedia.org/greenhouse
[2] Tantau H.J. and Lange D., 2003. Greenhouse climate control: an approach for integrated pest management. Computers and Electronics in Agriculture, Vol. 40, pp. 141-152.
[3] Aldrich, R.A. 1989. Greenhouse engineering.Northeast Regional Agricultural Engineering Service, Ithaca, New York.Baille, A. 2001.
[4] Trends in greenhouse technology for improved climate control in mild winter climates. Acta Hort. 559:161–168.Poorna Prakash dondapati, K. Govindaraju,-"An automated multisensoredgreenhouse management", international journal of technological exploration and learning, august 2012, pp. 2319-2135.
[5]https://en.m.wikipedia.org/greenhouse
[6]Pooja T. Latake, PoojaPawar, Anil C Ranveer "The Greenhouse Effect and Its Impacts on Environment" ©2015 IJIRCT
[7]DiogoVeber Lima; Antônio Carlos da Rocha Costa; NisiaKrusche IEEE 2011 "Net Logo and the Climate Change Model as a Tool for the Simulation of the Greenhouse Effect"
[8]Yingxu Wang, IEEE 2005, "On Long Lifespan systems"
[9]Adela Puşcaşiu; SilviuFolea; HonoriuVălean; Alexandra Fanca; TeodoraSanislav, IEEE 2017 "Monitoring the on-site contribution to the greenhouse effect by distributed measurement of carbon dioxide"
[10]Wei-Hua Yang; Sheng-Nan Zhao; Kan-Hong Wang; Wei Li; Jing-Yu Ma, IEEE 2009 , "Greenhouse Effect Reduction in Biomass Power Plant: A Case Study"
[11]Harris Tanveer; David Gauntlett; Jhonnattan Diaz; Po-Cheng Yeh , IEEE 2014 , "Design of a flight planning system to reduce persistent contrail formation toreduce greenhouse effects"
[12]Hua He; Junliang Li, IEEE, "Effect of irrigation and fertilization methods on yield and fruit quality of film-mulched watermelon in greenhouse"