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PLC BASED SWITCHING CONTROL FOR INDUSTRIAL AUTOMATION FOR REPETITIVE NATURE OF WORK

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ABSTRACT
The analysis carried out in this project highlights the concepts, working, advantages and practical applications of programmable logic controllers, along with a comparison with other control systems for industrial automation in repetitive nature of work. This operation is generally used for repetitive nature of work. The main objective of the project is to design a programmable sequential switching of any load using embedded system based PLC concept. The development of this application requires the configuration of PLC architecture - that is, the selection of the machines, and writing debugging of the application program. In this project, the clock plays an important role, wherein it is used in these modes: the set mode, auto mode and manual mode for controlling different industrial loads (bulbs, fans, motors etc.).
KEYWORDS: PLC- ProgrammableLogic Control

INTRODUCTION
Automatic Switching has been a very rapidly growing area of electronics with good potential for further developments. The most attractive applications of this technology are in medium and large scale industries. Every individual that is paying money to have a better standby supply has a right to have maximum satisfaction for its industrial needs. In this project we are operating loads on three different modes by using PLC: set mode, auto mode and manual mode. In the set mode - through the inbuilt digital clock - the machinery runs based on the 'On' or 'Off' and on time, whereas in an auto mode, it runs through default settings; and, finally in the manual mode, the real-time systems used extensively in the industrial control applications can run depending on the user's need and flexibility. By adopting this project accuracy can be increased as the tasks performed by the PLCs will be more when compare to the microcontroller methods.

LITRATURE SURVEY
A PLCs is specifically made to fit in industrial environment, where it is exposed to hostile condition such as heat, dust, humidity, unreliable power, mechanical shocks and vibration. PLCs have both hardware and software features that make them attractive as controllers of wide range of industrial equipment's. A PLC can work in the harsh and extreme conditions of the industry where other systems such as a Micro-Controller cannot. Programming is a lot easier as compared to other embedded system which makes the job easy for the technicians. PLC's allow end user to configure and control the application which is more useful in industries. We are living in the Developing country like India where frequent power failure is a major problem facing all over the country. The major issue is how to maintain the availability of electricity under the situation of these sudden power shutdowns, fluctuations and power failure to protect the devices in industries. This research idea is related to the effort to overcome this problem. We are presenting the design of "Automatic Transfer Switch" for a industrial load with the help of PLC, instead of conventional relays and various parameters of generator as well as MAIN timers, along with the designed SCADA systems to monitor the power line incorporated with the GSM alerts. This will enable automatic switching of load as per the main power status and it has usage in industrial load.[1]

. An automated machine is increased in this globalised world. This project outlines the timer controller for multiple machines. Over the years, the demand increases for high quality, greater efficiency and automatic machines. In this project, the main application is control of Oven operation and movement of conveyer using PLC. The initial phase of the project focuses on passing the inputs to the oven at a required temperature, so as to constantly maintain a particular temperature in the ovens. The project mainly focuses on level, pressure and flow control at the various stages of the project plant. Thus the temperature in the ovens is constantly monitored and

brought to a constant temperature as required by the project plant. The automation is further enhanced by constant monitoring using SCADA screen which is connected to the PLC by means of communication cable. By means of tag values set to various variable in SCADA the entire process is controlled as required. This project has proved to be very efficient practically as the need for automation grows day by day. SCADA (Supervisory Control and Data Acquisition) system monitors the plant and helps reduce the errors caused by humans. While the SCADA is used to monitor the system, PLC (Programmable Logic Controller) is also used for the internal storage of instruction for implementing function such as logic, sequencing, timing, counting and arithmetic to control through digital or analog input/output modules and various types of machines processes. Systems are used to monitor and control a plant or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining and transportation.[2]

The supply of electricity for industrial, commercial and domestic use is highly unstable. This gives rise to the frequent use of alternative sources of power supply to meet up with the energy demands. The introduction of these alternative sources of supply brings forth the challenge of switching smoothly and timely between the mains supply and the alternative sources whenever there is a failure on the mains source. This paper presents design and implementation of automatic switching circuits which is used in PLC automation for constructing a workable automatic change-over switch with load starting/shut down functions. This switch turns ON the load automatically in cases of mains power failure and connects the load to the load output, alternatively it switches OFF the load automatically once power is restored and returns the load to the mains power with the help of desired range of parameters which may be set by programmer.[3]

BLOCK DIAGRAM

This is the block diagram of PLC based switching control for industrial automation in repetitive nature of work. The block diagram of PLC based switching control for industrial automation for repetitive nature of work is as below. There are three modes of operation set mode, Auto mode and Manual mode. When switch one is pressed set mode is operated and according to predefined time in the PLC program relay turn ON sequentially. When switch two is pressed Auto mode is operated and according to default time saved in the PLC relay will operated. When switch three is pressed Manual mode is operated and relay will operate according to user's choice. PLC plays an very important role in this project because all programming is placed in PLC. According to switch pressed the program will execute and send to relay circuit board, here relay is act as switch for the respective load connected to that relay. Here we are using four relay circuit as we switching four loads.

