

Control System Upgradation Using Zumbach Milling Machine

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ABSTRACT: ZUMBACH electronics is a worldwide seller and manufacturer of many electro-mechanical machine components consisting of several products for plastics and rubber, cable and plastic, steel and metal industries. Components like PLC, motor, VFD, CNC, relay, Human machine interface (HMI) etc are available in a high speed cutting system. In our project we explain how to control the high speed running of Zumbach Milling Machine. A high end 6 axis CNC milling controller is ADT-CNC4960. Additionally to several enhanced functions, big screen is included in it. It also has many other features like Programmable Logic Controller, Computerized Numerical system, and TYPE3 other third-party software to get Computerized Aided Manufacturing machining program.

KEYWORDS- PLC, HMI, CNC Milling controller, VFD, Zumbach Milling machine, CAM

I. INTRODUCTION

On-line measurement, monitoring and control equipment a pioneer of on-line measurement, zumbach manufactures a comprehensive range of non-contact, on-line measuring and control instruments. Our technology is in use world-wide for such dimensional parameters as diameter, thickness, eccentricity, out-of-round and for physical or electrical parameters like expansion, capacitance, dielectric strength, and more. One or more parameters of a assembly line are often monitored simultaneously. Zumbach technology is employed successfully within the industries by thousands of consumers round the world who believe the standard and reliability of our instruments and systems: within the cable industry – for telecommunication wire, data wire, power line, electronic and control cable, fibre optic cable – on extrusion lines of singles and jackets, cv-lines, rewinding stations. In the plastic industry – for the extrusion of pipe, tubing, profiles for plumbing, medical, automotive, and construction products. In the rubber industry – for the manufacture of hose, profiles for the automotive industry, hydraulics and construction industry. In the steel and metal industry – on hot rolling mills as well as in cold processes for steel and other metals.

II. RELATED WORK

In Electro-Mechanical machines it is necessary to control the speed of the rotating table. The existing method for speed controlling is by changing the diameter of the pulley each and every time the machine is in need of speed change. The above method of speed variation is time consuming and less efficient. Hence, in this project work Variable Frequency Driver (VFD) is used so as to control the speed of moving plate by changing the frequency and voltage of the PLC. This method helps in both increasing and decreasing the speed. Use of VFD not only saves time consumption, but also helps in easy access to motor control.

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III. MANUAL OPERATION MEASUREMENT

A. SPECIFICATION

Max drilling diameter: 35 mm
 Max machining diameter: 40 mm
 Vertical travel of table: 6 mm
 Spindle diameter: 35/42/75 mm
 Spindle speed: 3000-18000rpm
 Production rate upto: 35 pcs/mins
 Standard execution with 380V electrical equipment
 15 Stations rotating table
 14 Working stations
 Electronic-hydraulic control
 Floor space: 3000x3000 m
 Machinery weight: 3500Kg



Fig 1. Zumbach milling machine

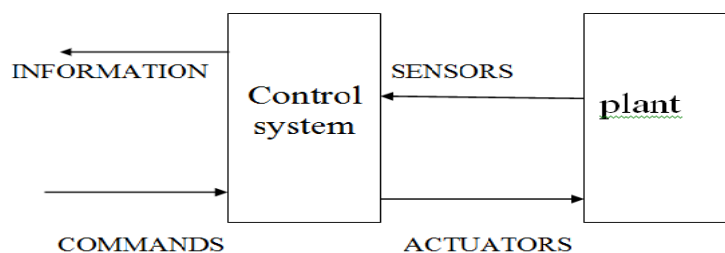


Fig.2 Overview of control

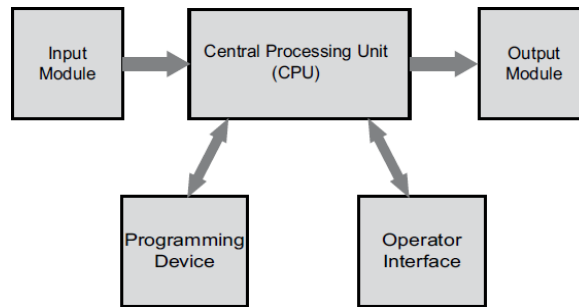


Fig.3 PLC Basic Operation

IV. METHODOLOGY

A. PLC

A Siemens S7 programmable logic controller (PLC) is commonly used in commercial and industrial control applications. These are differing from other computers, in which the tasks that they perform. PLCs make decisions which is based on a program, and control outputs to start a process. This PLC is based on Totally Integrated Automation (TIA) concept.

