

# Changing Relay Logic to PLC Logic from AZ11 Machine

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**Abstract-** Getting rid of the physically cabled connection gift inside the conventional az11 device by using introducing percent control approach. In convectional device human is want for running the machine. This leads to engage someone in system and consumes lot of time for drill an gadgets. The intention is to layout and enforce the machine operation with the help of PLC manage technique for easier modifications and blunders correction inside the system, decreasing number of contacts held by using relays, extra operating speed and performance ,more security and decreases high heat.

A present manually running gadget is computerized. Percent is programmed the usage of ladder logic programming with s7 300 processor ideally for optimum automation at minimum value. This proposed paper states that the breakdown time is reduced and the gadget availability is accelerated. Variable frequency drive (VFD) is employed for speed manage of feed motor by casting off electromagnetic clutches.

**Indexed Terms-** az11 machine, PLC logic, Relay logic, ladder logic, s7-300

## I. INTRODUCTION

With the appearance of new technology, the capability of conventional az11 machine can be better through replacing the load of cabled reference to the assist of PLC manipulate strategies.

The reason of that is to discover the faults effortlessly. It brings flexibility to the operation and also reduces the breakdown time, hold close controls and without problems pick out the faults. It enhances maximum automation at minimum cost saves installation space. Few goals which might be also achieved all through the operation of system are:

- Implementation of interfacing of different electrical and mechanical components with PLC.

- Implementation of control principles i.e. ON/OFF(or)switching control using PLC
- Interfacing of different motor with different operating voltages with PLC.
- This design reduces continuous monitoring by manforce and also saves time.

## II. PROPOSED METHOD

Rugged and designed to face up to vibrations, temperature humidity and noise. Have interfacing for inputs and outputs already in the controller. PLC are easily programmed and have a without difficulty understandable programming language.

## III. AZ11 MACHINE

Az11 machine also recognise as horizontal milling device is a heavy-responsibility commercial device. This machine tool is used for both uninteresting (drilling) and reducing purpose. Boring operation is often favored due to the fact we can correct hollow size or alignment and can produce easy finish. Milling check with a rotating cutter which has five axes in it.

There are two types of panel.

- Main panel
- Operating panel

It uses six 3phase induction motor for operation and control.



Fig 1 Picture of az11 Machine

IV. MACHINE AXES

- X-axis (horizontal axis)
- Y-axis (vertical axis)
- Z-axis (parallel to spindle)
- W-axis (outer axis parallel to z-axis)
- B-axis (table axis)

During working condition, only one axis switch should be ON such that one axis rotates in one direction at a time. If no switch is kept ON, no axis rotates (or) moves. It has positive and negative limits for each axis except table axis.

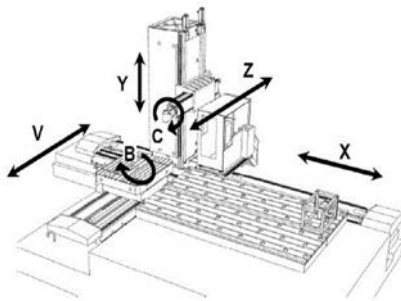


Fig 2 Machine Axis Diagram

V. PLC AUTOMATION

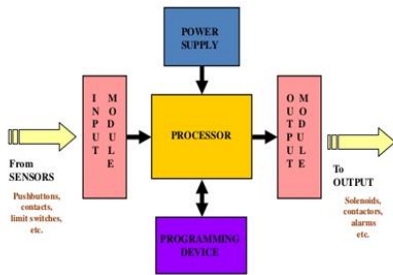


Fig 3 PLC Block Diagram

VI. MAJOR COMPONENTS OF PLC

- i) power supply  
It offer the voltage needed to run the primary PLC components. The energy supply offers internal dc current to operate the processor good judgment

circuitry and input/output assemblies. Commonplace power degrees used are 24v dc (or) 120v ac.

- ii) i/o modules  
Input deliver signals from the method into the controller. Eg: input switches, pressure sensors, operator inputs, and etc

output are the tool that the PLC makes use of to send adjustments out to the world. Output modules are the actuator, the PLC can exchange to modify (or) control the process. Eg: moors, lighting fixtures, relays, pump, and etc. Both i/o modules gives sign communicate and isolation between the internal good judgment-level alerts in the PLC and the field's excessive level sign.

