PLC Programming and Panel Wiring for Plywood Cutting Machine

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Abstract-A cutting tool or cutter is typically a hardened metal tool that is used to cut, shape, and remove material from a work piece by means of machining tools as well as abrasive tools by way of shear deformation. Choosing an automatic fabric cutting system means extreme precision as well as speed and efficiency. This type of cutting system makes it possible to speed up cutting, even particularly difficult materials, and reducing times while increasing production volumes. Potential injuries from shear or cutting point hazards include amputation, lacerations, contusions, crushing of tissue, and broken bones. Due to the speed of mechanical parts, injury is inevitable when a body part comes in contact with a shear or cutting point. This process requires expertise in electrical engineering, programming, and automation.
Keywords: PLC, SMPS, STEPPER MOTOR, HMI.

I.INTRODUCTION

The first step in designing a control system for a plywood cutting machine is to select a PLC that can handle the necessary inputs and outputs. The PLC will be responsible for receiving input signals from sensors, processing them, and sending output signals to control the cutting machine's various components. Next the control system's architecture should be designed to ensure that all components of the machine can communicate with each other and that the PLC can execute the necessary control logic.

This may involve designing a custom control panel with the appropriate switches, buttons, and indicators. Once the control system's architecture is established, the PLC program can be written to implement the control logic required for the machine's operation. This typically involves developing code to monitor sensor inputs, control the motor driving the saw blade, and communicate with the operator via

II.MOTIVATION TOWARDS THE WORK

The main motive is to provide PLC programming and panel wiring arises from the need for increased precision, efficiency, and safety in the cutting process. Traditionally, plywood cutting has been performed using manual saws or other cutting tools, which can be time-consuming and imprecise, leading to increased waste and decreased productivity. Automated cutting machines have been developed to address these issues, but they often lack the level of control and precision required for the most demanding applications. PLC programming and panel wiring can provide a high level of control and precision in the cutting process, allowing for accurate and repeatable cuts with minimal waste.

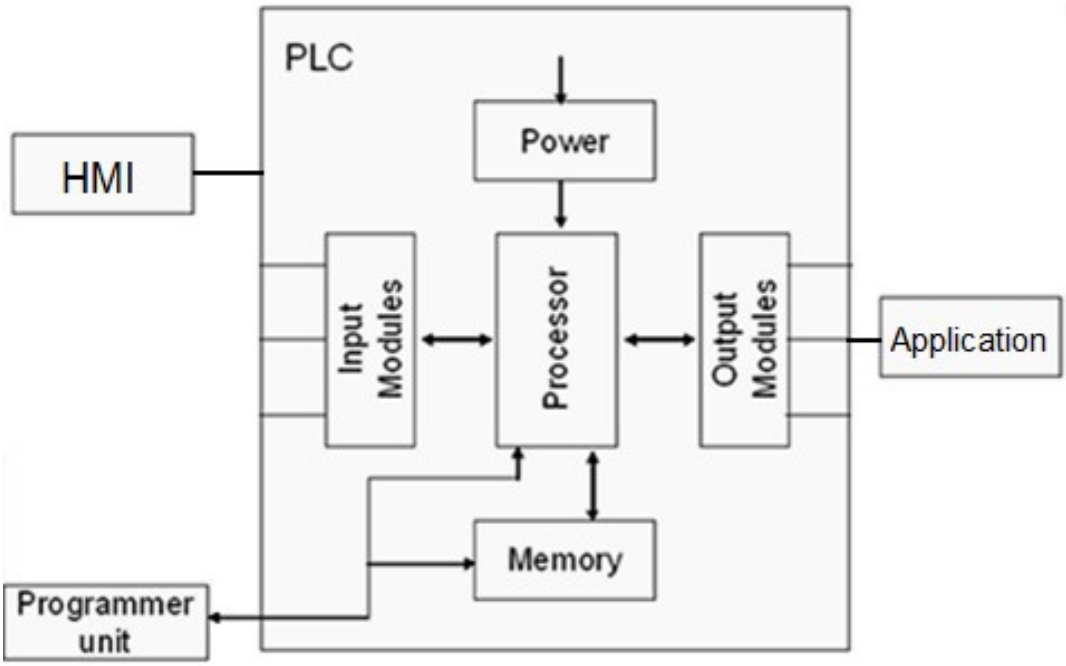
III. LITERATURE REVIEW

Kanchan Pandita et AL describes the Stepper Motor Driven Three Axis Robot using PLC describes how to prepare a PLC program that calculates the path coordinates and also drives the stepper motor. They have also prepared a HMI program that allows the user to control the system directly using buttons. Here a joystick has been used. Initially, a joystick is used to teach the robot learn the path and then the robot will perform the same function after some desired accuracy. A stepper motor-driven three-axis robot is a type of industrial robot that uses stepper motors to control the

movement of three axes, typically X, Y, and Z, to perform a specific task. The stepper motors are controlled by programmable logic controllers (PLCs), which are used to sequence and coordinate the movements of the robot. The PLCs are essentially specialized computers that receive inputs from sensors and other devices and use this information to control the movement of the stepper motors. The PLCs are programmed with a specific set of instructions that tell the stepper motors how to move in response to different.

