IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁜ Peer-reviewed & Refereed journal ⁜ Vol. 13, Issue 5, May 2024

DOI: 10.17148/IJARCCE.2024.13548

AUTOMATIC OPERATION OF MOTOR BY USING PLC (MICRO LOGIX 820)

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Abstract: The programmable logic controller (PLC) is a microprocessor-based system that accepts input data from switches and sensors. It processes that data by making decisions in accordance with a stored program, and then generates output signals to devices that performs a particular function based on the application. It was developed to automate the motor control process in a way that offered flexibility to make circuit design changes easier. The original purpose of the PLC was to allow electro-mechanical and electronic input devices to communicate with a computer that would perform logical operations on the input data and output a corresponding signal to some form of output device. A PLC is designed to check the input status, execute the program, and update the output status. It also uses a programming language based upon readily identifiable symbols common to motor control.

Keywords: PLC, Vibration Sensor, Motor Protection Circuit breaker, Switch mode Power supply, Reliable operation.

I. INTRODUCTION

Programmable Logic Controllers (PLC) are often defined as miniature industrial computers that contain hardware and software used to perform control functions. More specifically, a PLC would be used for the automation of industrial electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or food processing. They are designed for multiple arrangements of digital and analog inputs and outputs with extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact.

A PLC will consist of two basic sections: the central processing unit (CPU) and the Input/Output (I/O) interface system. The CPU controls all system activity primarily through its processor and memory system. The CPU consists of a microprocessor, memory chip and other integrated circuits to control logic, monitoring and communications. The CPU has different operating modes. In programming mode, the CPU will accept changes to the downloaded logic from a PC.

II. LITERATURE SURVEY

- The advent of the PLC began in the 1970s, and has become the most common choice for manufacturing controls PLCs have been gaining popularity on the factory floor and will probably remain predominant for some time to come.
- Ohio Northern University's mechanical engineering department teaches a required classical control systems course in the winter quarter and offers an elective course in PLCs the following term.
- At Grand Valley State University, the Dynamic Systems Modeling and Control course was revised to eliminate Laplace transforms allowing more instructional focus on mechanical engineering appropriate methods of problem solving.
- An additional internet-based resource that is being developed is a Virtual PLC-"a system that integrates multiple instructional technologies and techniques into a single Web-based learning system that is comprehensive in its treatment of PLC topics, motivational, and always available".
- From the authors' experiences and the examples given by colleagues in teaching ladder logic programming, students struggle with how to structure a ladder diagram.

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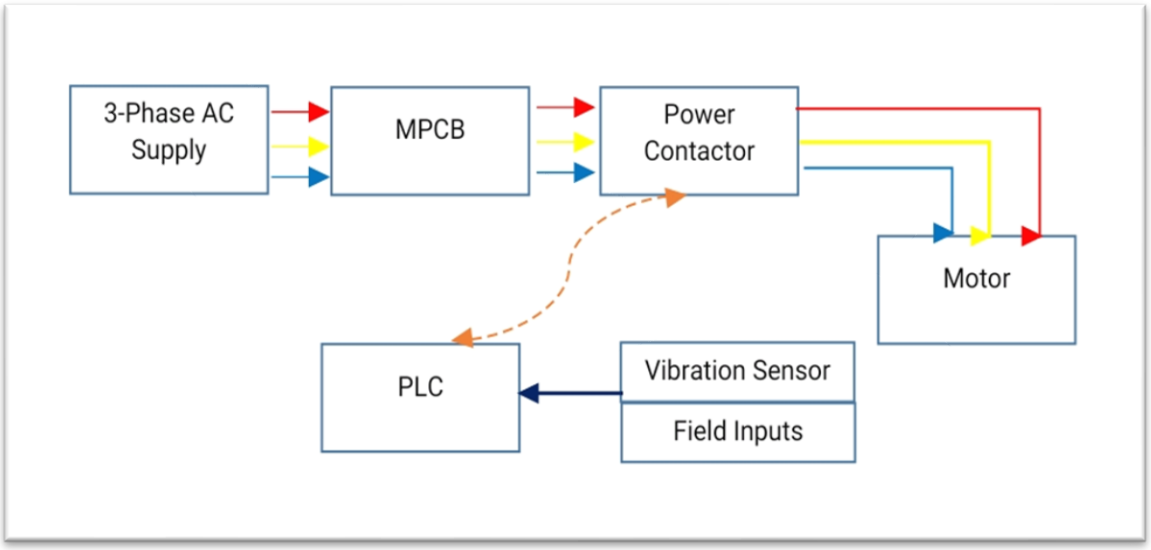
- The team of authors developed ladder logic in MICROLOGIX software and is verified in Allen Bradley PLC. ladder logic program of a typical application often results in complex software that is difficult to manage during configuration, and especially, during maintenance. The difficulty lies in a typical problem with real-time control software that is exacerbated by ladder logic