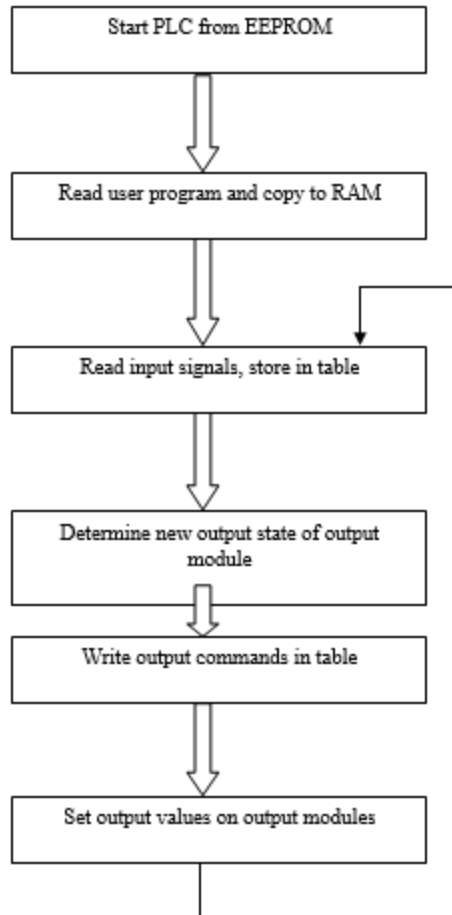
- iii) Processor  
It provides intelligence to command and govern the activities of the whole percent system. The processor is nothing however the central processing unit (cpu). Cpu is the "brain" of the PLC. The dimensions and form of cpu will determine the programming features available, size of the application good judgment available, amount of memory available and processing velocity.

VII. RELAY CONCEPT IN PLC

A relay is an electromagnetic switch operated through a highly small electric powered contemporary that may switch on/off a much larger electric powered cutting-edge during defective conditions.

Most common languages encountered in PLC programming are:

- Ladder Logic
- Functional Block Diagram
- Sequence Function Chart
- Boolean Mnemonics



Flowchart 1 PLC Processing Cycle

## VIII. SIMATIC S7-300 PROCESSOR

Az11 machine uses an advanced control system (i.e. PLC automation) using S7 300 processor.

The input to the processor is given by two ways:

- Memory card
- Flash card

The SIMATIC S7-300 is used in many applications worldwide and has been proven successful millions of times

### (A) STRUCTURE OF AN S7-300

An S7-300 Programmable controller is made up of the following components:

- Power supply(PS)
- CPU
- Function modules(FM)

- Signal modules(SM)
- Communication processor(CP)

### (B) S7 POWER SUPPLY(PS)

Dc supply is fed to the processor. The battery used here is lithium battery. The gain of the usage of this battery is that, the memory is retained even after strength off. The voltage score of this battery is 3.6v

### (C) S7-300 CPUS

A graded CPU range with a extensive overall performance variety is to be had for configuring the controller. The product range incorporates 7 wellknown cpus,7 compact CPUs,5 fail-safe CUPs and 3 generation CPUs. The CPUs are to be had from a width of most effective 40mm.

### (D) S7-300 PROCESSOR FUNCTION MODULES

The multi-facetted module range of s7-300 allows modular customization to in shape the maximum various obligations. Feature modules are wise modules that independently execute the technological tasks like counting, measuring, cam manage, PID control and motion manipulate. Consequently they reduce the load on the CPU. They're lessen when a high a stage of accuracy and dynamic reaction is needed.

### (E) S7-300 SIGNAL MODULES

Sign modules are the interface of the SIMATIC S7-300 to the method. The multi-facetted module variety of S7-three hundred allows modular customization to match most varied responsibilities. S7-three hundred helps multi-facetted technological obligations and offers exhaustive communicate options. Aside from the CPUs with integrated capabilities and interfaces, there is a wide variety of special modules in S7-three hundred layout for generation and communication.

### (F) S7-300 COMMUNICATION MODULES

Communication processors are used for connecting S7-three hundred to the distinct bus system / conversation networks as nicely for factor-to-point link. According to software case and module one-of-a-kind protocols and exclusive bus structures are available like commercial ethernet. Factor-to-point hyperlink through communication processors (cps) is an extremely effective and low-fee opportunity to bus structures. The gain of factor-to-point hyperlinks over bus structures is especially pronounced while only a

few (rs 485) gadgets are to be connected to the SIMATIC S7. The CPs can also without difficulty link 0. 33-birthday celebration systems to the SIMATIC S7. The interface modules for the S7-300 are to be had in 3 versions, each with one interface for the unique bodily transmission media.

Control of coolant motor is considered an example over here.

In order to control the conveyor belt, you will need the components shown:

Power supply for the control components.

CPU 312C with integrated input and output module.

Momentary contact switch.

PC Adapter USB for connecting the PC with the CPU312C

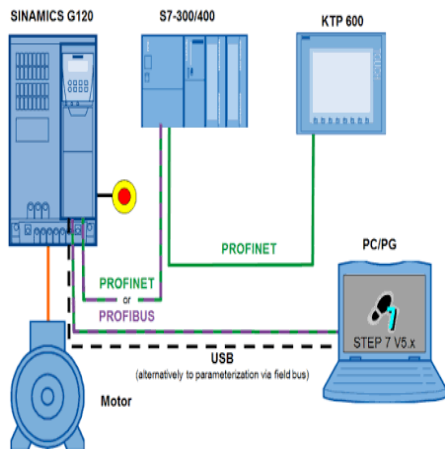


Fig 4 S7-300 Processor

The SIMATIC S7-300 conventional controller save set up area and features a modular layout. A huge range of modules may be used to enlarge the system centrally or to create decentralized structures in keeping with the venture handy, and centers a fee-powerful stock of spare parts. SIMATIC is thought for continuity and high-quality.