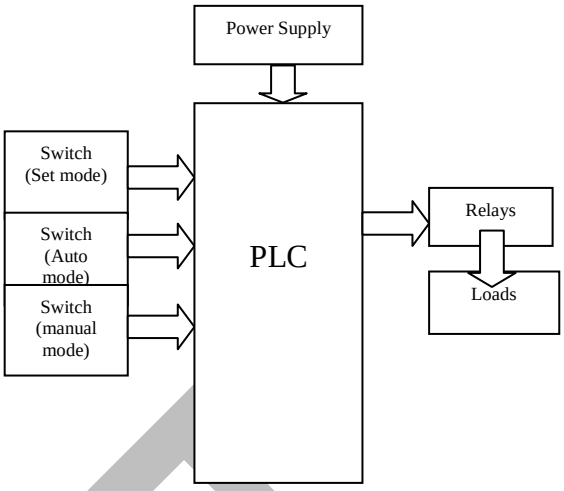

Fig.1 Block diagram of PLC based switching control for industrial automation for repetitive nature of work.

A. PLC

PLC is the component of PLC based switching control for industrial automation for repetitive nature of work. In this project we used SELEC PLC having 6 inputs and 4 relay outputs. The Name of PLC is SELEC MM1012. The PLC require 230V supply. A PLC is a microprocessor-based control system, designed for automation processes in industrial environments. It uses a programmable memory for the internal storage of user-orientated instructions for implementing specific functions such as arithmetic, counting, logic, sequencing, and timing. A PLC can be programmed to sense, activate, and control industrial equipment and, therefore, incorporates a number of I/O points, which allow electrical signals to be interfaced. Input devices and output devices of the process are connected to the PLC and the control program is entered into the PLC memory. SELEC MM1012 has a user memory of 232kb. PLC's programming is based on the logic demands of input devices and the programs implemented are predominantly logical rather than numerical computational algorithms. Thus, PLCs offer a flexible programmable alternative to electrical circuit relay-based control systems built using analog devices. The programming method used is the ladder diagram method. The PLC system provides a design environment in the form of software tools running on a host computer terminal which allows ladder diagrams to be developed, verified, tested, and diagnosed. First, the high-level program is written in ladder diagrams. Then, the ladder diagram is converted into binary instruction codes so that they can be stored in random-access memory (RAM) or erasable programmable read-only memory (EPROM). Each successive instruction is decoded and executed by the CPU. The function of the CPU is to control the operation of memory and I/O devices and to process data according to the program. Each input and output connection point on a PLC has an address used to identify the I/O bit.

B. RELAY

A relay is an electrical switch that uses an electromagnet to move the switch from the off to on position instead of a person moving the switch. It takes a relatively small amount of power to turn on a relay but the relay can control something that draws much more power. A relay is used to control the air conditioner in your home.

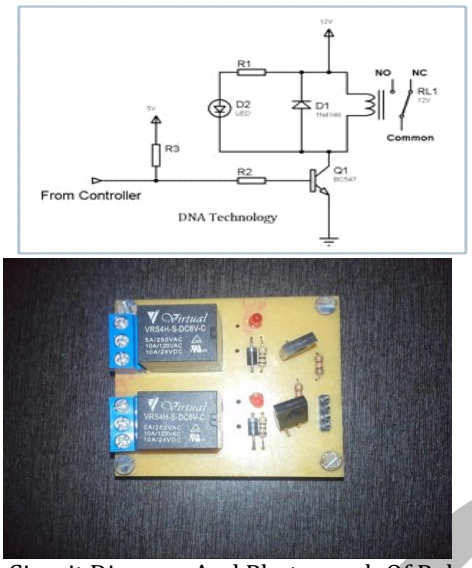

Fig.2 Circuit Diagram And Photograph Of Relay.

C. SINGLE PHASE TRANSFORMER (230V/12V)

It is used to step down single phase transformer as rating of 230V/12V.

Fig.3 Single phase transformer (230/12V AC)

D. POWER SUPPLY

A 230V single phase power supply is required to supply the single phase transformer.

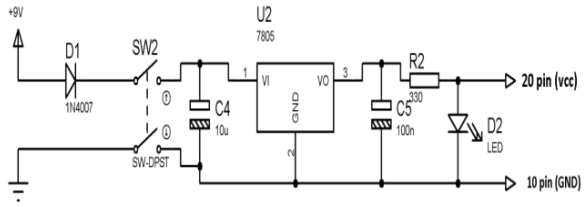

Fig.4 Circuit Diagram of Power Supply circuit description

The circuit diagram of PLC based switching control for industrial automation for repetitive nature of work. The main parts of circuit diagram are relay and PLC. We use four relays each for different loads. The loads is directly connected to the relay circuit. The relay is operated to PLC outputs. The 230V AC supply is converted to 12V DC supply for the PLC by the converter. The input for PLC is by the switches. When switch one is pressed set mode is operated and according to predefined time in the PLC program relay turn ON sequentially. When switch two is pressed Auto mode is operated and according to default time saved in the PLC relay will operated. When switch three is pressed Manual mode is operated and relay will operate according to users choice.

