

Industrial Drives Automation by using PLC

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ABSTRACT

Automation is basically the delegation of human control function to technical equipment for increasing productivity increasing quality reducing cost and increasing safety in working conditions. The industrial automation is very necessary for the manufacturing industry to survive in today's globally competitive market. A programmable logic controller (PLC) is a digital computer used for automation of electromechanical processes, which is a type of computer family and they have commercial and industrial applications. The development of programmable logic controller (PLC) makes it possible to do the required changes to the program without changing the electrical circuit connections. In this project will be designing the conveyor belt system for carrying and packing the goods using PLC. The compact PLC Genie-NX will be used in this work.

Keywords : Programmable Logic Controller, Genie-NX, Normally Open Coil

I. INTRODUCTION

Automation is the use of control systems and information technologies to reduce the need for human work in the production of goods and services. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the muscular requirements of work, automation greatly decreases the need for human sensory and mental requirements as well. Automation plays an increasingly important role in the world economy and in daily experience. Once-ubiquitous telephone operators have been replaced largely by automated telephone switchboards and answering machines. Medical processes such as primary screening in electrocardiography or radiography and laboratory analysis of human genes, sera, cells, and tissues are carried out at much greater speed and accuracy by automated systems. Automated teller machines have reduced the need for bank visits to obtain cash and carry out transactions. In general, automation has been responsible for the shift in the

world economy from industrial jobs to service jobs in the 20th and 21st.

Definition: "Automation is a set of technologies that results in operation of machines and systems without significant human intervention and achieves performance superior to manual operation." Industrial Automation also involves significant amount of hardware technologies, related to Instrumentation and Sensing, Actuation and Drives, Electronics for Signal Conditioning, Communication and Display, Embedded as well as Stand-alone Computing Systems etc.

Automation plays a very important role in manufacturing industry especially where repeatability is of great concern. The automated machines works in hazardous environment that is, in extreme temperature which is beyond the human conveniences centuries.

History:- The PLC was invented in response to need of the American automotive industry in 1968 GM hydrometric (the automatic transmission division of general motors) Issued a request for proposal for an electronic replacement for hard wired relay system.

The first PLC designated the 084 because it was Bedford associates 84th project was the result. Dickey Morley who is considered to “Father” of PLC.

Programmable Logic Controllers:- A programmable logic controller (PLC) or programmable controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or lighting fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. Programs to control machine operation are typically stored in battery-backed or non-volatile memory. A PLC is an example of a real time system since output results must be produced in response to input conditions within a bounded time, otherwise unintended operation will result.

A PLC is subject to many a conventions varying with the kind of manufacturer. The notations or what is called the ‘syntax’ in the programming language is specific to the manufacturer too.

Components of PLC:-

The function of an input module is to convert incoming signals into signals, which can be processed by the PLC, and to pass these to the central control unit. The reverse task is performed by an output module. This converts the PLC signal into signals suitable for the actuators. The actual processing of the signals is effected in the central control unit in accordance with the program stored in the memory. The program of a PLC can be created in various ways: via assembler type commands in ‘statement list’, in higher-level, problem-oriented languages such as structured text or in the form of a flow chart such as represented by a sequential function chart. In Europe, the use of function block diagrams based on function charts with graphic symbols for logic gates is widely used. In America,

the ‘ladder diagram’ is the preferred language by users. Depending on how the central control unit is connected to the input and output modules, differentiation can be made between compact PLCs (input module, central control unit and output module in one housing) or modular PLCs.

Input Relays (contacts) - These are connected to the outside world. They physically exist and receive signals from switches, sensors, etc. Typically they are not relays but rather they are transistors.

Internal Utility Relays - These do not receive signals from the outside world nor do they physically exist. They are simulated relays and are what enables a PLC to eliminate external relays. There are also some special relays that are dedicated to performing only one task. Some are always on while some are always off. Some are on only once during power-on and are typically used for initializing data that was stored.□

Counters - These are simulated counters and they can be programmed to count pulses. Typically these counters can count up, down or both up and down. Since they are simulated they are limited in their counting speed. Some manufacturers also include high-speed counters that are hardware based. We can think of these as physically existing.