IX. VARIABLE FREQUENCY DRIVE (VFD)

The feed motor which is used to move /run the axes at the required velocity fee is executed with the help of

electromagnetic clutches. The glide of mechanical energy is managed through the grab. These clutches are used for smooth beginning of the machine. It's miles operated manually and pushed when transferring the tools. With the intention to take away the guide operation VFD is being hired. VFD is hired to govern ac induction motor, speed and torque. Via this, the motor jogging velocity range is prolonged from zero speed to above motor pace for you to enhance the efficiency. In cases, wherein motor needs lower capacity, the VFD can reduce motor pace so that it will keep energy.

X. ACS355 VFD HIGHLIGHTS

Flash drop – transmission settings and speed adjustments are more quick and easy, can be used for bulk manufacturing. Sequence programming – standard logic programming, decrease the requirements of external PLC

Software – high tech, high performance, high flexibility. User interface – used without control panels to save cost. Cabinet compatibility – optimum installation layout.

Built in EMC (Electromagnetic compatibility) – no extra space, parts, time (or) cost. Transmission protection – protect the transmission with the best quality latest solution.



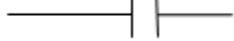
Fig 5 Hardware Model

XI. LADDER LOGIC

It is the most used programming language for PLC. It is well suited to express combinational logic.

The main ladder logic symbol represents the elements:

- Make contact



- Break contact



- Relay coil

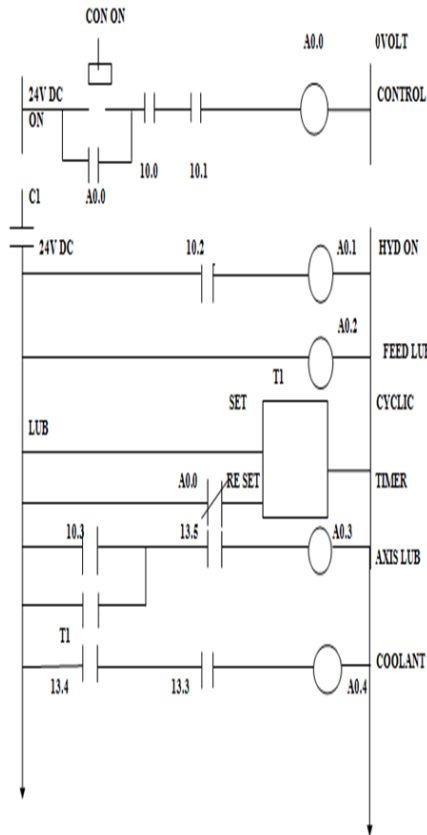
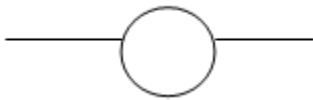


Fig 6 az11 PLC Ladder

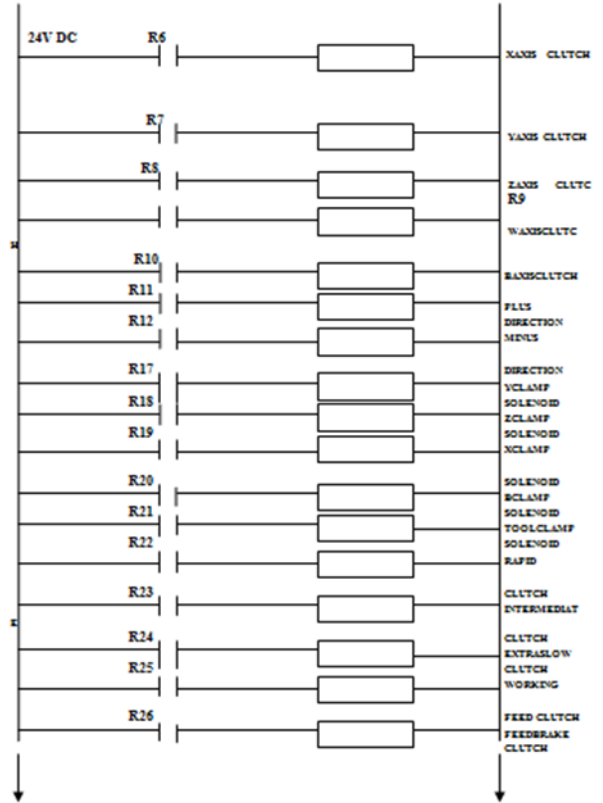


Fig 7 az11 M/C PLC Drawing

CONCLUSION

This project comprises of wide range of control operations of az11 machine which as being modified and controlled with the help of PLC automatic. By this project, the fault occurrence at any part of the system is being identified and necessary control measures are taken accordingly, breakdown time is reduced and also enhances maximum automation.

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