

DESIGN SPM FOR CURVATURE DRILLING MACHINE BY USING PLC AUTOMATION

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Abstract: Drilling plays very important role in automobile industry. Various types of drilling are used in industries. It is used for making the distinctive sorts of machines and job drilling. In automobile industries accurate drilling is necessary. Along these lines, we have the drilling is the at particular angle with particular time. In this way, we have analyzed the drilling of metal pipe or metal piece at a particular angle for specific product. According to some part features using programming logic control (PLC) automation to establish the best industrial implementation. In our project we work on the Human Machine Interfacing (HMI) to interfacing the machine by using PLC. Likewise present information to administrator and accommodates control contributions to verity of organizations including designs, schematics, contact screen, etc. Safety of the operator is very important term in the industry. For the safety purpose we used photovoltaic safety light curtain sensors are used.

Keywords: Mitsubishi PLC, HMI, Proximity sensors, Safety Light Curtain Sensors

1. INTRODUCTION

Motivation:

The old drilling machines are not operating automatically on plc automation. Drilling plays very important role in automobile industry. Distinctive kinds of drilling are used in industries. It is used for making the different types of machines and job drilling.

Background:

In existing system hand feed are used to assembly move vertical and horizontal movement. The operator safety is not available in existing drilling machine. Hand feed operate by human so this is risky job for human operator. This is more time consuming process.

2. LITERATURE SURVEY

[1]Automated Drilling Machine Based on PLC Yousef M. Abueejela¹, A. Albagul², Ibrahim A. Mansour³ and Obida M. Abdallah⁴.

In this paper author explain the System Components and Hardware Structure

[2]Research on PLC's communication and it's applications on a drilling simulator 978-1-4244-6349-7/10/\$26.00 _c 2010 IEEE Mei Dacheng¹ School of Computer Science Southwest Petroleum University Chengdu, China mdc@swpu.edu.cn

Oil drilling simulator is an electronic device which applies the modern electronic technology and the principles of communication to simulate driller operation in the process of drilling. It implements the simulation of the operations of drilling. This pepper is good references for simulation of the project.

[3]Selection of Technologies for Automation: Case Study of a Metal Piece Drilling Process IEEE LATIN AMERICA TRANSACTIONS, VOL. 14, NO. 4, APRIL 2016 V. M. Lira, A. B. R. Picon and C. E. Capovilla

This paper analyses the qualitative and quantitative characteristics of different technologies used to automate a particular process. In this way, we have analysed the drilling of metal parts for a specific product.

[4]Bilinear Modelling and Bilinear PI Control of Directional Drilling 2016 UKACC 11th International Conference on Control (CONTROL) Belfast, UK, 31st August - 2nd September, 2016 Isonguyo J. Inyang School of Aerospace, Transport and Manufacturing, Cranfield University, Bedfordshire, MK43 0AL, UK. Email: i.inyang@cranfield.ac.uk

This paper presents the design of an inclination and azimuth-hold controllers and their subsequent stability and performance analysis for directional drilling tools as typically used in the oil industry. Using an input transformation developed in earlier work that partially linearizes and decouples the plant dynamics of the directional drilling tool.

[5]HMI Connections And PLC Manual XINJE ELECTRONIC CO., LTD

This manual explains the HMI model, Parameter, Cable making, Device address.

[6] Performance Analysis of BLDC Motor for Sinusoidal and Trapezoidal Back-EMF using MATLAB/SIMULINK Environment

This paper presents a three phase inverter fed Brushless DC motor. The process considering the development of BLDC Motor Model in MATLAB/SIMULINK environment with sinusoidal and trapezoidal back-Emf waveform and also includes a comparison study for the harmonic analysis for sinusoidal and trapezoidal back-Emf models.

