



Design and Analysis of 70 Ton Automatic Hydraulic Riveting Press Machine

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ABSTRACT : The design and analysis of 70T riveting hydraulic press is fully automated by the use of PLC controller. The sensors act as a nerve for a machine to control the whole process. The force of a hydraulic machine is maintained by pressure control valve. The riveting machine is used to make rivets in the metal plate. The logics given to the PLC controls the whole machine process. The latest technology servo mechanism is used in this project to give the high accuracy and precision of the product. The more amounts of human efforts are reduced by the automation.

KEYWORDS: automation, hydraulic press, riveting, plc.

I. INTRODUCTION

The hydraulic pressing machine used for converting shape of the material to the required form by compressive force of action. The hydraulic riveting press machine is operated by compressive force which was generated from hydraulic pressure. The up and down movements of the machine makes the screw holes in the clutch plate metal. In automation any types of brands of controller can be used to program and control Hydraulic press machine is used for making various types of automobile parts.

At present, the rivet machine is the only equipment of the riveting car production line and has the advantages of simple structure, high reliability, fast production. Moreover, the machining function is suitable for the ordinary car factory processing, and can be achieved the function of inching. The hydraulic riveting machine system has the following characteristics:

(1) The system structure parts : hydraulic station, rivets, riveting power hydraulic tank, linkage, and small parts.

(2) The hydraulic device adopts the hydraulic station to input and output the oil pipeline.

(3) The hydraulic circuit comprises three loops :

(1)Pressure regulating (2)Circuit loop (3)Speed regulating valve, throttling speed control circuit.

However, with the application of riveting in the automobile industry, the demand and the technology of the hydraulic riveting machine system is growing, for a better understanding of the riveting connection's mechanical behavior in the hydraulic riveting machine system; this article will focus on the hydraulic riveting machine system design and its mechanical behavior analysis. Using the numerical simulation technology we can simulate the riveting process, from the measured rivet connection strength and shell element of the rivet connection structure behavior.

II. DIFFERENT TYPE OF RIVETS

1. solid rivet: The used of solid rivet is less. It has been replace in many cases by welding or bending.

2. Round rivet: The most commonly used is round rivet, it is used sometimes in steel construction. It is being replace by joining with HV fastener.

3. Hollow rivets: Hollow rivets are still in demand. It is relatively easy to work with hollow rivets.

4. Tubular rivets: Tubular rivet have flat edge at one end cylindrical sleeves for joining the metal part with sensitive material this rivet is used.



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5. Drive rivet: This is commonly used to rivet wood panels into place since the hole does not need to be drilled all the way through the panel.

6. Friction-lock rivet: Friction-lock rivets are available in two head styles, universal and 100 degree countersunk. Furthermore, they are usually supplied in three standard diameters, 1/8, 5/32.

III. RELATED WORKS

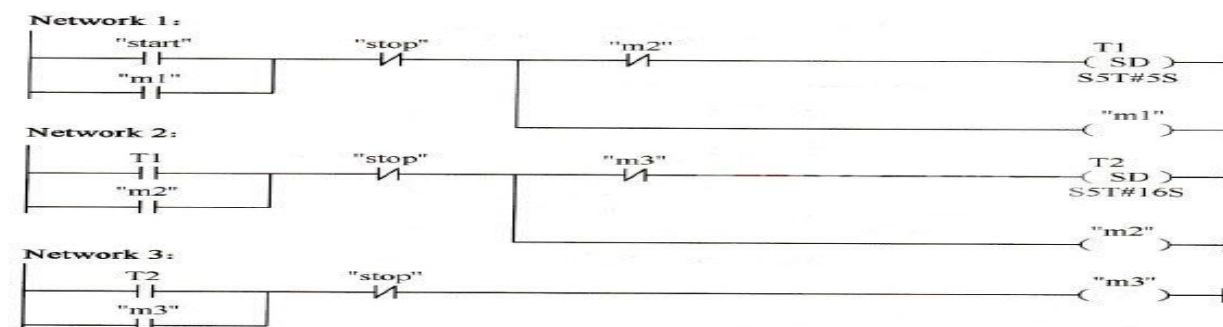
[1] The development of manually operated hydraulic press which encompasses the design, fabrication and performance of the press. The detail drawing of the develop machine was done by using Pro E software.