B. Encoder

An encoder is a combinational logic circuit that essentially performs a “reverse” of decoder functions. The process of converting symbols or numbers into a coded format is called encoding. An encoder has a N number of input lines, only one input is activated at a time and it produces an N-bit output code.



Fig.5 Encoder

C. Metal sensor

A sensor which is able to detect the nearby objects without any physical contact. This sensor emits an electromagnetic field beam and it waits for a change in the field. Different metal sensors detect different materials. For example, a capacitive photoelectric sensor detects plastic target; an inductive proximity sensor detects metal target. The distance which the sensor detects is referred as "nominal range".



Fig.6 Metal sensor

D. Laser sensor

Laser sensor emits a light on the surface and this laser beam is reflected from the surface and falls on the detector through the lens. Depending on the beam position, the angle is calculated.



Fig.7 Laser sensor

E. Reed switch

The **reed switch** is an electrical switch operated by an applied magnetic field. It consists of contacts on ferrous metal reeds which is sealed in a glass envelope. This switch works based on coil, making a reed relay, or by keeping a magnet near to the switch. Once the magnet is kept away from the switch, the reed switch return to its original position.



Fig.8 Reed switch

F. Power circuit

SMPS- switched mode power supply

It is a power supply which contains regulator and it converts into electrical power efficiently. The input 230V supply is given to the SMPS, which converts it to 24V & 5A DC which is required for the operation of relays, contactors, sensors, solenoid valves, LED's etc.

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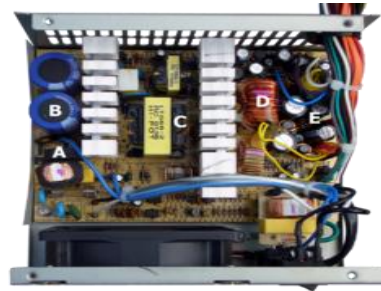


Fig.9 SMPS

G. Control circuit

Control circuit controls the whole operation and makes the machine to work with our sequence of operation. It includes Time PLC in which we program the logic. Through the output of PLC, we drive relays, solenoids and also the complete sequence of operation.

H. Relays

A relay is a switch in which it is used to control a circuit by a low power signal. The logic of relay is based on the contacts in which they energize and de-energize.

V. FLOW CHART

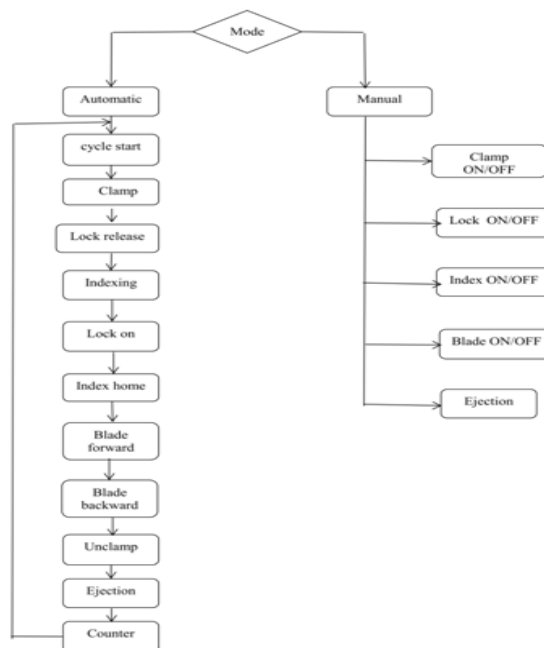


Fig 2.Ladder flow chart of zumbach milling machine

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VI. ALGORITHM

A. Automatic mode

- STEP1: Start the program
- STEP2: Select the mode
- STEP3: Press foot switch or pedal
- STEP4: Clamp a coil core
- STEP5: Release the clock
- STEP6: Tapping the coil core
- STEP7: Lock the indexing pulley
- STEP8: Return to home position
- STEP9: Blade move to forward direction
- STEP10: And again its move to the backward direction
- STEP11: Unclamp a coil core
- STEP12: Then eject a coil core
- STEP13: Count a tapped coil core
- STEP14: End a program