IV.OBJECTIVE OF THE PROJECT

- To controls the movement of the cutting blade and the positioning of the plywood sheet.
- Reduces waste and breakage.
- Reduces human correction errors

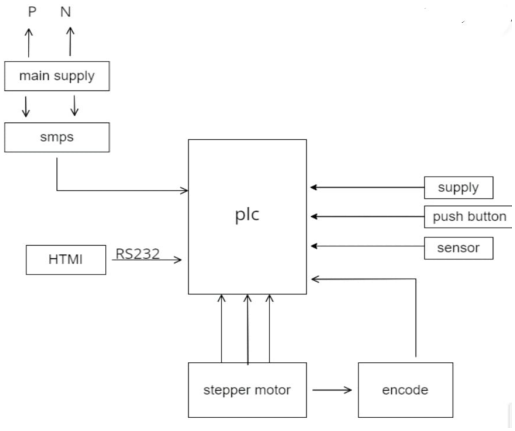


V. PROPOSED SYSTEM

The first step is to determine the requirements of the plywood cutting machine, including the size of the plywood sheets, the cutting patterns, and the required accuracy. Once the requirements are known, the appropriate (PLC) can be selected that can handle the necessary inputs and outputs. The control system's architecture should be designed to ensure that all components of the machine can communicate with each other and that the PLC can execute the necessary control logic.

VI.COMPONENTS DESCRIPTION

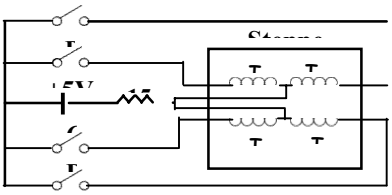
Stepper motor



A stepper motor is a type of electric motor that rotates in small, precise steps instead of continuously like a typical AC or DC motor. The motor's rotation is controlled by sending electrical pulses to its coils, which cause the motor to move in small increments of a fixed angle, typically 1.8 degrees per step.

Fig. 2 TheDrivingCircuitaStepperMotor.

HMI



Human-Machine Interfaces (HMIs) are systems that allow humans to interact with machines, devices, or software applications. The purpose of an HMI is to provide a user-friendly interface that enables users to operate and control a machine or system. HMIs are commonly used in industrial settings, such as manufacturing plants and process control systems, but are also found in consumer products such as home automation systems and automobiles.

ENCODER

An encoder is a device used to convert mechanical motion into digital signals that can be read by a computer or control system. Encoders are commonly used in a variety of applications, such as robotics, machine tools, and industrial automation systems, to provide accurate position and speed feedback.
There are two main types of encoders: incremental and absolute. Incremental encoders provide information about changes in position, while absolute encoders provide information about the exact position of a rotating shaft or linear motion.

SMPS

A switched-mode power supply (SMPS) is an electronic circuit that converts electrical power from one form to another, typically from AC (alternating current) to DC (direct current). SMPS is used in a wide range of applications, including computers, consumer electronics, industrial equipment, and telecommunications equipment.
The basic principle of an SMPS is to switch the input voltage on and off rapidly to generate a high-frequency signal. This signal is then converted to a different voltage level or type of power, depending on the application. SMPS circuits typically include a rectifier, filter capacitor, switching transistor, and transformer. The rectifier converts the input AC voltage to DC, which is then filtered by a capacitor to smooth out any fluctuations. The switching transistor then rapidly switches the voltage on and off to generate the high-frequency signal, which is then passed through the transformer to convert the voltage to the desired output level.
Proximity sensors

Proximity sensors are electronic sensors that detect the presence of nearby objects without physical contact. These sensors are commonly used in industrial automation applications, such as machine control and material handling systems.
There are several types of proximity sensors, including inductive, capacitive, and photoelectric sensors.

VII.RESULT

The cutting-edge side rake influences cutting resistance and therefore the whole process of crosswise woodcutting. Figure 5 shows a great increase of measured value at the beginning of the tool's penetration of the wood, followed by a decrease as a result of inertia of the circular saw and completion of the cutting process. Afterwards, the cutting process runs at a constant value (the torque value is changed very little), only rotating without any loading at the end of the process. The course of torque M_k during the cutting process of circular saws made of high-speed steel (Fig. 6) is characterized by a rapid increase to a maximum value, a small decrease to an intermediate value, and a rapid decrease as the cut is completed.

VIII.CONCLUSION AND FUTURE SCOPE

1. To Increased accuracy: PLCs can provide precise control over the positioning and movement of the cutting blade, resulting in more accurate cuts and reduced waste.
2. To Improved safety: PLCs can be programmed to incorporate safety features such as emergency stop buttons and safety interlocks that help prevent accidents and injuries.
3. To Increased productivity: By automating the cutting process, PLCs can improve the speed and efficiency of the production line, resulting in higher productivity and throughput.

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