Indian Journal of Emerging Electronics in Computer Communications
Vol.2, Issue 1, 2015, Page.326-332, ISSN: 2393-8366

Building Management System using PLC

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Abstract **:** With Indian Industries suddenly being exposed to Globalization and being made to complete against their Global Counterparts. It has become Ultimate for every industries to follow WTO norms in their Industries. In which Safety and security of Plant Personals and Plant plays a colossal part. This Project PLC Based BMS is concerned with the Implementation of Safety features in industries with the Powerful combination of Programmable logic Controller aided with SCADA end monitoring and control. This Project is achieved by erecting specific purpose sensors in the Industrial field and monitoring their changes using PLC and SCADA Interface Mounted in the control room. Based on the communication between field sensors and Programmed PLC module certain alarm signals can be raised and safety and security of the Industry can be maintained. Since one end being a visual Monitoring and Control (SCADA) it becomes uncomplicated for one to understand what's phenomenon is taking place in the operating medium without any upheaval. The ultimate goal of safe running of the plant without any interrupts because of safety let-out is achieved with the help of this Project in a cost-effective way best suited for growing economy like India.
Keywords**:** - PLC, SCADA,BMS

I.INTRODUCTION

An industry/building management is a multi-core venture, involving enormous amount of material resources and labor, for its operations. Any profit-driven industry should have safety and maintenance as one of its major agenda in fulfilling the dual aims of high productivity and employee satisfaction. Thus, security of a plant plays a key role in averting disasters, which can cause large-scale monetary and human losses Safety in industries began long before recorded time. The use of dedicated software for safety and control applications began with the technological advancement in the field of PLC. With the advent of newer technologies, situations have turned around a lot and the need to view the live process in a system, within a control room has become essential. With the development of SCADA (Supervisory Control And Data Acquisition), the task of monitoring and controlling the entire process and confining it to a restricted control room has become possible. SCADA is a software package, which incorporates various facilities such as alarm popup, history files, graphical representations, animations etc. The general parameters being monitored are Internal light control, External light Control, Water level control, Fire detection.

A. WATER LEVEL CONTROL

The water level in a tank is monitored using leads. So when the water reaches low level, a control signal is sent to activate the motor and as soon as water reaches the high level another control signal is being sent to stop the motor.

B. EXTERNAL LIGHT CONTROL

The external lights of the building are automatically switched on/off according to the intensity of the light. LDR is used to sense the intensity of external light. If the light intensity is less than all the lights are switched on automatically.

C.FIRE DETECTION

When fire breaks out, there is an increase in temperature and this is sensed by a thermistor. The change in temperature causes a change in resistance of thermistor. A control circuit is constructed using comparator and relay. The conditioned signal is sent to the PLC. An alarm is used to notify the persons in the surrounding area about the fire.

D. INTERNAL LIGHT CONTROL

When the person is entering in to the building the IR sensor senses the person and according to the person entering in to the building each load is automatically switched on. For ten persons the load 1 is turned on and greater than 10 person the second load will turn on likewise greater than 20 person load 3 is switched on automatically. If no one is entering means loads will not switched on.

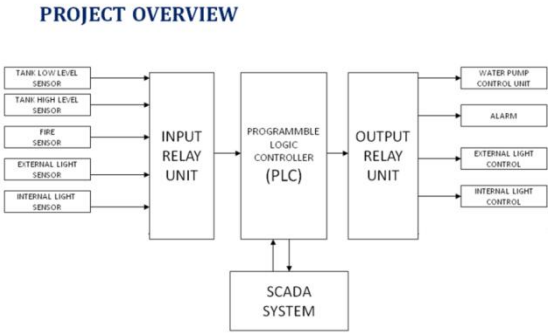

Fig.1 Overview of Project

II. PROGRAMMABLE LOGIC CONTROLLER

A Programmable Logic Controller is a specialized computer used to control machines and processes. It uses a programmable memory to store instructions and execute specific functions that include on/off control, timing, counting, sequencing, arithmetic, and data handling. Basically, the PLC is an assembly of solid-state digital logic elements designed to make logical decisions and provides outputs. Initially the PLC was used to replace relay logic, but its ever-increasing range of functions means that it is found in many and more complex applications .Programmable controllers offer several advantages over a conventional relay type of control. Relays have to be hardwired to perform a specific function. The programmable controller has eliminated much of the hardwiring associated with conventional relay control circuits

