

Using PLC to Control an Automatic Flat Fabric Pressing Machine

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ABSTRACT

Heat-using fabric presses are used a lot in the textile industry, in many different stages. There are many types of heat press machines from many different brands on the market. Research and application of PLC to control flat-plate automatic fabric pressing machines for teaching at Hanoi University of Textile and Garment Industry is the main content of the article. The design calculation of the flat plate automatic fabric press is carried out in the main part, which is the control part. Although the design and calculation are quite simple, it can help learners solve many theoretical and practical problems. This is a solution to improve training quality.

KEYWORDS: PLC, automatic heat press machine, automatic fabric pressing machine, teaching.

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I. INTRODUCTION

Heat press machines are indispensable equipment in the garment industry, used for fabric pressing and heat transfer printing. It operates on the principle of using high temperature and pressure, helping to flatten the fabric and transfer graphic images to the surface of the material to be printed as required. Using a heat transfer press brings many practical benefits such as allowing layers of materials to be pressed, printing, pressing all kinds of images and logos designed onto many different materials easily, quickly, and safely. Ensures high productivity and sharp, beautiful print quality. In addition, using a heat press machine also ensures high safety, accuracy and reliability. Research into the design and manufacture of automatic plate heat presses in Vietnam is currently very limited, although this is a popular device in the garment industry. At Hanoi University of Textile and Garment Industry, when lecturers teach and students research equipment in the garment industry, they encounter many difficulties. Drawings, 3D models, and machine models are not available. In addition, machine manufacturers do not provide drawings, 3D models, and miniature models, so access to learning, research, building drawings, and designing control systems faces many difficulties. Researching the application of PLC to control flat-plate automatic fabric presses for teaching at school is necessary to meet the needs of studying and researching the design of industrial machines in general and sewing equipment in particular.

3D model of flat plate automatic heat press machine as Figure 1.1.

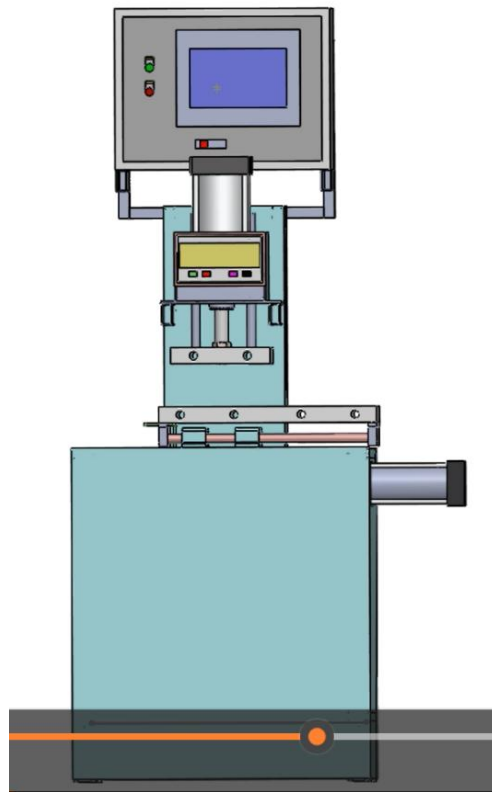


Figure 1.1 The 3D model of flat plate automatic fabric press

II. OVERVIEW OF HEAT PRESS MACHINE

2.1 Research situation abroad

Heat press machines are indispensable equipment in the garment industry, used for fabric pressing and heat transfer printing. Heat presses operate on the principle of using high temperature and pressure, helping to flatten the fabric and transfer graphic images to the surface of the material to be printed as required.

Using a heat press machine brings many practical benefits such as allowing layers of materials to be laminated, printing, pressing all kinds of images and logos designed onto many different types of materials easily, quickly, and securely. High productivity, beautiful appearance. In addition, using a heat press machine also ensures high safety, accuracy and reliability.

The machine operates on the principle of using temperature and pressure to apply decals and print images and patterns on the surface of the material to be printed, making the products flat, beautiful, rich and diverse.



Figure 2.1 The Flat heat press

2.2. Research situation in the country

There is very little research into the design and manufacture of automatic plate heat press machines in our country, although this is a popular device in the garment industry. Furthermore, the flat-plate automatic fabric pressing machine model allows automatic factors such as temperature, pressing force, pressing time, 3D models of the machine, and design drawings to serve continuous training. major in the field of mechanical and electrical engineering at the school

Conclusion: Heat press machines help print and press images of patterns, logos... onto different materials, making products beautiful, attractive, and diverse to serve people's fashion needs. In the textile industry in Vietnam, many types of heat presses are used as described above, most of which are imported from China and Taiwan. Automation is still not high and depends heavily on people. However, with the goal of researching and mastering technology to serve the school's teaching, the research team conducted research on applying PLC to control an automatic flat-plate fabric press using pneumatic cylinders to perform the tasks. stated goal.