3.BLOCK DIAGRAM

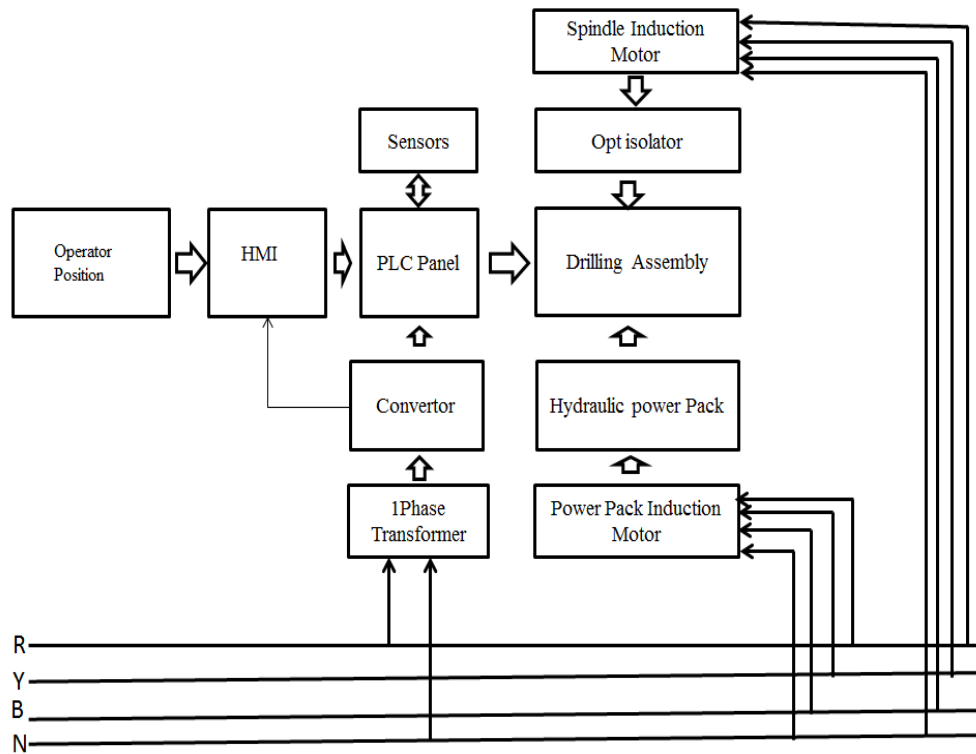


Fig.1 Block Diagram Of System

Block Diagram Description

Block diagram consist of:

- 1) Hydraulic set up PLC
- 2) Proximity sensors
- 3) Drilling assembly
- 4) Control panel (PLC panel).
- 5) HMI (Human Machine Interface) set up

A common 3ph 415 VAC supply is given to power pack induction motor and spindle induction motor.

1ph AC supply is given to 1ph transformer. The single phase step down transformer is step down the voltage 415V-230V AC.

Converter 230V AC is converted into 24V DC .This 24V DC going to PLC and HMI.

3ph 415V AC supply is given to the hydraulic power pack, this is connected to hydraulic oil tank. In hydraulic oil tank 100lit oil will be stored. Pressure meter is used for oil pressure measurement.

This pressurized oil is going in the hydraulic cylinder to up and down the drilling tools by using actuators. Sensors are sensing the metal and give input to PLC.

Operator operates the machine through HMI and HMI output is given to PLC as input.