[2] press fitting is done by two child parts of muffler used in silencer of automobile and marine industry. The modelling of machine by using CAD software

[3] Pressing machine is made for manufacturing of automotive body building and sheet metal applications. The frame and cylinder is modelled using CATIA V5 and analysed by ANSYS software.

[4]. Hydro pneumatic riveting machine work by using PLC has overcome the drawback of the microcontroller, AVR. In microcontroller, AVR the programming is difficult and handling the machine is also difficult so we are using plc. In plc programming is easy and it is require less maintenance and handle easily. Hydro-Pneumatic riveting machine we are able to do fast and different types of riveting in small period of time as compare to any other systems, productivity is increased by using this machine and operation is totally secured by analyzing all the process we are satisfy by using hydro pneumatic because by using hydraulics it is capable of moving higher load and it also provide high forces and by using pneumatic system generally have long operating lives and require litter maintenance.

IV. LADDER LOGIC



V. PROPOSED METHOD

In proposed method the machine can operated automatically with the help of PLC(Programmable Logic Controller) and HMI(Human Machine Interface). Various Types Of Sensor Used to Monitor And Control the Process. PLC get input from the sensors(proximity sensors , pressure level sensor, Metal level detector ,Magnetic detector) and give the outputs depends upon

the logics. The piston lifts up and down with the help of servo motor through servo mechanism. It gives the accurate result with more efficiency.

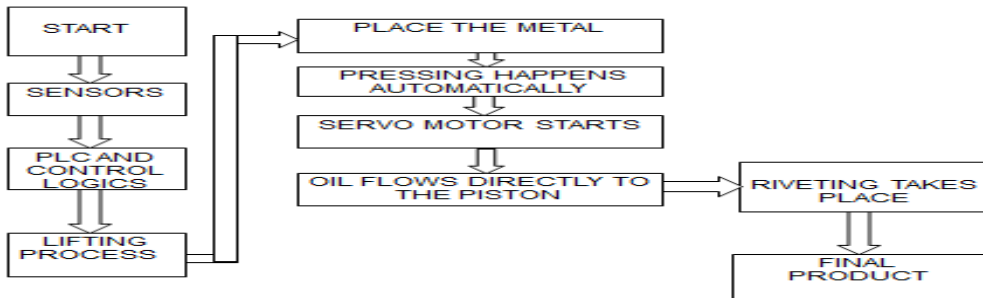
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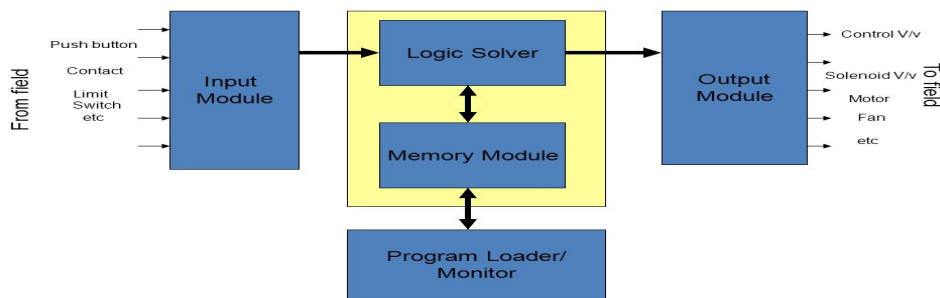
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Vol. 8, Issue 2, February 2019

BLOCK DIAGRAM



Block Diagram of PLC



1.Siemens plc. Siemens automation solution is scalable and flexible. They are powerful in term of their interpretation and are qualify with integrated IOS, inter-grated PROFINET interface for programming, HMI connections, distributed IOS and distributed drive architecture.

PANEL DIAGRAM





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RELAY

Relay is a switch which controls (open and close) circuits electromechanically. The main operation of this device is to make or break contact with the help of a signal without any human involvement in order to switch it on or off. It is mainly used to control a high powered circuit using a low power signal.

