DESIGN AND CONTROL OF THE MISCIBLE PROCESS REACTOR USING PLC

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Abstract:
This paper is composite of different application which is really well utilized in present and living environment, this project used in industrial application. Nowadays, the application of PLC is widely known and used in this digital world. PLC's application is obviously applied at the industrial sector. In this project, a discussion about PLC application will be explained in more details and specified. Whereby a machine that used to prepare automatic filling and mixing process into bottles is fully controlled by the SELPRO PLC, which acts as the heart of the system. The system sequence of operation is designed by ladder diagram and the programming and visualization of this project is totally integrated by SELPRO software. Several electronics and electric devices that usually been controlled by the PLC are alarm acknowledgement system, blinking bulb, motor for conveyor system, submersible pump, sensors, selector switch, push button, relays, pneumatic system, solenoid valve and other devices.

Keywords—**Push button, Relays, Motor for conveyor system, Solenoid valve, Sensors.**

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I. INTRODUCTION

A. INTRODUCTION TO PROCESS REACTORS

Application that employs process reactors and looking for a way to improve the efficiency of the operation, seeing what process automation we have (and don't have) in place is a good way to start. When automation technologies are integrated into the system, they not only improve process control but they can also be an effective way to increase productivity, minimize costs and make your facility operate more ergonomically. There are many different aspects of a reactor that can be measured and regulated via control systems; the ones we select to have automated should be based on the application-specific requirements.

The process reactor is the generic term for a type of vessel widely used in the process industries. The process reactors are used for a variety of process operations such as solids dissolution, product mixing, chemical reactions, batch distillation, crystallization, liquid/liquid extraction and polymerization. In some cases, they are not referred to as reactors but have a name which reflects the role they perform (such as crystallizer, or bioreactor).

The main challenge engineering team faces in process plants is to maintain quality, reduce human intervention, and increase efficiency.We have designed and automated by the virtue of process reactors in process industries.

B. BLOCK DIAGRAM OF LIQUID MIXING AND FILLING.

This paper is a complete application of automation. The various process of this system is controlled by PLC. PLC is heart of the system and the system is controlled according to the programmed PLC. Figure 1 shows the block diagram of the whole process. There are seven inputs to the PLC out of which five is the output of the proximity sensor. The proximity sensor senses the presence of the bottle at the conveyor belt. In this work metallic bottles are used which are detected by a proximity sensor. Infrared sensor is another choice that may be used in place of proximity sensor. When the bottle is sensed by the proximity sensor, a signal is sent to the PLC through signal conditioning circuits. The PLC then operates the dc motors to start the mixing process and deliver the mixture to the tank. In real time systems AC drives may be used for the purpose. Depending upon the need, proportion and amount of two different liquid to be filled and mixed in bottle, the closing and opening operation of valves connected to motors is controlled through PLC. PLC is a programmable device developed to replace mechanical relays, timers and counters. PLCs are used successfully to execute complicated control operations in a plant. The PLCs helped reduce the changeover time from a month to a matter of just few days. PLC consists of an input/output (I/O) unit, central processing unit (CPU) and memory. The I/O unit acts as the interface between PLC and real time systems. All logic and control operations, data transfer and manipulation work is done by CPU.

The input section converts the field signals supplied by input devices/sensors to logic-level signals that the PLC's CPU can read. The Processor Section reads these inputs, Processes the signal, and prepares the output signals. The output section converts the logic level output signals coming from processor section to high level signals and used to actuate various output field device. The programmer/monitor is used to enter the user's program into memory and to monitor the execution of the program

Figure shows basic block diagram of PLC (Programmable Logic Controller). The CPU of PLC is programmed using a programming terminal usually through personal computers or dedicated HMIs. Basic Modules associated with the CPU are external modules and i/o modules along with bit, byte, word and double word addressable memory locations. A PLC is an example of a hard real time system since output results must be produced in response to input conditions within a bounded time.

PLCs provide the advantages of high reliability in operation, flexibility in control techniques, small space and computing requirements, expandability, high power handling, reduced human efforts and complete programming and reprogramming in a plant. The PLC is designed to operate in the industrial environment with wide ranges of ambient temperature, vibration, and humidity and is not usually affected by the electrical noise that is inherent in most industrial locations. It also provides the cost effective solution for controlling complex systems.

