

# PLC Based Office Automation System

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**Abstract**— This paper is based on PLC based office automation. It is basically a combination of various devices and sensors like LDR sensor, smoke detector, temperature detector, IR sensors, light intensity sensors and PLC. In order to save electricity and saves time, we are using PLC because it can handle number of inputs and outputs. So we are interfacing all the sensors listed above with PLC to control various office systems like fire control, fan and ac speed control according to temp, light controlled.

**Keywords**-PLC, sensors

## I. INTRODUCTION

Nowadays, the information technology sector and industries are growing rapidly. With this growth and advancement of industries the need of automated systems is also required. So for fulfilling this requirement of industries, automation has brought big and powerful change. The use of automation is for the security of people and information, for comfort, for the offices and homes for saving time and labour requirements, etc. PLC is that powerful thing that plays the role of brain of the overall system; it can control all the operations under it. A PLC is a single chip microprocessor based special computer, it is user friendly which can handle and control the machines and processes. Because of these all advantages of PLC we are using PLC as a heart of the system.

In this paper, PLC based office automation; we are designing total office with the aim to save electricity and to save time. We are developing the office automation system with the following points:

- Automatic main lights.
- Automatic porch light control.
- Automatic fan and AC control.
- Automatic fire hydrant system.
- Automatic direct sunlight control.

## II. COMPONENTS

### A) Power Supply

This unit is very important part of the project. We use +24v regulated supply coz PLC runs on 24v supply. The power supply unit consists of different unit like –Transformer- step down converts' high voltage ac main voltage ac. Rectifier – this converts ac to dc but the dc obtained is varying dc.

Filter – it help to make variable dc to a soft constant dc.Regulator- this block eliminates the ripples in the dc and keep it's at a fix value.

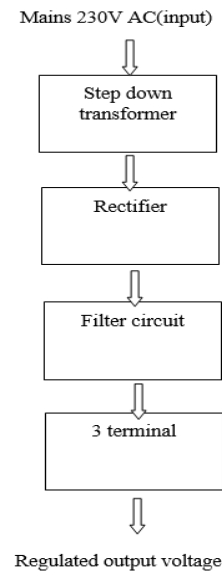


Fig 1: Power Supply

### B) Smoke Sensor(MQ6)

This is a simple smoke sensor which is suitable for the sensing of LPG , LNG , cigarette smoke. This sensor is very sensitive and response is very fast. It takes less than 10 secs to response. It detects the range from 100-1000 ppm and this range can be adjusted manually according to requirement. By using this sensor we are building a fire fighting system in the office.



Fig 2: Smoke Sensor(MQ6)

### C) LM35 Sensor-

It is a temperature sensor. We use this sensor because it directly senses the temperature in centigrade. So the conversion time required for converting centigrade to kelvin

is reduced. It can sense temp from -40 to 110deg centigrade. This temp sensor is used in our project for automatic fan and AC control system . For that we are providing different temperature ranges for controlling ac or fan according to temperature . The range is give to the PLC by ladder programing.

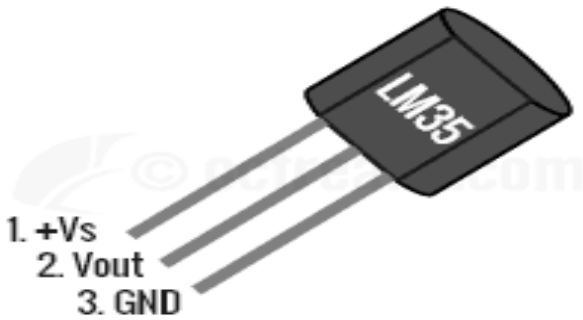


Fig 3: LM35

**D) LDR Sensor-**

This is used for detection of intensity of light from environment. It is used for the application of curtain control in our project. In this according to intensity of light the resistance of the sensor varies and we provide two series motor one to rotate in forward to get the window curtains off and another is for reverse i.e. opening of the curtain which is obtained by reversing the motor.

**E) ARDUINO-**

It is a single board microcontroller. The hardware consists of a 8-bit ATMEL AVR MICROCONTROLLER. It has 6 analog inputs as well as 14 digital I/O. This controller is used as slave part in our project. It works according to the command given by the PLC. All the output of the project is connected to the controller which is work as per the PLC instruction and detection of sensor.



Fig 4:Arduino

**F) IR Sensor-**

This sensor is used for the detection of nearby objects. But we use this sensor for switching of lights in office automatically. This sensor contains a led and phototransistor whose output is connected to the LM 358 IC for proper amplification. On the output side of these sensor

V pin is connected to 5V, GND is connected to GND of ARDUINO, and the out is connected to input of ARDUINO. Here we use 2 IR proximity sensors on the door of office.



Fig 5: IR sensor

**G) PLC**

PLC is a system which uses electronic operation for purpose of controlling. We use DELTA DVP-SS2 series plc in our project. It gives fast command, which makes fast execution of given work. Also it is very flat and compact in size. It consists of 8DI & 6DO. As we are doing automation we need such type of PLC flat and having faster response.