A. ARCHITECTURE

The Components of PLC are The Central Processing Unit, Input/output (I/O) section, Power Supply. The Programming Device. An open architecture of PLC design allows the system to be connected easily to devices and programs made by other manufacturers. The PLC activates its output terminals in order to switch things on or off. The decision to activate an output is based on the status of the system's feed-back sensors and these are connected to the input terminals of the PLC. The decisions are based on logic programs stored in the RAM and/or ROM memory. They have a central processing unit (CPU), data bus and address bus. A typical unitary PLC is shown in fig.2.

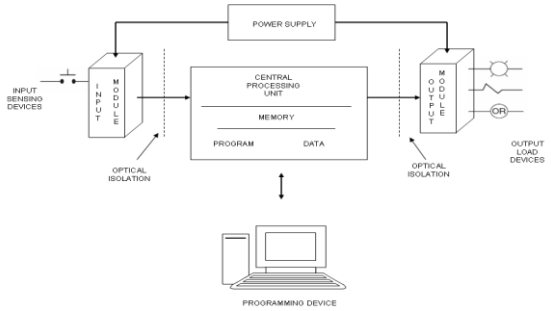

Fig.2 Architecture of PLC

III.COMMUNICATION ADVANTAGE

Enhanced RS-232 port (includes 24V dc power for network interface devices). 300; 600; 1200 ; 4800; 9600; 19,200 and 38,400 baud rates. RTS/CTS hardware handshake signal Connection to DH-485, Device Net and Ethernet networks through the 1761-NET-AIC, 1761-NET-DNI, 1761-NET-ENI and1761-NET-ENIWinterface modules. Connection to modems for remote communications

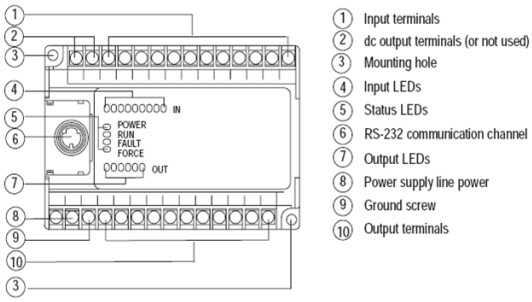

Fig.3Omron CP1E

IV.SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

Computer-based supervisory control and data acquisition (SCADA) systems have evolved over the past 40 years, from standalone, compartmentalized operations into networked architectures that communicate across large distances. In addition, their implementations have migrated from custom hardware and software to standard hardware and software platforms. These changes have led to reduced development, operational, and maintenance costs as well as providing executive management with real-time information that can be used to support planning, supervision and decision making. SCADA provides management with real-time data on production operations, implements more efficient control paradigms, improves plant and personnel safety, and reduces costs of operation. These benefits are made possible by the use of standard hardware and software in SCADA systems combined with improved communication protocols and increased connectivity to outside networks, including the Internet. Listed here are typical definitions of a SCADA system and the source of each definition:

SCADA is the technology that enables a user to collect data from one or more distant facilities and/or send limited control instructions to those facilities. SCADA: Supervisory Control and Data Acquisition by Stuart A. Boyer, published by ISA The Instrumentation, Systems, and Automation Society; 3rd edition. A system operating with coded signals over communication channels so as to provide control of RTU (Remote Terminal Unit) equipment. IEEE Standard C37.1-1994, Definition, Specification, and Analysis of Systems Used for Supervisory Control, Data Acquisition, and Automatic Control. Specific terminology is associated with the components of SCADA systems. These SCADA elements are defined as follows.

