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Evaluating Electromagnetic Embossing Machines

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Abstract

Embossing is traditionally done by hand in various manufacturing industries, employing a jig and fixture. Mechanical, pneumatic, or hydraulic machines are used for embossing. These machines are more expensive to manufacture, install, and maintain, and their operating costs are also higher. This machine is defeated by an electromagnetic embossing machine. To create forces, we propose an embossing machine with an electromagnetic coil coiled around a metal core. The goal of this endeavour is to create a machine that can aid in decreasing human effort. This machine will meet the fundamental demands of the industries at a low cost, with simple installation and better operator safety and precision.

Keywords: *Iron core, embossing, and electromagnet*

INTRODUCTION

In today's fast-changing environment, the technical production process must be less time-consuming and more efficient. This results in the development of different new types of machines that are efficient, inexpensive, and simple to maintain. Our primary goal is to create a low-cost, efficient, low-power-consuming embossing machine for lower-capacity jobs such as plastic embossing and aluminium foil embossing. As 230v power is given to the system, EMF induces force in the electromagnet. The workpiece is embossed using an electromagnet embossing machine. Because copper is an excellent conductor of electricity, the machine has a copper coil winding. The operation of an electromagnet is based on Faraday's law. According to Faraday's law,

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when a conductor is put in a magnetic field, an electromotive force is created.

OBJECTIVE

- To preserve precision.
- Create an automation unit for embossing so that the machine may be readily integrated into today's automated industries.
- To carry out the most difficult procedures

PROBLEM DEFINITION

- Machines for pneumatic embossing:
- More floor space is necessary owing to the compressor, air filter, tube, drier, regulators, and other components.
- Seal leaks might result in energy loss.
- The operation gets loud.
- Hydraulic embossing presses:
- Hydraulic fluid is frequently corrosive.
- Energy loss due to friction
- Internal component damage
- Machines for mechanical embossing:
- Frictional power losses
- Operation becomes noisy.

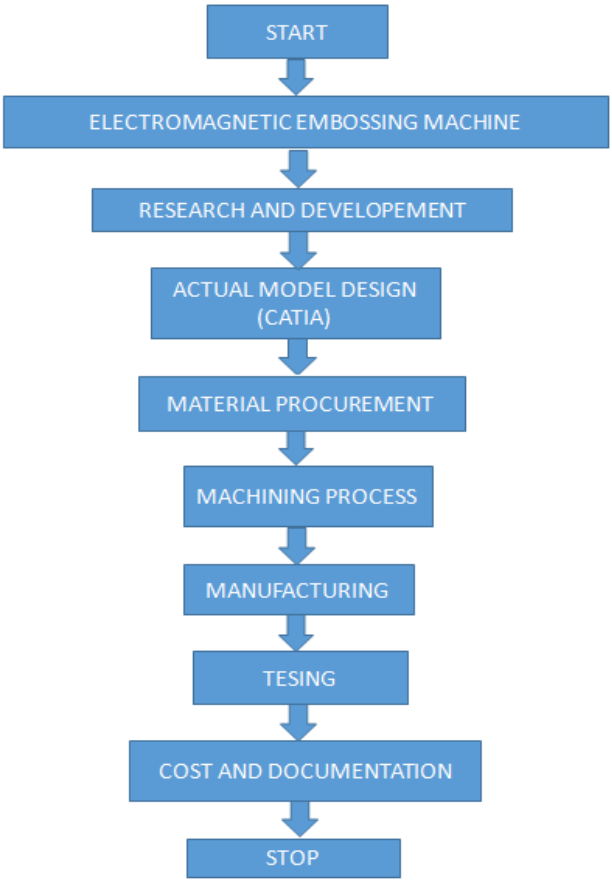


Figure 1: Methodology

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LITERATURE REVIEW

- Swati Datey, Akhilesh Solanke, and Rajat Kokate evaluate an electromagnetic embossing machine. This paper is a review of research on an electromagnet that operates on Faraday's law. Embossing machines are used in the industry for low-cost automation.

- Daraniya Divy, Vaghela Harshit, Rajgor Ratna, and Turakhi Samveg conducted research on Electromagnetic Multipurpose Machines. In this paper, we look at how mechanical, hydraulic, and pneumatic forces are employed to drive a machine that generates a lot of friction. Investigate electromagnetic force calculations.