Figure 6: Delta PLC (DVP SS2)

**III. SYSTEM INFORMATION**

**A) Automatic Main Lights Control-**

For this we used two IR sensors. These sensors are mounted below handle of door .When any person opens the door the output of sensor changes its level. One sensor is mounted on front side which acts as a positive counter and another one is on backside of door which acts as a negative counter. Initially when no one enters or leaves the office both counter count is 0. But when someone enters in the office the positive counter count is increased by 1 and light gets on. The lights get on till the negative counter value goes to 0.

### B) Automatic Porch Light Control-

In this porch light control basically we are using brightness sensor for sensing the light. According to the sunlight intensity at the day time the lights in the porch will remain off and when the sunlight in the environment goes low then at the evening time the porch lights started glowing and the night the intensity of them remain high. Use of this application will help us to save electricity at the day time. It will also prevent our office from the thefts as they will see the lights are glowing.

### C) Automatic Fan And AC Control

For this purpose we are using LM35 temperature sensor. There are various temperature sensors but LM35 is most convenient for us because it directly senses the temperature in centigrade. According to the temperature sensed by the sensor we are providing various ranges of temperature for which fan/AC gets on depending on the command given in the ladder programming.

- Below 15 degree= fan on low speed
- Below 25 degree= fan on medium speed
- Below 35 degree= fan on high speed
- Above 35 degree= AC ON fans OFF
- Above 45 degree= fan and AC both ON

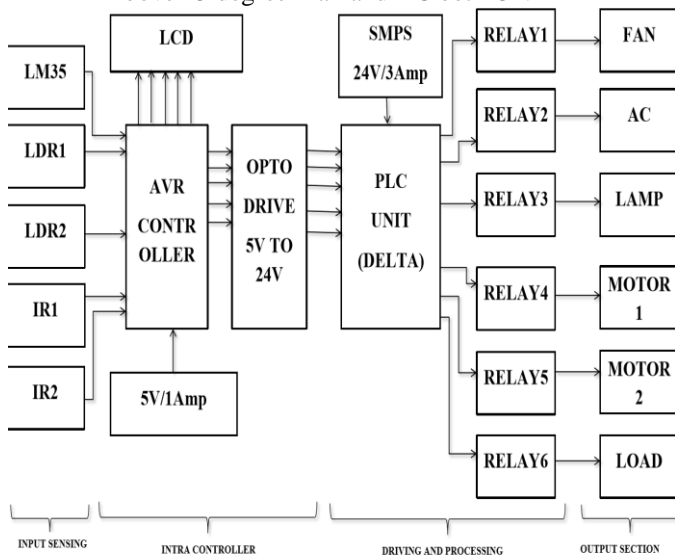


Fig 7: Block Diagram of overall system

### D) Automatic Fire Hydrant System-

For this we use MQ sensor. This sensor has five different series from this we use MQ6. This sensor is mostly useful to sense flammable gases, smoke. It also uses to detect LPG, LNG gases in house or any industry. There is a powder of a chemical material present in the circuit. When the flame of fire or any type of smoke in a specified proportion is detected then this sensor gets into act. The flame gets reacted with powder present in the circuit and decreases the resistance of the powdered material. Then after that the module circuit detect the smoke and depending on the amount of decrease in the resistance the scaling is

done according to that the spray of water (buzzer is provided) is sprinkled on the surface.

### E) Automatic Direct Sunlight Control Using Curtains-

For this application in our office automation system we use LDR sensor. This sensor acts on the intensity of light as the intensity of light varies the value of resistance is going to vary. As the intensity of light goes on increasing the resistance goes on decrease. We set a definite limit of resistance at which the curtain of the window gets off automatically during day time by programming the plc. For this purpose we use a servomotor which rotates 180deg clockwise as well as 180deg anticlockwise. All this done automatically as when the resistance goes down at specified limit in the program the motor gets on and the curtains gets off by moving the motor in clockwise direction. On reverse as the resistance increase the motor rotates anticlockwise and curtain gets on.

## IV.RESULTS

In this PLC based office automation system we are using LED lights, fire hydrant system, curtains, DC motors, indications for fan and light, etc. as outputs. By doing the main light control using IR sensors we can control the lights on/off operations of the system. By the use of this system we can save electricity. In the second section of porch light control by using brightness sensor the lights will on only at the evening and night times. So it is also useful for our office automation system to save electricity. In the third section by doing fan and ac speed control we can save electricity required for AC. In the fourth section of operation of fire hydrant system we can save our office from fire by giving alarm.

## V.CONCLUSION

The main aim of this system is to integrate technology and to automate the overall office for saving the time and electricity and also to reduce the humans work. By this project we are trying to provide more comfort to the offices where work load is more. By providing the automation which helps to reduce the work of peons and also helps to provide comfort to the employees and customers in the offices like banks, finance companies, software companies, other offices etc.

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