A. OPERATOR

Human operator who monitors the SCADA system and performs supervisory control functions for the remote plant operations.

B. HUMAN MACHINE INTERFACE

Presents data to the operator and provides for control inputs in a variety of formats, including graphics, schematics, windows, pull-down menus, touch-screens, and so on.

C. MASTER TERMINAL UNIT (MTU)

Equivalent to a master unit in a master/ slave architecture. The MTU presents data to the operator through the HMI, gathers data from the distant site, and transmits control signals to the remote site. The transmission rate of data between the MTU and the remote site is relatively low and the control method is usually open loop because of possible time delays or data flow interruptions.

D. REMOTE TERMINAL UNIT (RTU)

Functions as a slave in the master/slave architecture. Sends control signals to the device under control, acquires data from these devices, and transmits the data to the MTU. An RTU may be a PLC. The data rate between the RTU and controlled device is relatively high and the control method is usually closed loop

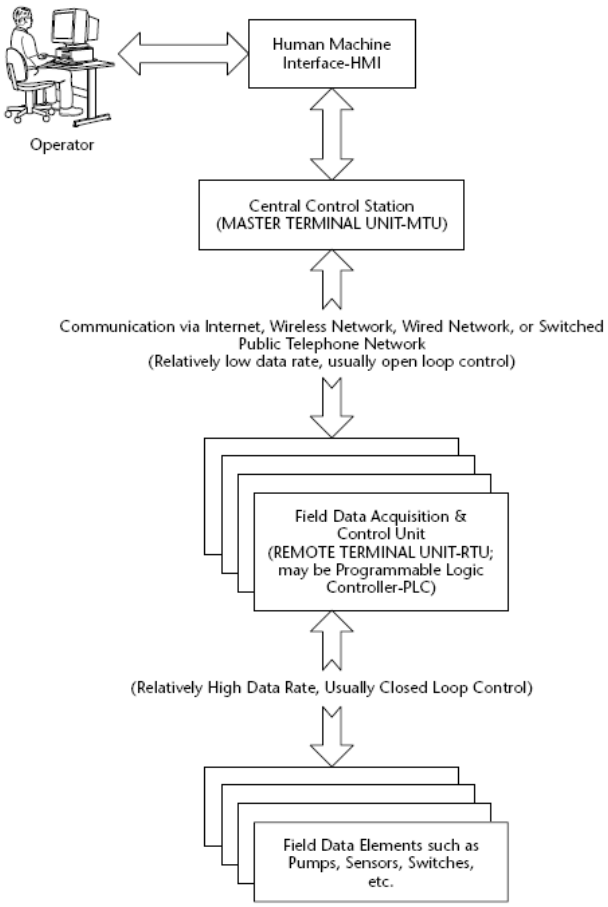

Fig.4 Typical SCADA System Architecture

V. MODBUS PROTOCOL

In the late 1970s, Modicon, Incorporated, developed the MODBUS protocol. MODBUS is positioned in layer 7 (the application layer of the OSI model) and supports client-server communications among Modicon PLCs and other networked devices. The MODBUS protocol defines the methods for a PLC to obtain access to another PLC, for a PLC to respond to other devices, and means for detecting and reporting errors. The protocol supports other protocols such as asynchronous master-slave transmission, Modicon MODBUS Plus, and Ethernet. In order to take advantage of the supporting tools, hardware, and software that are used for the Internet, MODBUS/TCP was also developed. It is based on the OSI model, although not all layers are used. A typical MODBUS transaction comprises the following steps. The MODBUS Application protocol sets the format of a client-initiated request. A function code in a MODBUS data unit, as the message packet is called, directs the server to execute a specific action. A data field in the message provides additional information used by the server to perform the requested action. If there are no errors in the exchange, the server completes the requested action, typically sending data back to the client. If an error occurs, the server reads an exception code in the data unit to determine the next action to be performed.

