

Centralized Controlling System for College Automation

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Abstract:- Automation systems these days have many advantages over manual systems which includes decrease in human effort and increase in reliability. This project aims at Complete Automation of an establishment. The systems incorporated are controlled automatically by Programmable Logic Controller (PLC) and visualized by Supervisory Control and Data Acquisition (SCADA). As each appliance is interfaced with PLC, the project proves to be accurate, reliable and more efficient than the existing controllers.

Keywords: - PLC, SCADA, Automation and PIR sensor

I. INTRODUCTION

Automation and control system engineering has come a long way. The main method in the past for automation was based on manual control and manual switching. Nowadays controlling of any system is done through electricity and the main electrical component is relay. With the invention of Programmable Logic Controller (PLC), the automation systems have changed. These days, almost all the Industries and manufacturing plants use PLC for their ruggedness and inhibition to dust and humid environment. PLC also has many advantages over standard microcontrollers like having a simple programming language like Ladder Language Programming, easier maintenance as compared to Microcontroller, rugged and immune to humidity and dust and having a longer lifetime than microcontroller.

A green establishment (building) refers that it has incorporated ways to save electricity and energy. It uses smart monitoring and automation systems that help save energy. Our project deals with a Green College or University. We have incorporated many systems like Smart class, intelligent water pumping and water cooling system, Digital Notice Board and smart doors. We are using PLC because of the above mentioned advantages. As this project solely focuses on college automation, long life with less investment is a plus point.

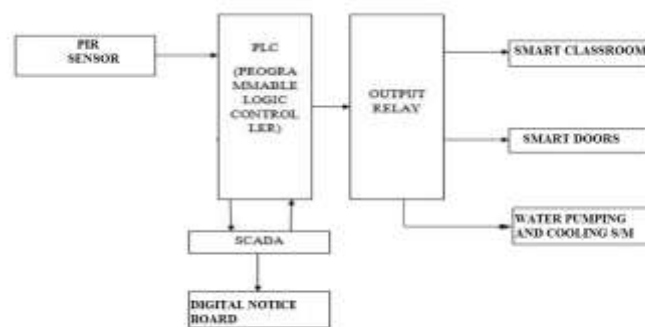


Fig.1 Block Diagram of Proposed System

II. RELATED WORK

The design criteria for the first programmable controller were specified by the Hydromantic Division of General Motors Corporation in 1968. The initial PLCs only had the feature for controlling relay functionality and were programmed in RLL (Relay Ladder Logic). PLCs offered the automobile industry quick change for year to year models changes. In addition, PLCs were modular and easily understood by plant floor personnel [1].

Automation systems have been manufactured in areas such as industry automation, home automation etc. but these systems do not take into consideration the environmental field of knowledge. The home automation which are largely based on microcontroller like the Samsung Smart Home, are not feasible as they

cost more and their average life is 10 years. Whereas, when we use a PLC, the initial investment will be higher than the microcontroller based system, but the average life will be 20 to 25 years with least maintenance. In this project we have taken into account the green aspect of engineering which incorporates energy saving and material saving. In our smart classroom system, the lights and fans will switch off as soon as the students leave the class and the class is empty. In our intelligent water pumping and cooling system, water will be pumped to the overhead tank if it is below a fixed level and when it reaches a high level, the motor will automatically switch off. These are few examples that show that in this project we have inculcated the energy saving factors.