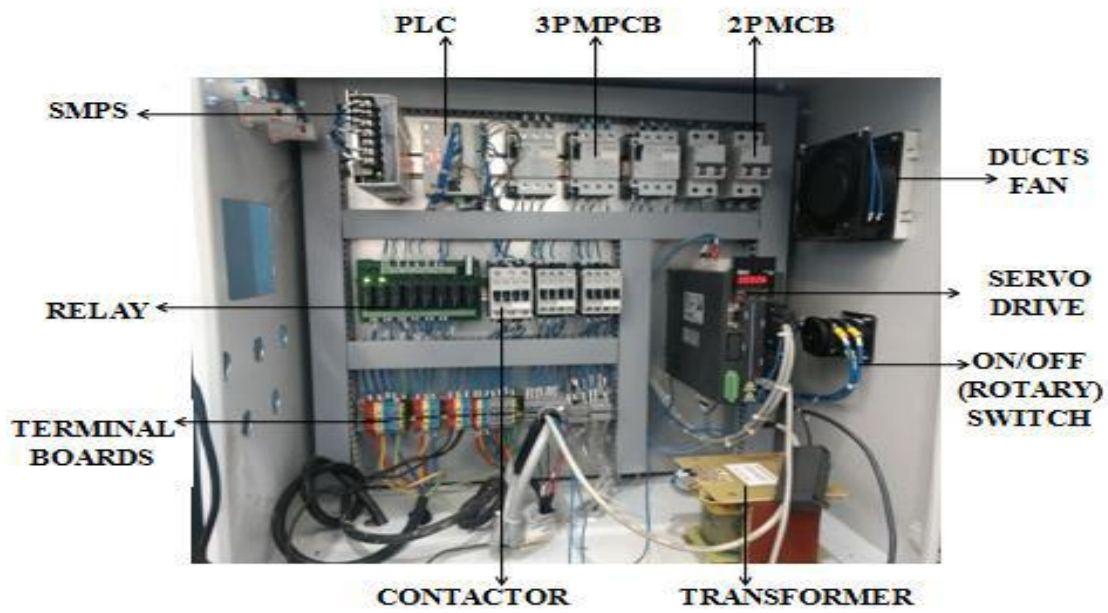


Fig.2 Control panel of the system

4.FLOWCHART

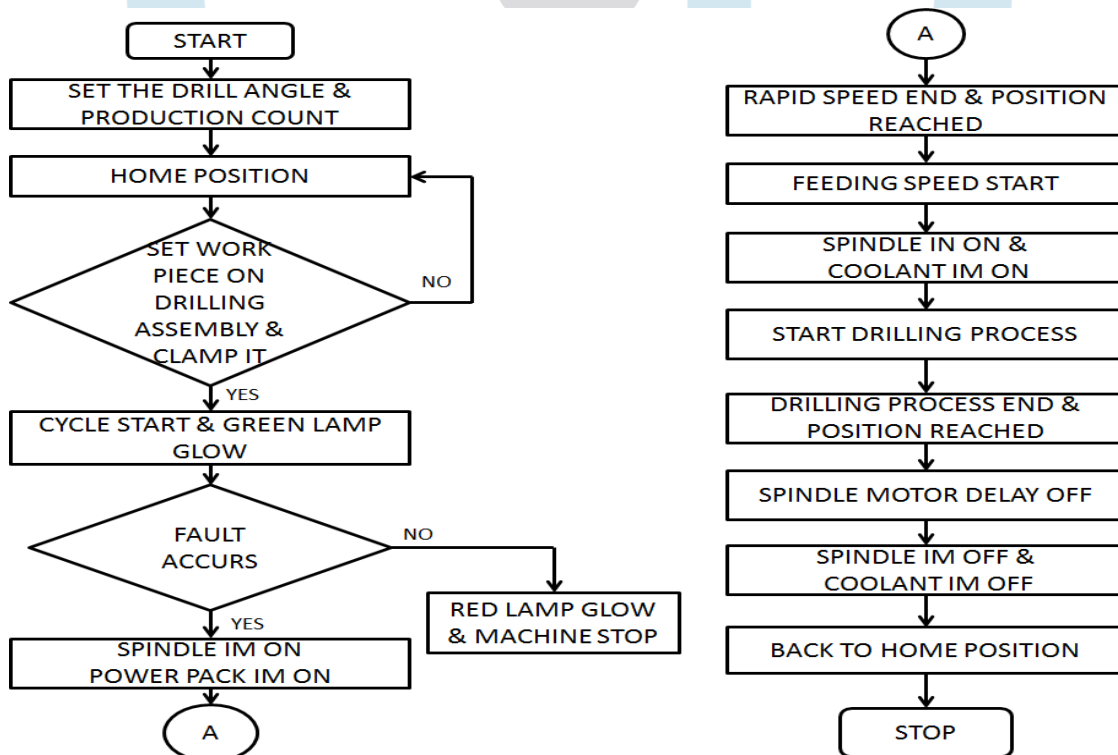


Fig.3 Flowchart

- STEP 1: In the proposed system set the drilling angle and production count. Initialize the length and diameter of the work piece.
- STEP 2: Cycle of drilling process start the spindle induction motor and hydraulic power pack induction motor is ON.
- STEP 3: When drilling assembly start feeding speed and then spindle induction motor ON.
- STEP 4: Drilling process start.
- STEP 5: When feeding speed complete the spindle induction motor OFF and Drilling process complete.
- STEP 6: And Drilling assembly back to the home position.

In the proposed system set the production count and drilling angle to drill the work piece. Work piece is placed on the