

Fully Automated Cotter Pin Insertion Using Servo Press

Kusuma Raj N*¹, Sahana M A¹, Varsha M S¹, Yasin Mubarak¹, Dr.Vagdevi S²

¹Department Eee, Gsssietw, Mysuru, Karnataka, India

²Assistant Professor, Department of EEE, GSSSIETW, Mysuru, Karnataka, India

ABSTRACT

Few years ago, industries depended completely on man power which was the deciding factor of production rate, duration as well as economic status of industries. But now it is an era of AUTOMATION which decreases the stress on workers, helps in completion of the work faster and also decides the growth of industries. Instead of working hours together it's better to make the work easier using automatic control and operations in order to increase the rate of production and decrease the time consumption in completion of work. Also it is very difficult to pick and place heavy equipment, the workers may face problems. Hence, automatic pick and placing of the equipments and for other operations automation will be helpful considering the safety of workers.

Here we are automatically inserting a cotter pin using servo press. Servo press consists of servo drive and servo motor .Using a programmable logic controller (plc.), the servo motor and the servo drive can be controlled in order to insert a cotter pin to the specific requirement

Keywords: Cotter pin, servo motor, servo drive, plc and DIDO communication.

I. INTRODUCTION

Presses are used in industrial settings for a wide variety of uses, including squeezing, forming and pressing operations .There are many different types of presses .Among those the most popular these days are pneumatic press, hydraulic press and the servo press technologies .But pneumatic and hydraulic presses are similar in function and can be used for a lot of the same things. However there are some specific differences between them to be considered when attempting for choosing between them.Pneumatic presses are controlled by manipulation of pressurized air. The air is forced in to a tube which fills with the air and applies pressure that causes the press to move downwards. Once the press stroke is finished the air is evacuated through valves and mechanical springs cause the pump to

move upward again. Pneumatic presses greatest advantage is their speed. They can move ten times faster than hydraulic presses. They can also stop at any time that the operator opens valves to release the air. Pneumatic presses are extremely versatile, able to be placed on a factory in any position in which the operator requires it to be, even upside down.Hydraulic presses are fundamentally chambers filled with some sort of liquid, usually oil .A position presses in to the chamber, causing the oil to shift position. Since the chamber is sealed, the oil exerts pressure on another, larger piston or base plate, which is in turn pressed downwards. Hydraulic presses are very strong and dependable. They are able to create a large amount of pressing tonnage. They are ideal for hydro forming, which is a type of metal shaping involving a liquid agent. They move very slowly. However it requires a lot of

maintenance. They have a great deal of other devices that monitor and regulate the oil pressure to ensure the press work efficiently. Traditional mechanical press can achieve the highest production speeds. The hydraulic press offers versatility but mechanical servo press offers both versatility and higher production speeds. Since pneumatic press last up to five years without being replaced and hydraulic press requires lot of maintenance and regulate oil pressure to ensure press work efficiently. Thus it is better to choose servo press in order to get desired operational control. To insert a cotter pin we are using servo press by programming a plc.

II. METHODS AND MATERIAL

A Fully automated cotter pin insertion is designed mainly using a PLC, Servomotor and a Servomotor drive .In order to insert a cotter pin a constant torque is required. Hence it is necessary to have a motor that produces a constant torque, therefore we use a servomotor. The block diagram of an entire cotter pin insertion unit is as shown in the figure below. The PLC is connected to the servomotor and the servomotor drive through a profinet bus. Once the input is given the PLC gets activated and starts operating. Here the PLC used will be ET200s of make Siemens. The PLC is configured using simatic manager step7 version (5.5) software to monitor the distance and pre-set current value is also configured in order to maintain a constant torque of the motor. The communication from the PLC to the servo drive is made through the profinet bus. The servo drive and servo motor is configured using delta software. The servo motor is connected to a servo drive that converts the rotational motion to the linear motion. The servo motor and the servo drive used is ECMA-CA-1020-P-S.

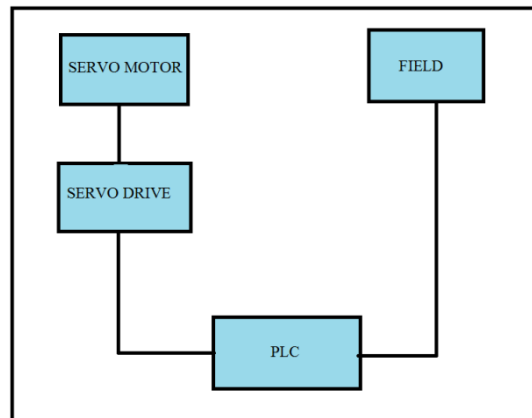


Figure 1.1. Block diagram

III. RESULTS AND DISCUSSION

Servo drive is configured with digital inputs and digital outputs as per the requirement. It is configured with four different positions to which the servo motor has to be run. The configuration is done using the DELTA software. The PLC is programmed for 4 different positions wherein the plc triggers, monitors and controls the servo motor for running to the specific positions configured. By doing carrying out these operations cotter pin has been successfully inserted to the position required accurately.



Figure 1.2 cotter pin insertion [front view]



Figure 1.3 cotter pin insertion [rear view]



Figure 1.4 cotter pin insertion [side view]

IV. CONCLUSION

Cotter pin insertion using a servo press has been configured using a servo drive and programmed with programmable logic controller for four variants of pressing. The four different variants help in pressing the cotter pin accurately without any damage. The prominent function of servo press is to press a cotter pin accurately and is found to be more accurate than traditional presses such as hydraulic and pneumatic press.

V. REFERENCES

1. https://www.google.co.in/url?sa=t&source=web&rct=j&url=http://www.raa.ca/magazine_pdf/tech%2520articles/Cotter%2520Pins.pdf&ved=2ahUK Ewj8yLH5ncXZAhULQ48KHUEzCuoQFjAAegQ IARAB&usq=AOvVaw1JzAudFpyrRgI6mjR9xqiu
2. Lotus Seven S4 (Type 60) Restoration: Installation of Front Stub Axles, Wheel Bearings and Hubs” -Andrew R. Barron .This work is produced by Opens tax-CNX and licensed under the Creative Commons Attribution License 3.0†
3. Lee Ellard, national sales manager, stamtec, inc. STAMTEC metal stamping and forming equipment
4. www.ksrbg.com
5. www.machinedesign.com
6. <https://www.hunker.com/12000153/pneumatic-pres-vs-hydraulic-press>
7. <https://www.machinemakers.typepad.com>
8. <https://www.fagorarrasate.com/product/8/servopress.aspx>

9. https://www.da7c.co.uk.in/booksid+nBvefxD_OagC&pg=PA553&lpg=PA553&dq=cotterpi+pin+in+stub+axle&sourcesbooks.google.co.in10.http://www.da7c.co.uk/technical_torque_articles/king_pin_renewal.html
10. 11.<https://Basicstudyondynamiccharacteristicsforservopressmachine-ieeeexplore.org>.
11. 12.<https://www.siemens.com/global/en/home/products/automation-software/tia-portal/software.html>.
12. 13.<http://www.fagorarrasate.com/product/8/servopress.aspx>
13. 14.<https://www.hunker.com/12000153/pneumatic-press-vs-hydraulic-press>
14. 15.<https://www.linkedin.com/pulse/analysis-working-principle-electric-servo-press-haloong-press-machine>