VI. SCADA SOFTWARE

Wonderware provides a flexible, maintainable and secure software platform for SCADA environments. These solutions are built on and integrated with a single, open and scalable software architecture that can connect to virtually any automation system, remote terminal unit (RTU), intelligent electronic device (IED), programmable logic controller (PLC), database, historian or business system in use today. The open nature of this platform enables users to expand their existing systems without having to buy new hardware or control systems.Wonderware solutions enable distributed peer-to-peer communications. In addition, existing assets can be modeled within the software. This saves a tremendous amount of time when adding new wells, substations, devices or other monitoring stations – because the engineer can reuse the template that contains all of the information necessary for control, such as scripts, alarms and communication methods. That also greatly improves the reliability of the system because the software's existing templates are field-proven.

Fig.5 SCADA Wizards

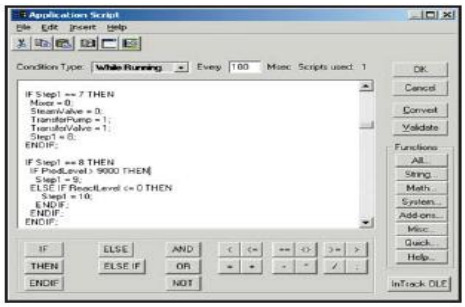

Fig.6 Script

VII. SCADA HARDWARE

A SCADA system consists of a number of remote terminal units (RTUs) collecting field data and sending that data back to a master station, via a communication system. The master station displays the acquired data and allows the operator to perform remote control tasks. The accurate and timely data allows for optimization of the plant operation and process. Other benefits include more efficient, reliable and most importantly, safer operations. This result in a lower cost of operation compared to earlier non-automated systems.

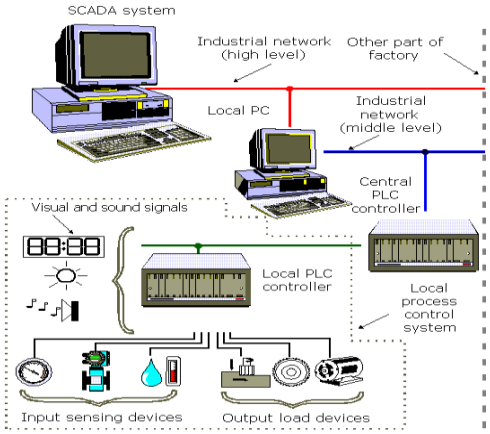

Fig.7 SCADA system

IX. SCADA DESIGN

The below dialog box is a SCADA screen. We are going to design our project here. symbol factory is an icon having all the graphical structure using this we can design our desired project. And then SCADA is connected to the PLC .PLC is a controller controlling the field inputs or parameters and changes in the field input is monitored by SCADA

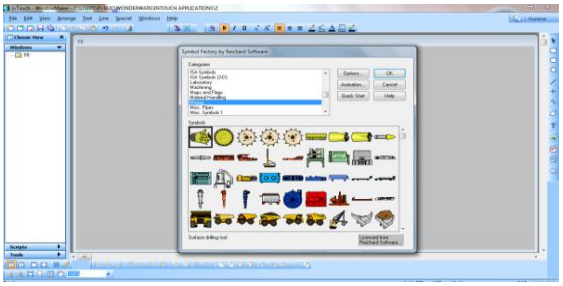

Fig.8 Symbol Factory

X. CONCLUSION

This project solves security and maintenance problems in industries/building such as fire accidents, water level indicator, and temperature control.Thusit is clear that the Programmable Logic Controller System interfaced with SCADA is superior to the present system of implementations. Multimedia features have enhanced safe operation of industries. The industrial setup, which we have considered for demonstration of the project capability is a prototype and hence resembles the real conditions to the closest.The project is not only applicable to one processing zone, but can be extended to fit any need.

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