drilling assembly and clamp it. Then actuates the relay and turn ON the spindle induction motor and hydraulic power pack induction motor. After some distance travels drilling assembly in rapid speed. The spindle induction motor at its certain speed is called rapid speed. Next start feeding speed and now drilling assembly fed to the tool it moves at certain speed which is called as feeding speed . the drilling process start now drilling tool (bar) to drill the work piece as the tool reaches the pre-set values. It drill the work piece to the proper size and proper angle. Here check the condition drilling process completed or not if completed then the drilling assembly back to the home position.

5.MACHINE DESIGN

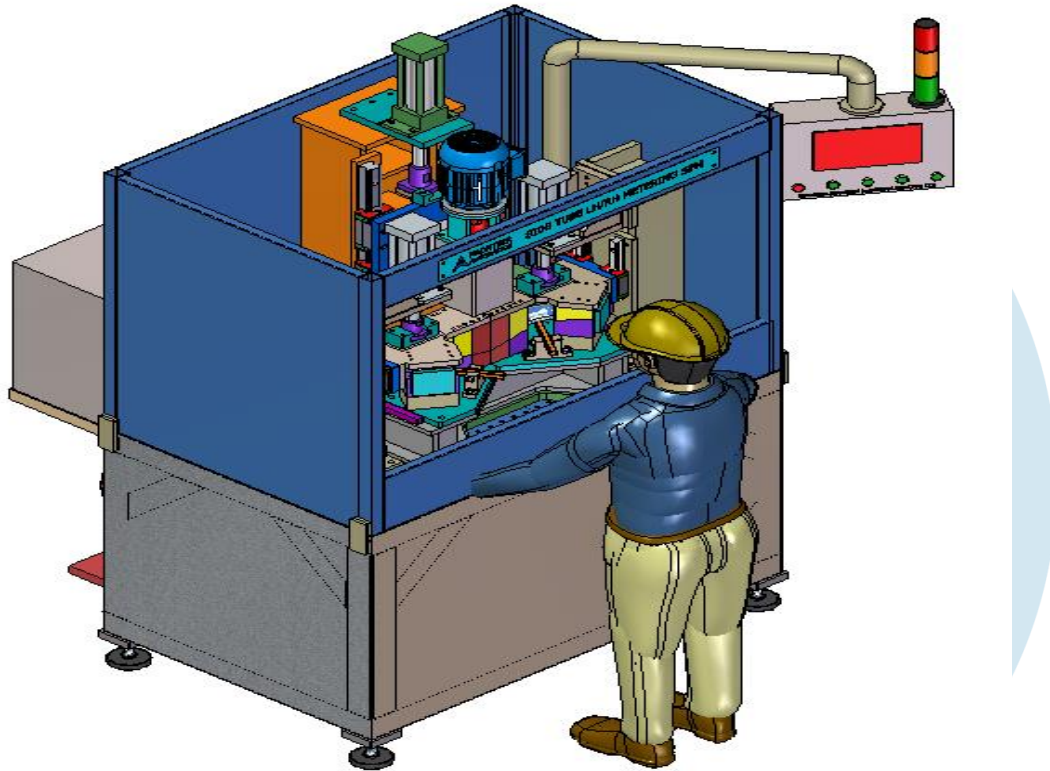


Fig.4 Machine design

6.SIMULATION AND RESULT:

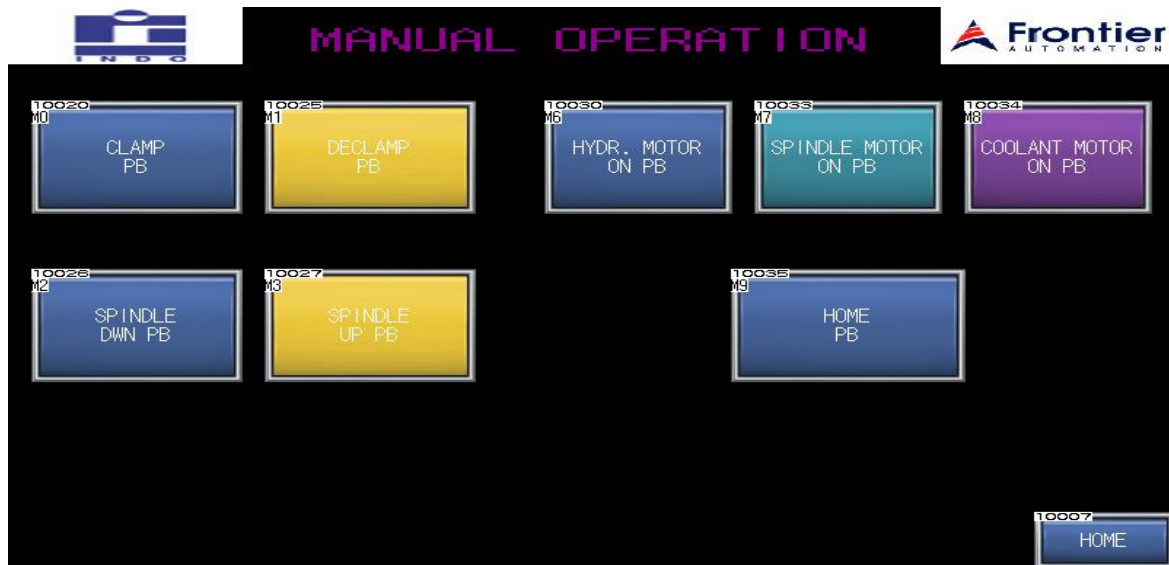


Fig.5 Simulation of automation

TIME (HR)	COUNT	TIME (HR)	COUNT	TIME (HR)	COUNT
00-01	56	08-09	56	16-17	56
01-02	56	09-10	56	17-18	56
02-03	56	10-11	56	18-19	56
03-04	56	11-12	56	19-20	56
04-05	56	12-13	56	20-21	56
05-06	56	13-14	56	21-22	56
06-07	56	14-15	56	22-23	56
07-08	56	15-16	56	23-24	56

Fig.6 Result of automation

7.FUTURE WORK:

Automation is now often applied primarily to increase quality in the manufacturing process, where automation can increase quality substantially. It gives emphasis on flexibility and convertibility of manufacturing process. Production rate automatically increases and cost effective.

8.ACKNOWLEDGEMENT:

We would like to thank our guide Prof.S.G.Gholap of Electrical department for the valuable guidance and constructive suggestions, this helps us in making our project.

9.CONCLUSION :

This project can be concluded to be innovative for improvements in special purpose drilling machine by using plc. automation and the system design has been done.

REFERENCES:

- [1] Automated Drilling Machine Based on PLC Yousef M. Abueejela¹, A. Albagul², Ibrahim A. Mansour³ and Obida M. Abdallah⁴
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