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Programmable Logic Controller programming and wiring of pills vending machine

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ABSTRACT-Automation is basically the delegation of human control functions to technical equipment aimed towards achieving higher productivity, superior quality of, higher efficiency, improved safety in working conditions. Our project includes advanced systems and techniques to control pills dispensing processes, reducing the need for human interventions. This is the biggest advantage of our project. Pills vending machines provide computer-controlled storage, dispensing, and tracking of medicines are recommended together as a potential mechanism to enhance efficiency and patient safety. There is no doubt that these medicine vending machines can improve the efficiency of medication distribution, but their capacity to decrease medication errors is controversial and it depends on many factors, including how users can design and implement these systems. From this concept, we conclude that the Pills vending machine using PLC is more efficient than any other conventional methods. It is a person-less service as it is programmed in Programmable Logic Controller which is going to drive the servo motors for dispensing machine and SCADA for monitoring the process.

KEYWORDS: PLC, SCADA, SERVO MOTOR

I. INTRODUCTION

A vending machine is an automated machine which is intended to provide the users with a diverse range of products. It is a 24x7 standalone unit which requires a standard power supply connection to the function.It is used to serve the wide clientele with variety of products handling from grocery to processed products.Our project "Programmable Logic Controller programming and wiring of pills vending machine", intended to provide and track pills based on user choice which can be installed at hospitals. Our pills vending machine includes main technologies like PLC and SCADA. Programmable Logic Controller is a digitally operating electronic sytem, designed for use in an industrial environment which run for longer time and can withstand power fluctuations unlike microcontrollers.SCADA (Supervisory Control and Data Acquisition) is used for controlling and monitoring. Here using delta WPL soft and SCADA Intouch software, we can maintain the stock list,solded quantity and the remaining stock which have to be refilled manually.This project can reduce the human error in the time of giving medicines. By using above software we can control and monitor the list of the tablets taken and number of tablets need to be refilled.

II. MOTIVATION TOWARDS THE WORK

The main motive is to provide 24 hours of medical facility, person less service, high efficient machine, cost effective machine to people at rural areas, railway stations, bus stands, hill stations, medical stores, hospitals etc. Diagnosis is always a concern for the people who are travelling long distances in trains or buses. At the same time medicine availability also has a major impact excluding the factor about a complete cure. The aim of this project is to give preliminary relief so that we

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can give people a better chance of resisting the health from before they are able to reach the doctor.

III. OBJECTIVE OF THE PROJECT

- The objective of this prototype is to provide temporary relief to enable individuals to prevent their health before reaching a doctor.
- To develop an automated emergency kit for some common symptoms of disease that provides medication or preliminary treatment.
- To deliver such healthcare in areas that may not be possible for a medical store.

If the person in need of medicine could get the appropriate medicine when necessary, that would be enough. In many situations, doctors are generally not available immediately. In places like roads, rural areas, fuel stations, train station, and malls. So, this machine will be very useful in those situations.

IV. EXISTING SYSTEM

Problem comes when there is need for some medicine and when drug store is unavailable. In places where people turnover is very small, the supply of medicines within the patient's reach may be critical issue. In some cases, the rural individuals do not have access to these facilities so they need to travel long distances and so vending machine came into existence where we can install this machine at rural areas for people to access easily. The conventional methods for designing a vending machine includes microcontroller modules. Microcontrollers are compact in size therefore used only in small digital equipment. Microcontrollers cannot access multitasking devices and can only handle a single operation or task at a time. Microcontrollers can never be reprogrammed and are not multi tasking. Microcontrollers are typically programmed in high level languages like C++ or JAVA, codes are very complex to understand and code in embedded systems.

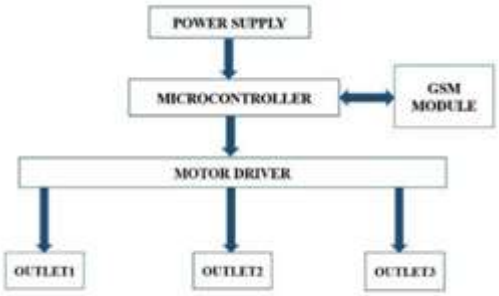

Fig.1 Block diagram of existing system

V. PROPOSED SYSTEM

In order to overcome the disadvantages of the existing method this Pills vending machine using PLC is introduced to develop a system to deliver machine 24x7 to the people. Power supply is given to SMPS(Switched Mode Power Supply) which converts 230v AC to 24 DC because PLC can only work at 24V DC. PLC(Programmable Logic Controller) is an industrial computer which has number of inputs, outputs and memory. To operate delta hardware it should be programmed in respective delta software (WPL soft v2.0). Ladder logic program for vending machine operation is done in WPL soft and the program is loaded into Delta hardware, once the program is loaded we don't require PC for running the program because the loaded program will be stored in PLC until we reload it with another program. For this communication we need ethernet communication between PC and PLC. Now for the user to operate they require some visual representation about the pills details, for this purpose SCADA software(Intouch) is used for monitoring, controlling and tracking the amount of pills taken and amount of pills need to be refilled. The backend of the Intouch shouldbe linked with WPL soft program using kepserver(Kepware)which is a common platform for connecting all automation software and hardware. PLC has inputs and outputs , after the program has loaded the PLC output terminals are connected with springs where the tablets are kept in between the gaps of springs. We can choose the spring type depending on the type of object we keep in between the springs. Now for driving the spring servo motors are used and pills supposed to come out of the spring outlet depending on user interface with SCADA. We can also do the same program in Delta HMI(Human Machine Interface) for the user to interact directly using touchpad but HMI's are little expensive to install. For this we require Delta HMI software(DOP Soft).