III. PROPOSED WORK

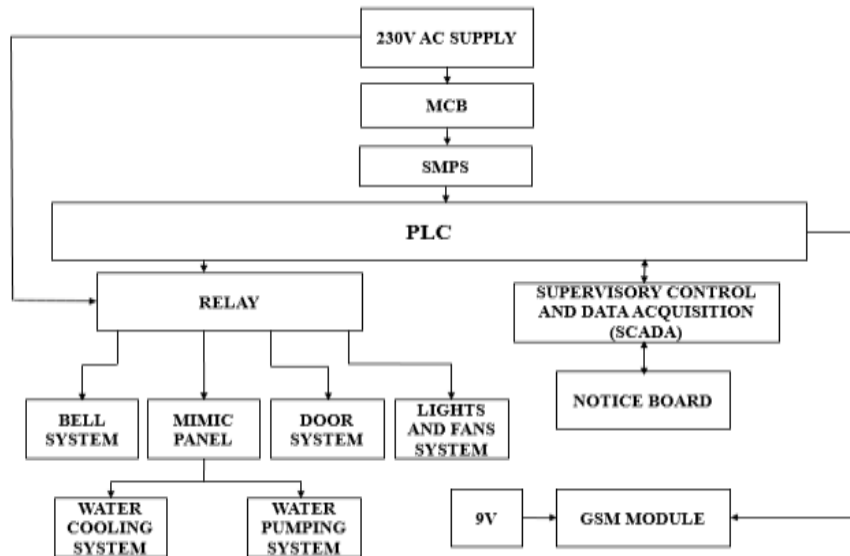


Fig 2. Block Diagram of the Proposed System

The above is the block diagram of our proposed system. The PLC will used will be Allen Bradley. It will be controlling Bell system, smart classroom, smart door system and intelligent water pumping and cooling system through a relay card. It will also control the Digital Notice Board through SCADA. We are using a GSM Module so that the important notices displayed will be sent to the HOD's of various departments. The interfacing of the different modules with PLC is done with a communication medium i.e. either Ethernet cable or RS232 cable. The systems are controlled via a Relay Card.

IV. WORKING

A. Bell System

The Bell in a college is integrated into our project by controlling it. The bell timing for different year students would be different so that the college environment becomes free from congestion.

B. Smart Classroom

The recent problem that needs to be attended to is the problem of electricity and power consumption. As can be seen that whenever a person leaves a room or a class, he/she does not switch off the fans and lights. This problem is solved by our project by integrating the lights and fans and controlling it via PLC and PIR Sensor. When a person leaves the room, the PIR Sensor will detect motion and send the output to PLC which will switch off the lights and fans. The supervisor in the control room can also switch off the lights and fans via the SCADA.

C. Smart Doors

The main gate of the college will also be controlled in our project. In this system, at a particular time the main gate of the college will close and if a student comes after that, the PIR Sensor will detect movement and send this output to PLC. The PLC will then open the door with the help of motors and gears.

D. Intelligent Water Pumping and Cooling System

In this system the water pump in an establishment is controlled by PLC. When the water level in the overhead tank goes below a particular level, the motor will switch on and water will be pumped into the tank. When the overhead tank is full i.e. the water in the tank goes above a particular level, the motor will be turned off. The water from the overhead tank will flow in the coolers via a valve. This valve will open when the coolers tap is pressed and will close itself when the tap is released.

E. Digital Notice Board

The notice board in a college will be made digital. The notices will be entered in the SCADA Screen and they will be displayed on the Notice Board. In addition with this, each and every notice will be messaged to the Head of Department of every branch so that they are informed.

V. PROGRAMMING AND SCADA SAMPLES

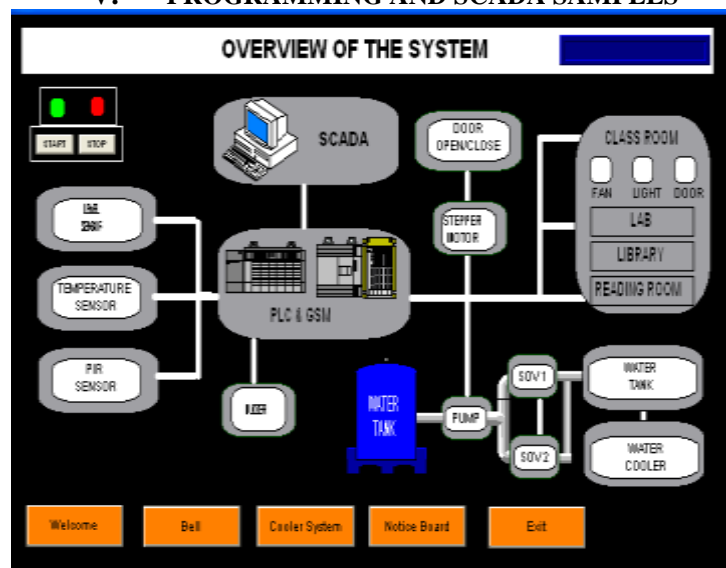


Fig 3. Overview of the System



Fig. 4 Intelligent Water Pumping and cooling System



Fig 5. Bell System

VI. CONCLUSION

Energy saving and environment protection is the main requirement in today's world. In this research work, we attempted to develop a system that saves energy and power, reduces human effort and increases efficiency with the help of PLC and SCADA. The proposed work shows that if this system is installed in an establishment, the costs relating to energy will significantly be reduced. This project can be extended for use in various establishments like Government Buildings, Homes, Hospitals and Industries.

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