III. DESIGN A CONTROLLER USING PLC

3.1. Control Requirements

The automatic press is set up to press automatically with parameters such as temperature, pressing time and pressing force. With pre-adjustable pressure depending on the thickness and properties of the material to adjust contraction accordingly. The operating mode is as follows: press the Start button, cylinder 1 will push the heating plate slowly down to heat press the product. predetermined pressing time. After pressing, cylinder 1 goes up and cylinder 2 brings the next pressing plate into the pressing position. The product is released and finished one pressing. The pressing process is repeated by pressing the start button after each cycle. The operation is repeated until the machine stops. All temperature parameter settings, pressing time and actuator operations are controlled by PLC.

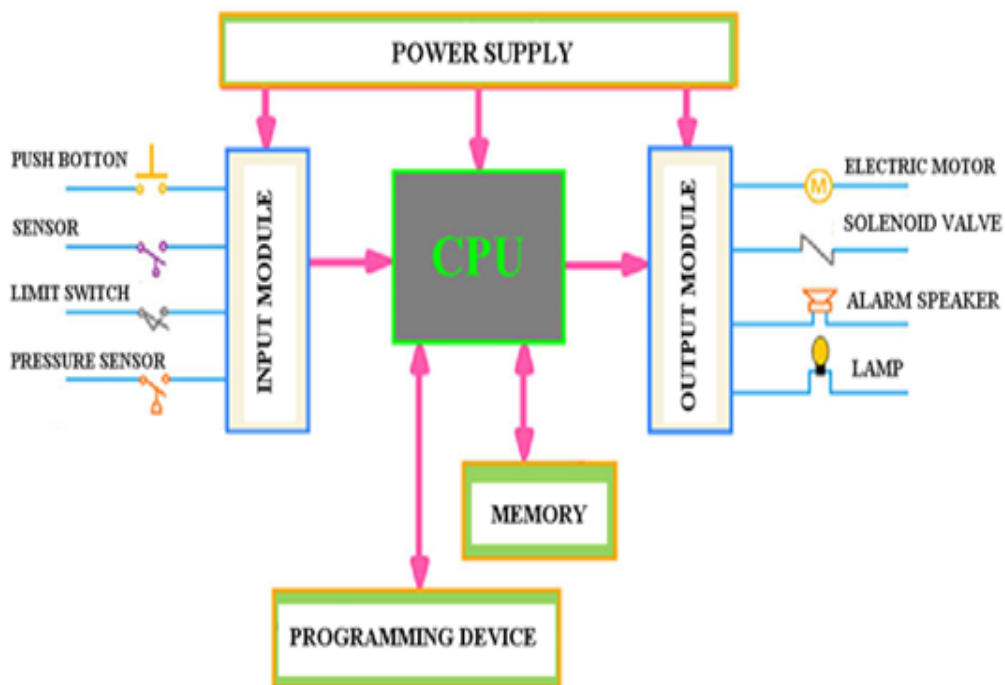


Figure 3.1 The system using PLC

3.2. Control design

The PLC control system of the automatic flat plate press is controlled by a central CPU controller that controls all operations of the PLC. The processing speed of the CPU determines the control speed of the PLC. The program is implemented according to the algorithm (Figure 3.2) set up to control the heat of the pressing table and product pressing time with the PLC control system diagram (Figure 3.3).