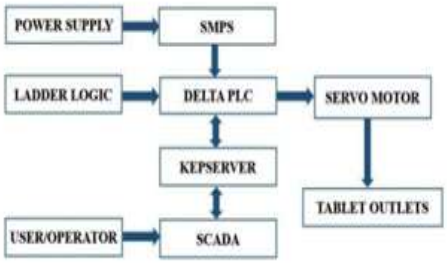

Fig.2 Block diagram of proposed system

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VI. COMPONENT DESCRIPTION DELTA PLC

A digitally operating electronic system, designed for use in an industrial environment. It uses a programmable memory for the internal storage of user-oriented instructions for implementing specific functions such as logic, sequencing, timing, counting and arithmetic, to control through digital or analog inputs and outputs, various types of machines or processes. Delta PLC comes in different series like AH500, S,E, DVP-16SP,DVP-06XA etc. We used DVP-SE series delta PLC for operating vending machine. PLC's with ethernet communications allow communication from remote mobile platforms. Delta providing android application to read write data in PLC. It uses Modbus TCP/IP protocol for communication. Android application called ' Delta smart viewer 'use wi-fi connection and connect to the same network with device connected, connect to the device by entering PLC

IP address and port number also the station Id. We use program delta PLC using ladder logics like NO(Normally Open),NC(Normally Close) contacts and coils. Addressing for these coils are given based on instructions given in WPL soft.

Fig.3 Delta PLC

SCADA (Supervisory Control And Data Acquisition)

SCADA systems are crucial for industrial organizations since they help to maintain efficiency, process data for smarter decisions, and communicate system issues to help mitigate downtime. The basic SCADA architecture begins with programmable logic controllers (PLCs) or remote terminal units (RTUs). The SCADA software processes, distributes, and displays the data, helping operators and other employees analyze the data and make important decisions. The operator pauses the operation and views the SCADA system data via an HMI to determine the cause of the issue. The SCADA system's ability to notify the operator of an issue helps him to resolve it and prevent further loss of product. For PLC and SCADA communication many PLC require driver files. PLC which communicates in a protocol requires SCADA which communicates in the same protocol. Features of SCADA includes real time trend, historical trend, alarm condition, security, report generation, scripts. In our project for the monitoring process we use Intouch (SCADA wonderware).

SWITCHED MODE POWER SUPPLY (SMPS)

A Switched-mode power supply is an electronic power supply that incorporates a switching regulator to convert electrical power efficiently. Like other power supplies, an SMPS transfers power from a DC or AC source to DC loads, such as a personal computer, while converting voltage and current characteristics.

Fig.3 SMPS

MINIATURE CIRCUIT BREAKER

MCB is an automatic switch that opens when excessive current flows through the circuit. It can be reclosed without any manual replacement. In case of a fuse, once it has been operated it must be replaced or rewired depending on the type of the MCB. A circuit breaker is an automatically operated electrical switch designed to protect an electrical circuit from damage caused by excess current from an overload or short circuit. Its basic function is to interrupt current flow after a flaut is detected.

Fig.4 MCB

12V DC MOTOR

A DC motors is the motor within a class of electrical machines which converts direct current electrical power to mechanical power. These motors relies on forces that magnetic fields produce. Regardless of the type, DC motors have some kind

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of internal mechanism, which is electronic or electromechanical. In both cases, the direction of current flow in part of the motor is changed periodically. A 12V DC motor is small and inexpensive, yet powerful enough to be used for many applications. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances.

Fig.5 DC MOTOR

RS232 COMMUNICATION CABLE

RS232 is a standard protocol used for serial communication, it is used for connecting computer and its peripheral devices to allow serial data exchange between them. As it obtains the voltage for the path used for the data exchange between the devices. This cable supports both synchronous and asynchronous data transmission. In vending machine , this communication cable is used to connect computer and PLC where the ladder program in PC will be loaded into PLC using RS232 communication cable.

Fig.6 RS232 CABLE

SPRING

Springs are used to keep tablets in between the springs where springs are attached to motor, when motor rotates springs also rotates and tablets comes out of it. Depending on the type of object, design, user requirement we can select different types of springs for vending machine.

Fig.7 SPRING

ADVANTAGES

- Human instrusions are minimized
- Gives more accuracy, works continuously, gives consistency
- Maintenance is minimized
- Ladder logic is easy to implement and troubleshoot

VI. RESULTS

Fig.8 SCADA INTOUCH

Fig.9 PROTOTYPE MODEL

Fig.10 WPL SOFT

VII. CONCLUSION

Pills vending machine using PLC is more eco-friendly and simple to operate. In the same way we can model any vending machine using PLC so that labour cost will be minimized. It will give entrepreneurs to attract more customers. This system can further improved by interfacing biomedical instruments. This pills vending machine using PLC is technically feasible for the people. It will set

benchmark in an industry and ease the lives of people.

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