III. METHODOLOGY



As per shown in the block diagram, the MPCB carried the power which will carries the 3 phase supply, which is connected to power contactor. MPCB act as a overloads relay it provide protection against the overload condition. The temperature sensor for measuring temperature and Vibration of the motor. The output of these sensors are given to PLC. In this method of protection, the online monitoring of induction motor is done and all the necessary electrical parameters –temperature, Motor running status motor running status and Vibration of the motor can be monitored. If the parameters are bounded which mean all the parameters are within their normal operating range, the PLC will continuously be allowing the induction motor to be connected with the three phase supply. However, if there is any disturbance found, PLC will trip the induction motor by giving a tripping- signal to magnetic contactor and relay as per the programmed conditions.Motor starters are of many types however the scope of this PLC tutorial is confined to simple motor starter.

It should have the following provisions.

- Push button to start the motor: The motor should continue to rotate even when the push button is released.
- Stop Push button to halt the motor after it started.
- Over current protection: In case of over load, the motor should stop automatically by the signal coming from contactors of overload relay.
- Vibration Sensor: It should prevent the motor from vibration which will cause the motor to damage so that the sensor feedback is taken to PLC.
- The motor starter should also have indicator (Lights) to show ON or OFF status of motor.

Since it is required that once push button is pressed, motor should run continuously even if the push button is released. To achieve this part, an input Q1 (normally open) is used and connected in parallel with I1. This input depends upon output Q1. When output is high, input Q1 is also high. Since input Q1 provides parallel path with I1, so if any of them is to be high, motor will run (if other conditions are also satisfied). Start button (Normally open), stop button (Normally close), overload relay (Normally close) and limit switch (Normally open) are connected in series. So motor will run if start button is pushed, stop button is not pressed, overload relay is not picked and limit switch is closed.

Software and Programming
Programming Soft ware

Connected Components Workbench software is a set of collaborative tools supporting Micro800 controllers. It is based on Rockwell Automation and Microsoft® Visual Studio® technology and offers controller programming, device

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configuration and integration with HMI editor.
Use this software to program your controllers, configure your devices and design your operator interface applications. Connected Components Workbench software provides a choice of IEC 61131-3 programming languages (ladder diagram, function block diagram, structured text) with user-defined function block (UDFB) support that optimizes machine control.

Use Connected Components Workbench Software

To help you program your controller through the Connected Components Workbench software, you can see the Connected Components Workbench Online Help that comes with the software. Controller Changes in Run Mode Micro820 controllers allow you to make certain changes while in Run mode by using the following features:

- Run Mode Change (RMC) Allows logic modifications to a running project without going to Remote Program mode. Run Mode Change (RMC) is a productivity enhancement feature introduced in software version 8 for Micro820 controllers. The feature saves the user time by allowing logic modifications to a running project without going to remote program mode and without disconnecting from the controller. You must use the Connected Components Workbench Developer Edition software version 8 software, or later, to use this feature.

- RMC is useful during project development, when you add small changes incrementally to the logic and want to see the effects of the changes on the machine immediately. With RMC, since the controller stays in Remote Run mode, the controller logic and machine actuators do not have to reinitialize constantly, which can occur if the controller is switched to Remote Program mode (for example, the first scan bit is checked in the program logic to clear outputs). When you edit, build, and download a project without using RMC, a full build of the entire controller project is performed and a full download of the project is performed. During RMC an incremental build is performed and only incremental changes are downloaded to the controller.

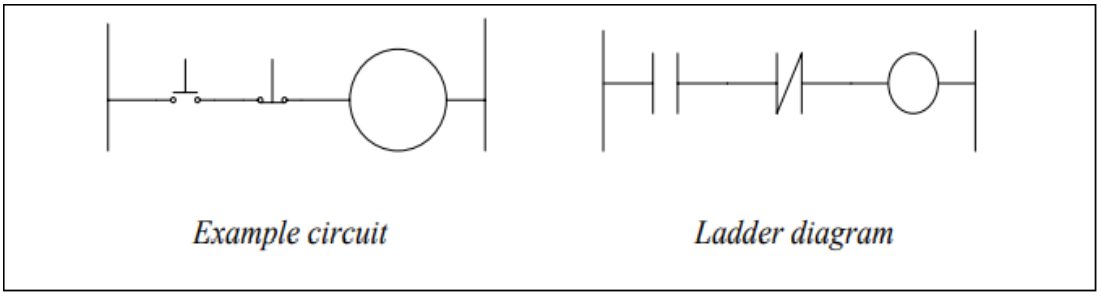
Logic Programming

Digital Inputs:

- MPCB Trip
- MPCB ON
- Contactor On / Run Feed back
- Motor OFF
- Motor ON
- Motor Trip
- Emergency Stop
- Start Push Button
- Local Selection
- Remote Selection

Digital Output:

- Contactor On
- MPCB Trip



Ladder Logic Diagram Commonly, the language or command for PLC designing base on the ladder logic diagram. There have numerical of symbol that have been used to developed the ladder logic diagram which every symbols represent the different functions. The formats for designing the ladder logic diagram are:

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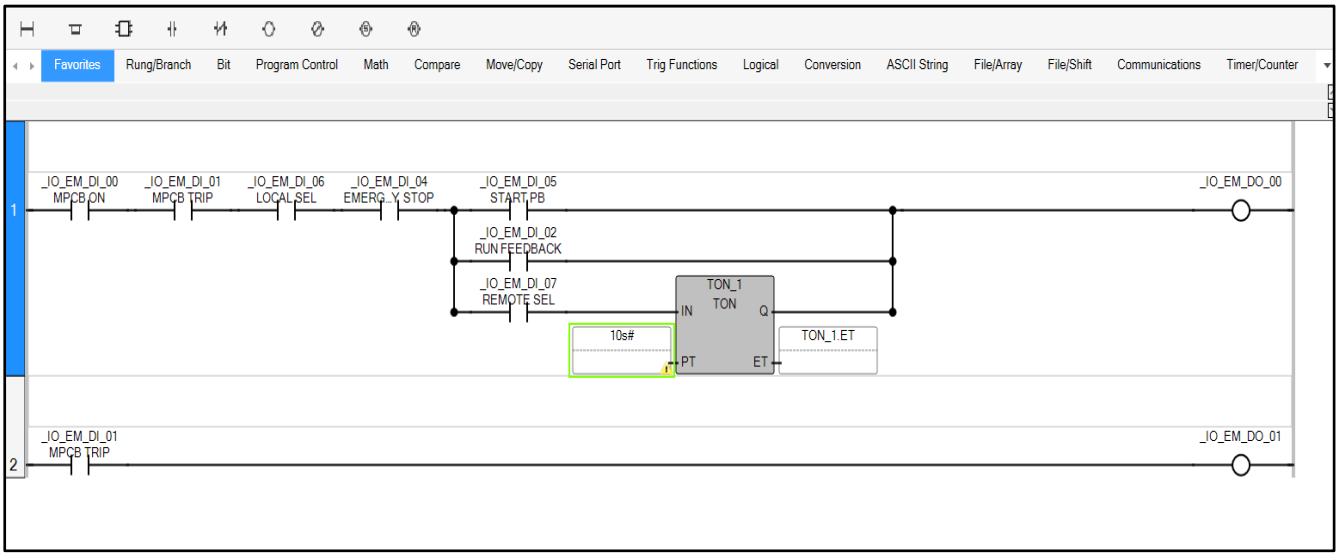
- Circuits are arranged as a series of horizontal lines containing inputs (referred to as contacts) and outputs (referred to as coils).
- Inputs must always go before outputs and are in the form of normally open and normally closed contacts. The ladder symbol for a normally open contact is . The symbol for normally closed contact is.
- There must always be at least one output on each line. An output is for example, a PLC output relay. The ladder symbol for a PLC output is drawn either as two parentheses close together, i.e. or as a circle.
- The numerical assignment for the inputs and outputs form part of the ladder diagram.
- The output on a program line is energized turn on when the inputs contacts to it are made when the contacts connect to 230 V supply to the coil.