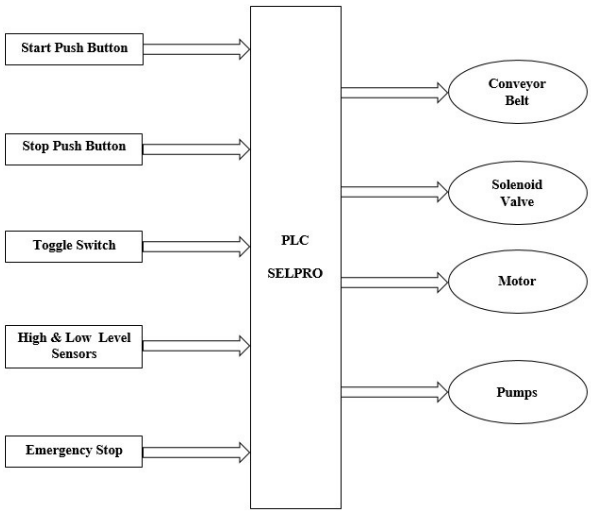


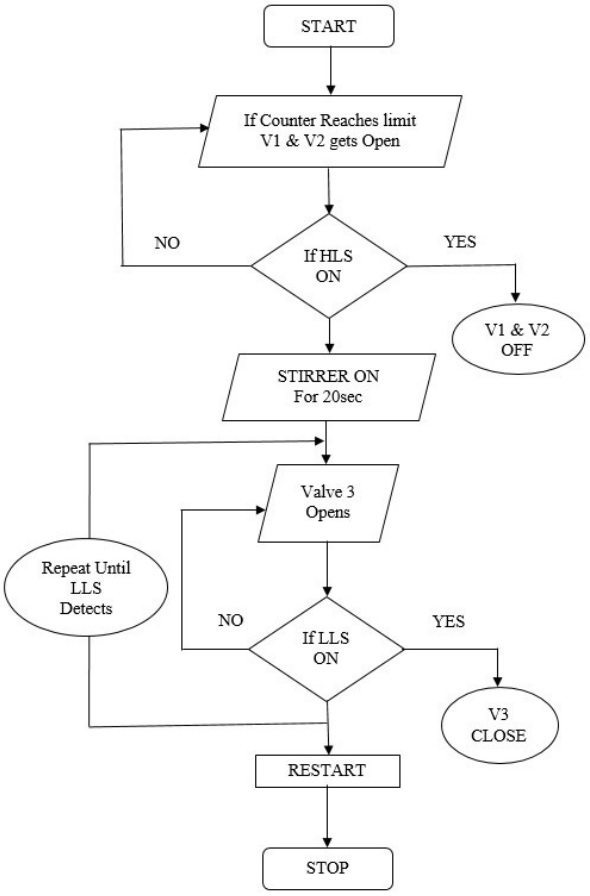
Fig no. 1. Block Diagram of proposed system

C. DESIGN AND SIMULATION

The following steps used in the liquid mixing and filling process.

Step 1: Switch ON.
Step 2: Set the counter values.
Step 3: If counter value reaches limit v1 & v2 gets opened.
Step 4: If high level sensor detects v1 & v2 gets closed stirrer gets activated and start running for predefined time.
Step 5: After completely mixing the liquid stirrer gets turned off.
Step 6: Valve 3 will be open for predefined time.
Step 7: After the filling of bottles valve 3 will be closed.
Step 8: Switch OFF.

D. SOFTWARE DESIGN OF LIQUID MIXING SYSTEM



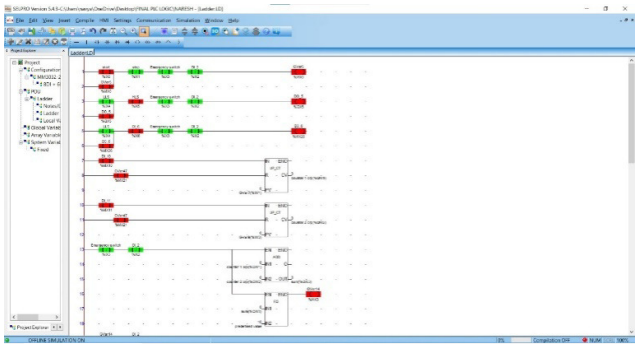


Fig no. 2. Overview of Arduino IDE platform

CONCLUSION

Automation systems are used to increase productivity, which in turn brings economic progress. The main purpose of PLC in automation is used to control the whole system. The cost of installation is not cheap but it can efficiently run for a long period of time. The performance, flexibility and reliability is based on the investment. A PLC based control system was applied to the automatic liquid filling station previously specified and the performance was measured. The entire system is more reliable, time saving and user friendly.

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