Timers - These come in many varieties and increments. The most common type is an on-delay type. Others include off-delay and both retentive and non-retentive types. Increments vary from 1 millisecond through 1 second.

Output Relays (coils) - These are connected to the outside world. They physically exist and send on/off signals to solenoids, lights, etc. They can be transistors, relays, or triacs depending upon the model chosen.

Data Storage - Typically there are registers assigned to simply store data. They are usually used as temporary storage for math or data manipulation. They can also typically be used to store data when power is removed from the PLC. Upon power-up they will still have the same contents as before power was removed.

Ladder Logic:-

Ladder logic is one form of drawing electrical logic schematics, and is a graphical language very popular for programming Programmable Logic Controllers. Ladder logic was originally invented to describe logic made from relays. The name is based on the observation that programs in this language resemble ladders, with two vertical "rails" and a series of horizontal "rungs" between them. Figure 5.0 below is a very basic example of ladder logic used in a programmable logic controls program.

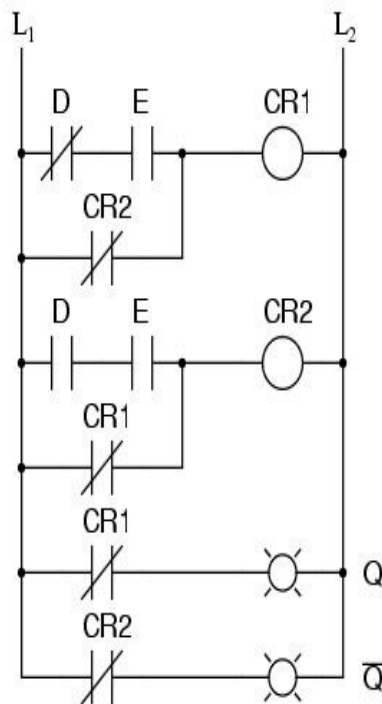


Figure 1

Ladder Logic Programming:-**Basics of Ladder Logic**

Ladder logic or ladder diagrams are the most common programming language used to program a PLC.

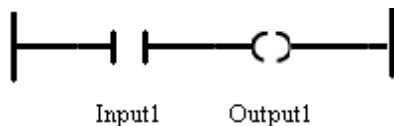


Figure 2

Normally Open Contact

This can be used to represent any input to the control logic such as a switch or sensor, a contact from an

output, or an internal output. When solved the referenced input is examined for a true (logical 1) condition. If it is true, the contact will close and allow logic to flow from left to right. If the status is FALSE (logical 0), the contact is open and logic will not flow from left to right.

Normally Open Coil

This can be used to represent any discrete output from the control logic. When "solved" if the logic to the left of the coil is TRUE, the referenced output is TRUE (logical 1).

Normally Closed Contact

When solved the referenced input is examined for an OFF condition. If the status is OFF (logical 0) power (logic) will flow from left to right. If the status is ON, power will not flow.

Normally Closed Coil

When "solved" if the coil is a logical 0, power will be turned on to the device. If the device is logical 1, power will be OFF.

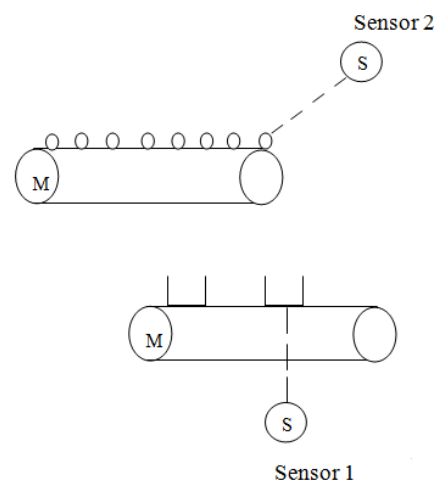
Proposed plane of work:

Figure 3

II. CONCLUSION

This project deals with the implementation of industrial automation. In this project the automatic packing of goods will be done. The system consists of 2 conveyor belts; one belt will be placed with the packing boxes and other one with the goods to be packed. System has 2 IR sensors, first one will detect the packing boxes and other sensor will count the numbers of goods to be packed into the boxes.