IV. RESULT AND DISCUSSION

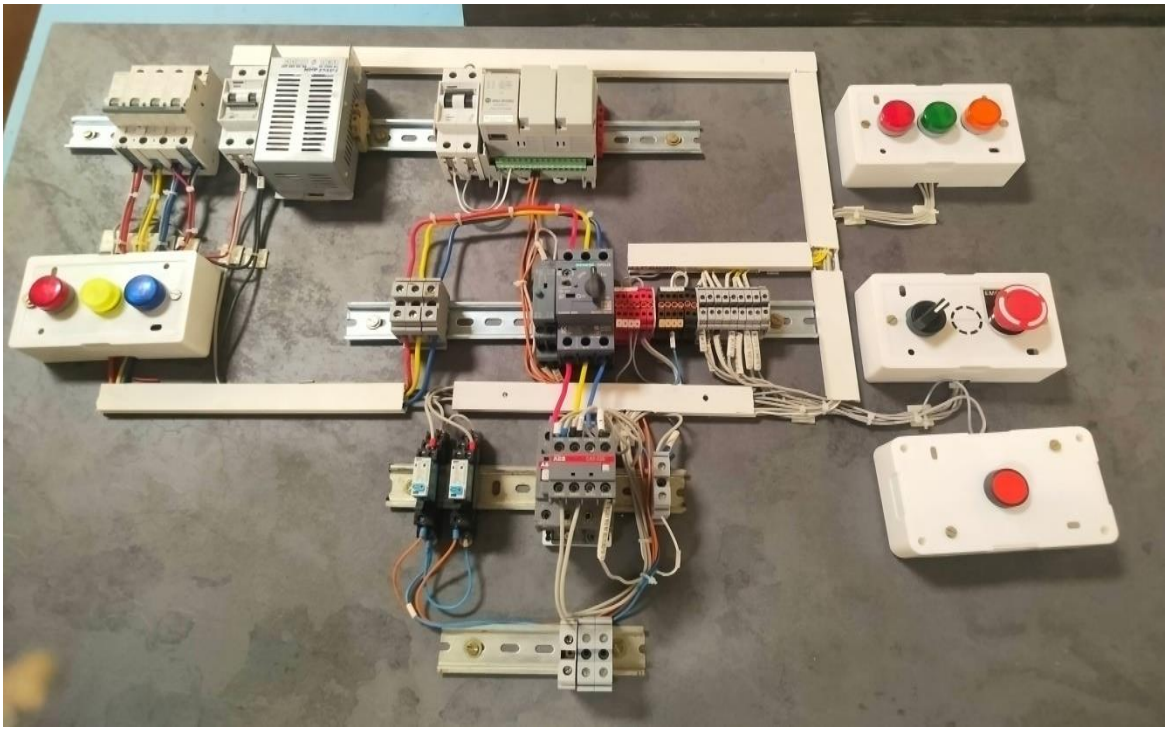


Fig: Project Model

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V. DISCUSSION

When PLCs approach solving problems of practice through the use of continuous improvement (CI) processes (see graphic below), they first collaborate to identify problems and their possible root causes using a wide range of data collected from within the system. PLCs study multiple sources of relevant data to fret out problems. Once the PLC identifies the problems, the next step focuses the PLC on understanding the root causes of those problems. The causes might be directly discernible in the data, but it could just as well take additional digging to get to the causes. Once a PLC focused on instruction understands problems and root causes, teachers have the authority to dig into the literature and research to develop a theory of change.

PLCs who are working with an instructional focus using continuous improvement methods might just as well be called mini-research groups since they take up understanding problems, their causes, and testing solutions using the disciplined methods of improvement science. In fact, the literature on improvement science often compares the work of these PLCs to action researchers who use their classrooms and those of colleagues as spaces in which they continuously test changes; study their results with simple, practical measures; and make adjustments until they are satisfied that they have change packages that can be pushed out with confidence to others. By using PLC, we can run the motor Locally and Automatically. Motor can have monitored remotely and Condition of the motor will be handle by the PLC.

VI. CONCLUSION AND FUTURE SCOPE

System for protection of System for protection of induction motor from abnormal conditions using PLC is built and tested. PLC can be used even in unclean circumstances and environments of high temperatures, humidity and chemicals and thus suitable in an industry than any other logic devices.

They have direct interoperability to other industrial devices such as relays, valves, actuators, transmitters, motor starters etc. Simplicity in programming of PLC makes the system more popular. The project can be modified by implementing supervisory control and data acquisition (SCADA), which provides real time monitoring of various parameters of the motor on a computer screen. Further, the protection can be implemented industries.

Future Scope

- **Latest trends in industrial automation**

Latest trends in the industrial automation include increased use of analytic, growing use of PLC and increased cloud-based supervisory control and data acquisition (SCADA) systems. These tendency will be effect the industrial automation control market, according to a report. The report also forecast that these trends will also result in an eight percent compound annual growth rate (CAGR) for the Asia region, but the direction are likely to be seen globally. Automation industry is moving towards the future of the unparalleled productivity spurred by superior energy efficiency, better design and operator visualization.

- **Latest PLC technology**

Latest PLC technology helps to monitor and control distributed multiple user applications. It also provides a accurate and overall picture of operations, meeting the demands of multiple stakeholders including maintenance and production information technology (IT). Reliable and robust functions can be obtained using the latest technologies of PLC. These technologies enable you to take the advantage of visualization and other new technologies, meeting various challenges in operation, discrete applications and delivering critical visibility when you need it.

- **Scope of PLC programming**

PLC's are continuously growing and evolving to be the best option for a variety of industrial automation applications. Scope of PLC programming is increasing rapidly because of greater programming flexibility and ease, more memory, smaller sizes and built-in wireless features, less time consuming.

PLC's are getting benefits from USB technology and thus make it easier than other methods and monitor your control systems. PLC programming will evolve, and with the availability of smaller micro and mini USB connectors, you can expect to see this option on more of the smaller PLC's. In the future, PLC will continuously evolve because of adapting technology increases in communications, hardware, and software

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