- An investigation on a multi-operational electromagnetic shaping machine Tejas Phage, Abhishek Rane, G Pendurkar According to this paper's evaluation, it is a very flexible technique in which the capacity of the machine may be adjusted by adjusting the electromagnet.

- Suraj P Jagtap, Prasad Kulkarni, and Vivek Kumar conducted research on the Design and Fabrication of Electromagnetic Press machines. In this research, we look at a machine that can help industries boost efficiency by minimizing the need for human labour. Low maintenance is required since there is no working media leakage. Simple operation with a high output rate.

- Dhiraj Gayakwad, Mahesh K Dargar, and R S Rana conducted research on a review of the Electromagnetic Forming Process. In this work, we look at magnetic flux, magnetic density, MDF sheet mass, electromagnet electrical power, and magnetic flux density estimates.

- Shubham S M Shubham conducted research on the design and manufacture of an electromagnetic punching machine.

- Chaitanya L. and Mhetre In this paper, we look at spring calculations, spring design, and electromagnet force.

Construction and Working

Machine embossing is done using electromagnetic force in electromagnetic embossing. The power supply is linked to the electromagnet, and EMF stimulates the iron core to create force. The circular plate is connected to the PVC pipe. It is a metal

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that is not magnetic. The bottom platform, middle plate, and top plate are all drawn on an MDF sheet. After that, the materials are cut with a jig saw cutter. Studs, nuts, and bolts are used to secure them in place. A plastic core is used to draught the electromagnet. The iron core is firmly inserted into the plastic pipe. Steel pipe, MDF sheet, copper wire, embossing tool, springs, PVC pipe, and other materials are utilized in electromagnetic embossing machines.

When the electromagnet is activated, the iron core becomes attracted to it (according to faradays law). Two helical springs are fastened to the centre of this plunger. Attachments are used to attach the embossing tool to the opposite end of this PVC plunger. When power is applied to the electromagnet, it becomes magnetic, and the iron core slides downward.

Suddenly, the embossing tool is forced against the work piece, and the embossing procedure is completed. When the electrical current is turned off, the plunger reverts to its original position utilizing spring tension, and the embossing operation is completed. The return stroke on this machine is not powered by electricity. As a result, this machine is built and functional.

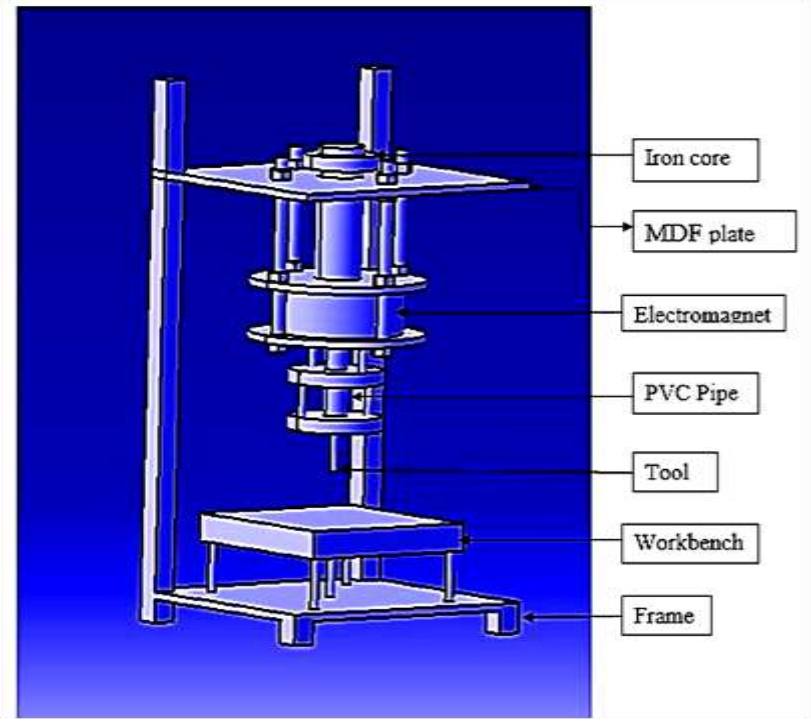


Figure 2: Experimental setup.

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CONCLUSION

This equipment is used in the creation of embossing operations. After creating an actual functioning model, this machine will be valuable for the industry to boost efficiency by decreasing labour and allowing for simple operation at a high rate of production. It is an extremely adaptable method in which the capacity of the machine may be modified simply by adjusting the magnets. Power usage is lower as compared to a typical machine. The foregoing result suggests that total costs can be decreased.

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