TRANSFORMER

Transformers are electrical devices consisting of two or more coils of wire used to transfer electrical energy by means of a changing magnetic field. Transformers are used for increasing or decreasing the alternating voltages in electric power applications, and for coupling the stages of signal processing circuits.

SMPS

A switched-mode power supply (SMPS) is an electronic circuit that converts power using switching devices that are turned on and off at high frequencies, and storage components such as inductors or capacitors to supply power when the switching device is in its non-conduction state. SMPS that takes rectified AC input from the wall, performs power factor correction and then converts the output into one or more lower voltage DC outputs.

CIRCUIT-BREAKER (MCB,MCCB,MPCB)

MCB (Miniature circuit breaker)

An MCB functions by interrupting the continuity of electrical flow through the circuit once a fault is detected. In simple terms MCB is a switch which automatically turns off when the current flowing through it passes the maximum allowable limit.

MCCB (Molded Case Circuit Breaker)

Molded Case Circuit Breaker (MCCB) is a circuit breaker and trip device assembled in a mould case. It can automatically cut off electric power in case of overload and short circuit.

MPCB (Motor Protection Circuit Breaker)

MCB are designed for a wide variety of functions circuit, protection functions while MPCB's are used for the specific function of protecting circuits driving electric motors. MPCB's usually have thermal and magnetic trips or mechanism to break the circuit when necessary.

BRAKE RESISTOR

The property of resistors to dissipate heat can be used to slow down a mechanical system. This process is called dynamic braking and such a resistor is called a dynamic braking resistor. To decelerate an electric motor, kinetic energy is transformed back into electrical energy.

SENSORS

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. Proximity sensors can have a high reliability and long functional life because of the absence of mechanical parts and lack of physical contact between the sensor and the sensed object. Proximity sensors are also used in machine vibration monitoring to measure the variation in distance between a shaft and its support bearing. This is common in large steam turbines, compressors, and motors that use sleeve-type bearings.

ACTUATORS

An actuator's function is to provide thrust and positioning in machines used for production or testing. One type is the electromechanical actuator, which converts the torque of an electric rotary motor into linear mechanical thrust.

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PLC CONTROLLED HYDRAULIC PRESS MACHINE



WORKING PRINCIPLE

A hydraulic system uses an incompressible fluid, such as oil or water, to transmit forces from one location to another within the fluid. **Pascal's law** states that when there is an increase in pressure at any point in a confined fluid, there is an equal increase at every other point in the container.

SOFTWARE DESCRIPTION

TIA description

TIA Portal that can be used for engineering SIMATIC S7-1200 Basic Controllers and configuration of SIMATIC HMI Basic Panels, as WinCC Basic is part of the software package. The **WinCCflexible** Engineering Software was used to configure SIMATIC operator devices of the x70 and x77 series from small Micro Panels to powerful Multi Panels as well as PC-based HMI with **WinCC flexible** Runtime SW.

Our basic aim was to design an application that work on pressure and make easy and quick work done. Hydro pneumatic riveting machine work by using PLC has overcome the drawback of the microcontroller, AVR. In microcontroller, AVR the programming is difficult and handling the machine is also difficult so we are using plc. In PLC programming is easy and it is require less maintenance and handle easily. Hydro-Pneumatic riveting machine we are able to do fast and different types of riveting in small period of time as compare to any other systems, productivity is increased by using this machine and operation is totally secured by analyzing all the process we are satisfy by using hydro pneumatic because by using hydraulics it is capable of moving higher load and it also provide high forces and by using pneumatic system generally have long operating lives and require litter maintenance.

VI. CONCLUSION

From the above, we can draw the following conclusions:

- (1) The riveting machine adopts the advanced hydraulic transmission electrical control system, relay, high efficiency, low noise, small vibration, high reliability, safety and other advantages;
- (2) For the hydraulic pump and booster pressure; adopted the advanced technology, hydraulic pressure technology;
- (3)The system can quickly boost; die is convenient to replace and automatic control.
- (4)The hydraulic device adopts the hydraulic structure, the structure of the device is complete, the assembly and the maintenance are convenient.



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