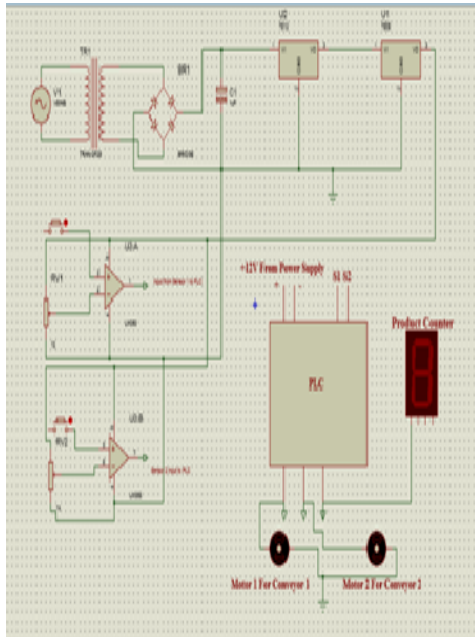


Figure 4. Circuit diag. of Industrial Drives Automation by using PLC

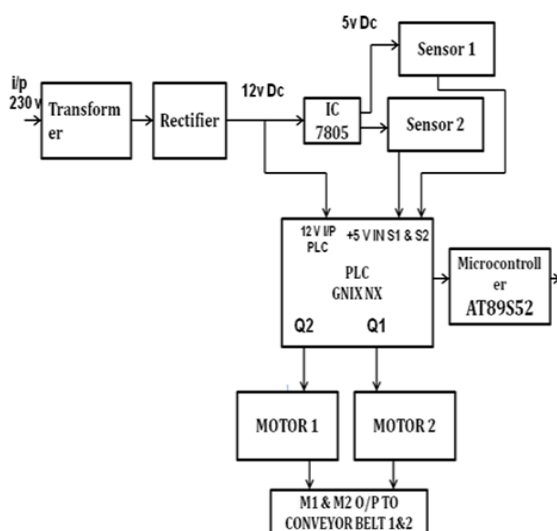


Figure 5. Block diag. of Industrial Drives Automation by using

The soft wiring advantage provided by programmable controllers is Tremendous. In fact, it is one of the most important features of PLCs. Soft wiring makes changes in the control system easy and cheap. If it want a device in a PLC system to behave differently or to control a different process element, all have to do is change the control Program. In a traditional system, making this type of change would involve physically changing the wiring between the devices, a costly and timeconsuming endeavor. In future definitely PLC is dominated on all other controlling methods. Future of PLC in industrial automation has been rising since 1947 and most of the industries including automation are using PLCs and install control systems to reduce the manual labour and improve the precision and efficiency. PLCs are very popular because of their precision.

Advantages and Disadvantages of Automation

- The main advantages of automation are:
- Replacing human operators in tasks that involve hard physical or monotonous work.
- Replacing humans in tasks done in dangerous environments (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc.)
- Performing tasks that are beyond human capabilities of size, weight, speed, endurance, etc.
- Economy improvement: Automation may improve in economy of enterprises, society or most of humanity. For example, when an enterprise invests in automation, technology recovers its investment; or when a state or country increases its income due to automation like Germany or Japan in the 20th Century.
- The main disadvantages of automation are:
- Technology limits. Current technology is unable to automate all the desired tasks.
- Unpredictable development costs. The research and development cost of

- automating a process may exceed the cost saved by the automation itself High initial cost. The automation of a new product or plant requires a huge initial
- investment in comparison with the unit cost of the product, although the cost of
- automation is spread in many product batches.

III. REFERENCES

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