B. Manual mode

- STEP1: Start the program
- STEP2: select the mode
- STEP3: ON/OFF the clamp push button
- STEP4: ON/OFF the lock push button
- STEP5: ON/OFF the index push button
- STEP6: ON/OFF the blade push button
- STEP7: ON/OFF the unlock push button
- STEP8: ON/OFF the unclamp push button
- STEP9: Then eject a coil core
- STEP10: Count a tapped coil core

VII. OVERVIEW OF THE MACHINE

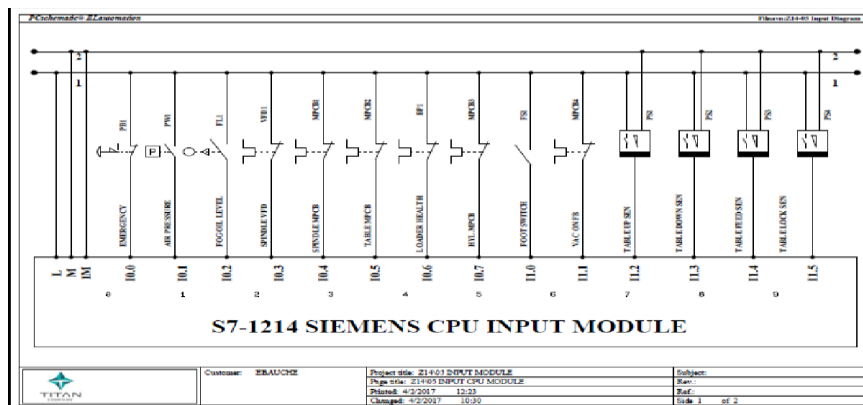


Fig.3 S7-1214 Siemens CPU input unit

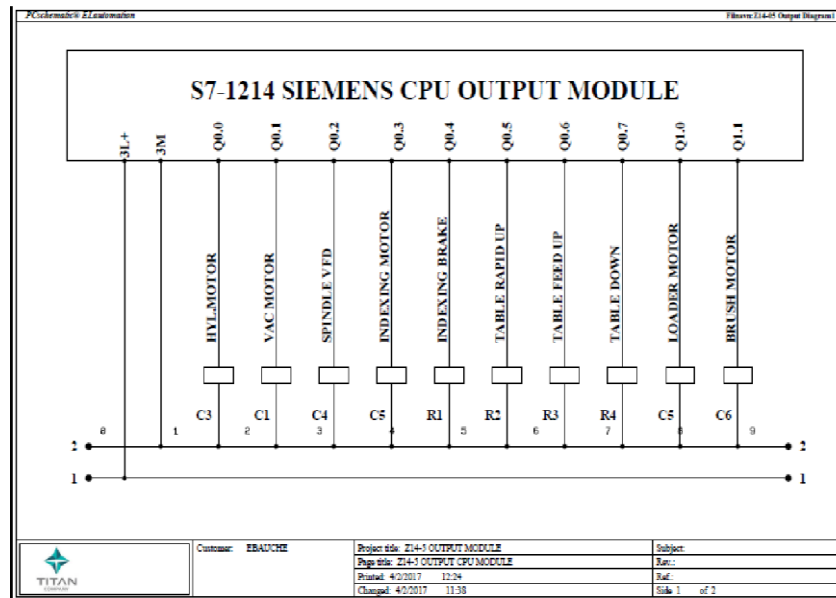


Fig.4 S7-1214 Siemen's CPU output module

VIII. CONCLUSION

By arising with the conclusion, Zumbach machine which done 14 operations by using HMI and SIEMENS S7 PLC. Hence by using that HMI user also can edit the error and fault by designing the program for user needs. In earlier there's no update of PLC and HMI, so user can't ready to edit the fault and error which occurs within the machine and program. Now a day's all are get updated, in order that technologies make all the mechanics to run automatic.

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