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Design a Prototype of Automatic Shearing Machine Using Arduino UNO

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Abstract - The design and development of a prototype automatic shearing machine powered by an Arduino UNO micro-controller are presented in this project. The goal is to develop a flexible and effective system that can automate the shearing process for a range of materials, including textiles and metal sheets. The incorporation of Arduino UNO guarantees accurate regulation and program-ability, permitting flexibility in response to varying shearing specifications.All things considered, this Automatic Shearing Machine prototype offers an affordable and flexible solution for sectors needing automated shearing procedures. Because of its incorporation of Arduino UNO, it can be customized and improved upon continuously, which makes it appropriate for a variety of applications in many production sectors.

Keywords—*Prototype, Shearing machine, Arduino UNO, Flexible*

1.INTRODUCTION

In the rapidly evolving landscape of manufacturing and automation, the integration of advanced technologies is becoming increasingly vital. One such innovative application is the development of an Automatic Shearing Machine, designed to streamline and enhance the efficiency of material cutting processes. This project revolves around the utilization of Arduino UNO, a versatile microcontroller, to create a smart and automated shearing machine. The traditional shearing machines require manual operation, which can be time-consuming, labor-intensive, and prone to errors. The incorporation of automation in shearing machines not only improves precision but also contributes to increased productivity. By leveraging the capabilities of Arduino UNO, we aim to design a cost-effective and user-friendly solution.

Shearing labor is often done by hand, mechanically, hydraulically, or pneumatically; lighter shearing is done with the manual and pneumatic varieties. The mechanically eccentric shears have a high output rate.

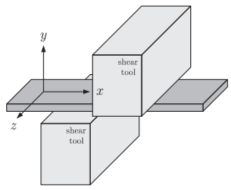

Fig1: Schematic 3D representation of shear geometry with definition of the coordinate system used

2. Body of Paper

Ease Of Use: During a visit to the V.S recruitment for sharing machine to cut 5 mm thick sheets off stainless steel these are various sharing machine available in the market to perform the this task. But the general manager at V.S Auto Tech Pvt. Ltd., is insisting to design and fabricate the machine in Auto Tech Pvt. Ltd., it was relevant that there is a house. After a detailed conversation with the general manager it was decided that the designing and optimizing part of the shearing machine would be executed. In this project, the design and optimization of a sharing machine which is capable of cutting 5 mm thick stainless steel sheet will be designed using Arduino. With this project the company will be benefited from the advancements of computer technologies and thus will be able to reduce cost of procuring a sharing machine.

A. Problems: Existing process require high labourcost.Existing process require high process time.Many accidents encountered with existing process.

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B. Requirements:Process should decrease the labour cost.It should cut minimum 5mm thick plate.To increase workers safety.Process should increase the productivity.

3.Methodology

Flow of working designs created for our project are then put into practice throughout the project's prototyping stage. The detailed actions conducted during this phase are displayed in fig. below. It is made up of a slider module and stepper motors. The synchronous belt that drives the slider's placement is precisely positioned and/or its speed is controlled by the stepper motors. It simply has two axes: the X and Y axes, which are used to control and move the slider diode and are driven by stepper motors. Programming is done with the Arduino program.

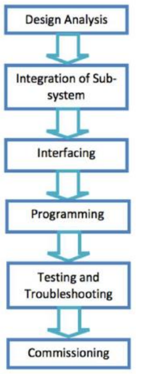

Fig 3: Flowchart of project

working principle

The 60 RPM DC geared motor drives the conveyor belt, ensuring a continuous feed of the foam sheet through the cutting area. Two metal-geared 9-gram servos control the gripping mechanism from above, securing the foam sheet in place for precision cutting. The other two metal-geared 9-gram servos control the vertical movement of the cutting blade, allowing for precise and controlled cutting. The Arduino UNO board coordinates and controls the entire operation, processing user inputs and generating output signals to control the servos.

1. Components Used:

1. Arduino UNO Board:

Fig 5: ARDUINO UNO Board

The Arduino Uno is a popular open-source micro-controller board based on the ATmega328P micro-controller chip. Here are some key features and details about the ATmega328P micro-controller

2. 60 RPM DC Geared Motor

A direct current (DC) motor with a gear reduction mechanism that produces an output shaft rotation speed of 60 revolutions per minute is known as a 60 RPM (Revolutions Per Minute) DC Geared Motor. These motors are frequently employed in many different applications where a particular torque and speed are needed.

Fig 6: 60 RPM DC Geared Motor

2. Project Working

•The 60 RPM DC geared motor drives the conveyor belt, ensuring a continuous feed of the foam sheet through the cutting area.

•Two metal-geared 9-gram servos control the gripping mechanism from above, securing the foam sheet in place for precision cutting.

•The other two metal-geared 9-gram servos control the vertical movement of the cutting blade, allowing for precise and controlled cutting.

Fig 7: Set up of project

•The Arduino UNO board coordinates and controls the entire operation, processing user inputs and generating output signals to control the servos.

Fig 8: Side view of project

3. CONCLUSION

1. It is reasonable to assume that shearing time will rise with cut length.

2. Shearing time is significantly influenced by cut width. Shear time grows in tandem with the cut's width.

3. A similar tendency of longer shearing times was noted when shearing GI sheets with gauges 25 and 23, as the specimen's length and width increased.

4. As sheet thickness increased, an increase in shearing time was noted.

5. The 28 gauge sheet, measuring 45 mm in width and 45 mm in length, required the least amount of shearing time.

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