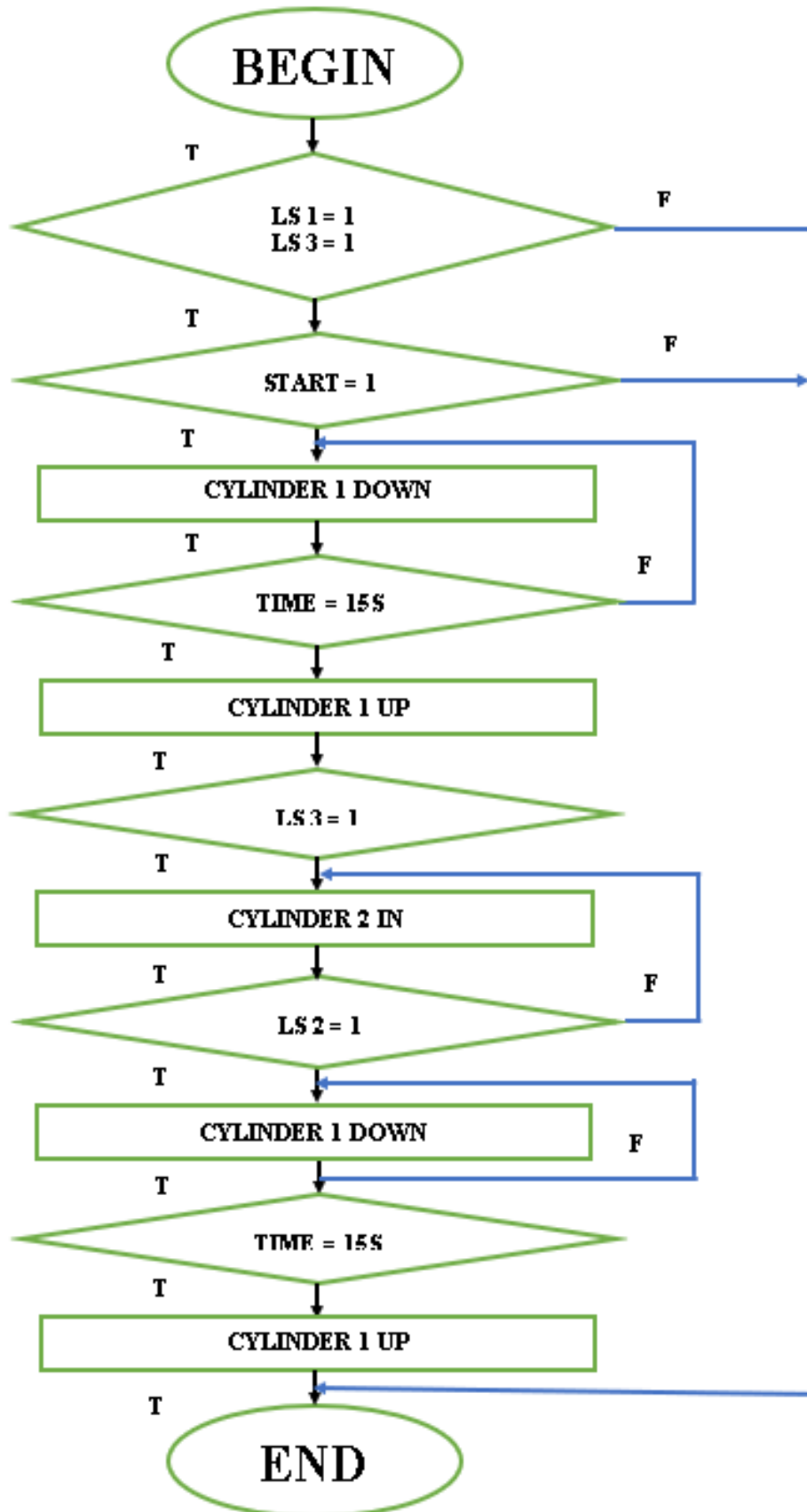


Figure 3.2 The flow chart of the algorithm

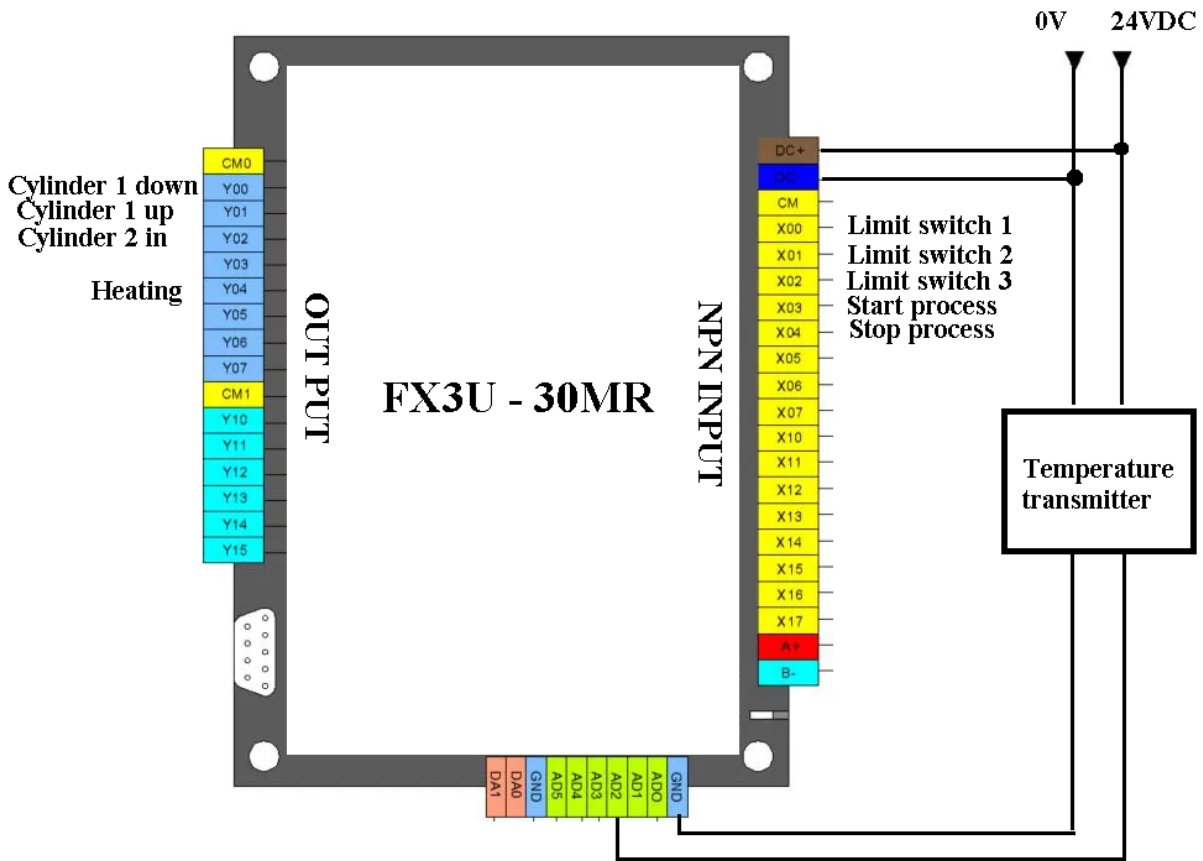


Figure 3.3 The control system using PLC for the press machine

The press is designed with compressed air pumped from the source through the air filter → to 2 5/2 solenoid distribution valves and then through the throttle valves → into the cylinders to convert kinetic energy into movement of the pistons. One valve coordinates the movement of the Press Cylinder with the up and down strokes, one valve coordinates the movement of the Horizontal Push Cylinder of the lower press table (Figure 3.4).

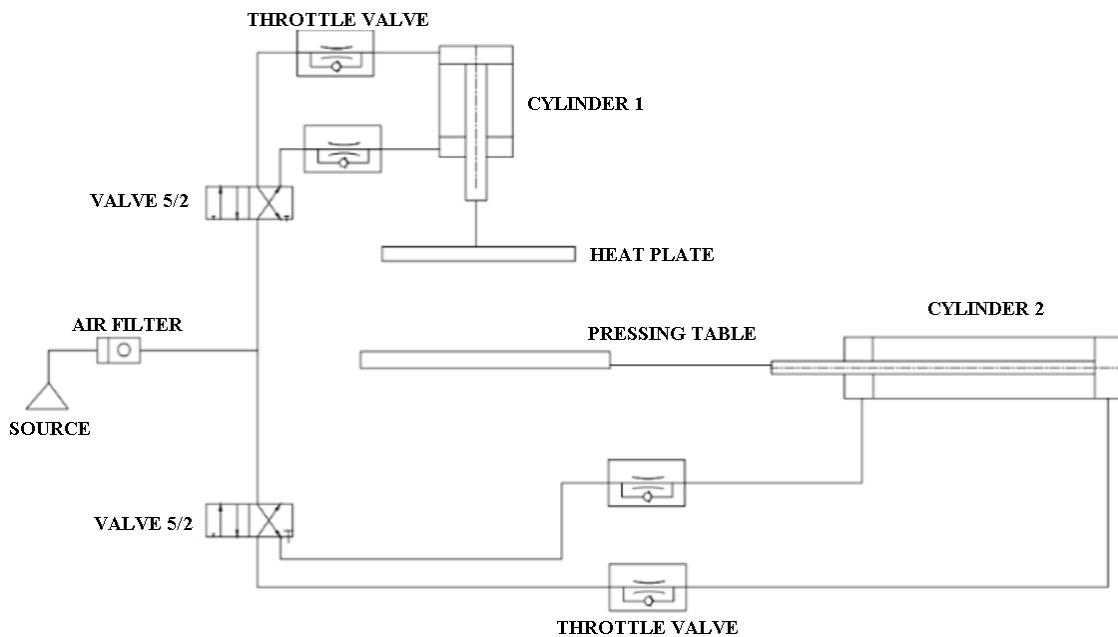


Figure 3.4 Pneumatic circuit diagram

Evaluation:

The working modes of the machine include: the machine is tested in different working modes such as: load mode, no-load mode. In idle mode, the machine operates properly according to the installed parameters and cycles. In load mode, the press was tested on several types of fabric: 100% cotton fabric, at temperature 1800C, pressing time 15s, pressing force 50kg = 500N; 65/35 cotton fabric, at temperature 1700C, pressing time 10s, pressing force 50kg = 490N; nylon fabric, at a temperature of 1200C, pressing time 10s, pressing force 40kg = 390N.... As a result, the machine operates according to the parameters and installation cycle, the quality of the pressed fabric meets the requirements.

Conclusion

PLC has been widely applied in industries in general and the textile industry in particular. The article has researched an overview of press types and control methods, thereby building a PLC control system for flat-plate automatic fabric presses to control temperature and time parameters to suit the needs of the press. Suitable for pressing fabrics in the garment industry.

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