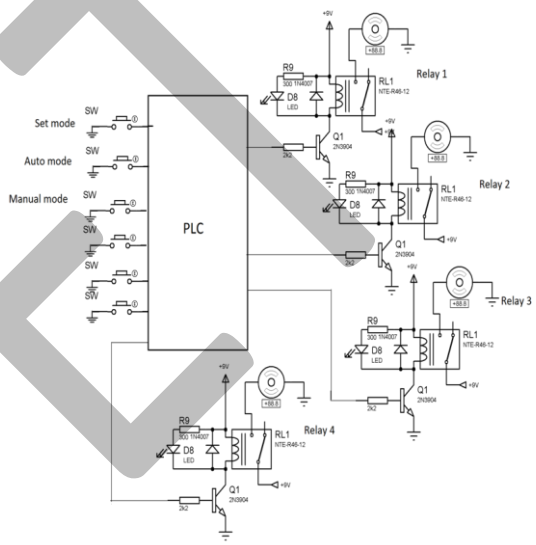

Fig.5 Circuit Diagram of proposed system.

FLOW CHART

The flow chart of PLC based switching control for industrial automation for repetitive nature of work is as below. There are three modes of operation set mode, Auto mode and Manual mode. When switch one is pressed set mode is operated and according to predefined time in the PLC program relay turn ON sequentially. When switch two is pressed Auto mode is operated and according to default time saved in the PLC relay will operated. When switch three is pressed Manual mode is operated and relay will operate according to user's choice.

The execution of flow chart is as below, If we give the supply to PLC the operation is get started then the PLC read status from the switch which we are pressed. There are four switches for four different loads. Switch one is for the set mode, switch two is for the Auto mode and switch three is for the Manual mode. If we pressed the switch one the Set mode come in working as we set before. The PLC will gives the trigger signal to the relay board and relay are on accordingly for time which is set in PLC programming. After turning on all relay sequentially the program again jump to PLC read status mode. If we don't press switch one then PLC not send trigger signal to relay and relay will remains off condition. If we pressed switch two then Auto mode is come in operation and PLC send triggering signal

to relay for default time set by the user during pressing of switch two, and are operating sequentially for particular time. After turning on all relay sequentially the program again jump to PLC read status mode. If we don't press switch two then PLC don't send any triggering signal to the relay board and relay remains in off conditions.

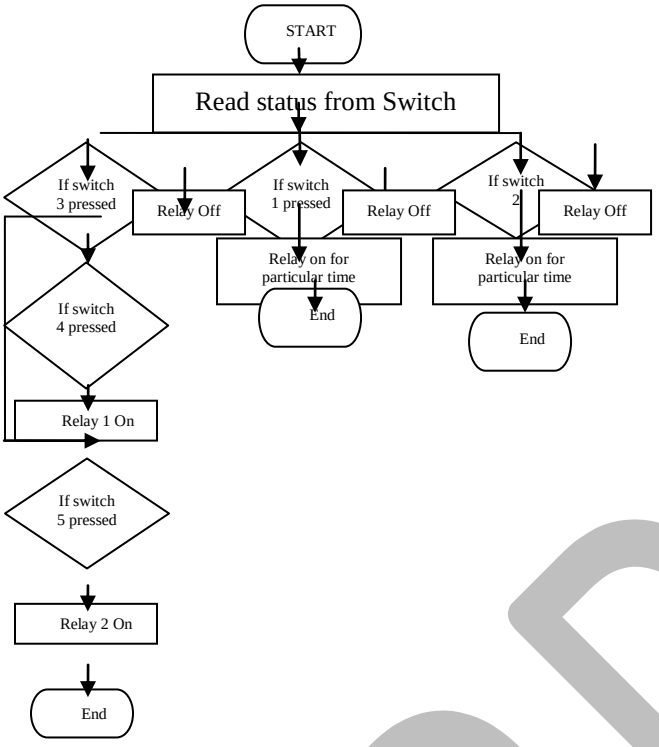

Fig. flow chart of the proposed system

If we pressed switch three then Manual mode come in operation, In this mode again there are four switches for four different loads. In this mode we manually operate the switches to turn on the loads. If switch four is pressed then relay one will triggered and first load is on for user choice time. If switch five is pressed then relay two is get triggered and second load is on for users choice time. This procedure is followed in Manual mode for turn on the different loads. If we don't press any switch then PLC don't send trigger signal to any relay and relay will remains in off condition. This is how execution of flow charts.

CONCLUSION:

In this paper we have presented a design of a system based on PLC that is used to monitor and control the switching industrial loads in three modes.

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