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Automatic Table Top Injection Molding Machines

Pratik Ashwinikumar Birari, Swati Dnyaneshwar Borade,
Arnav Sanjay Jadhav, Samruddhi Vishwanath Demse
Guru Gobind Singh Polytechnic Nashik, Maharashtra, India

Abstract: *This project focuses on the design and development of an "Automatic Tabletop Injection Molding Machine," a compact and user-friendly system for rapid prototyping and small-scale production of plastic parts. The machine incorporates automated functions, including material feeding, injection, cooling, and part ejection, minimizing manual intervention and enhancing efficiency. The system utilizes a microcontroller-based control system to regulate the injection process, ensuring precise control over parameters such as temperature, pressure, and injection time. The machine is designed to be compact and easily adaptable to various Mould configurations, making it suitable for educational, research, and small-scale manufacturing applications. The project aims to provide students with valuable hands-on experience in areas such as mechanical design, electrical engineering, control systems, and manufacturing processes, while also contributing to advancements in rapid prototyping and low-volume manufacturing technologies*

Keywords: Design and development of an automated tabletop injection molding machine

I. INTRODUCTION

In earlier studies, Injection molding is one of the widely used manufacturing processes for manufacturing plastic products. More than 30% of the weight of all plastic products is manufactured using the injection molding process. Besides plastic products, injection molding is mainly used in the automotive, medical, and electronics industries. High production rate and quality are some of the significant advantages of injection molding. The finished products from injection molding require minor finishing operations, which is another advantage However, the equipment used in injection molding can be quite expensive and sophisticated, so injection molding is not suitable for small-scale production.

Injection molding is melting plastic consisting of two types of thermoplastic polymers and thermosetting polymers. The machine injects the pressure onto the mold cavity that fills and solidifies the molten plastic to produce an end product. A whole injection molding process consists of three stages that are filling, postfilling, and mold opening. Some of the the cooling time by implementing modifications in mold design. Cooling channels in mold helps to reduce the cooling time and decrease the cycle time. More production cycles can be completed by decreasing cycle time, improving the industry's productivity. Injection molding is prone to defects, and some of the common defects are flow lines, weld lines, flash, and sink marks. Injection speed, pressure, and mold design are essential in reducing defects. Most of the defects are caused by improper injection pressure and temperature control. So, control over these parameters is crucial in reducing defects. Traditional methods rely on the operator's expertise and conventional defect detection techniques. These techniques are unreliable and time-consuming, and hence they increase the lead time and reduce the industries' productivity. So, there is a need for faster monitoring. Implementing machine learning techniques in injection molding can be a better alternative to traditional methods. Although establishing a machine learning network can be expensive, it is profitable in the long run. Machine learning techniques can also be used in optimizing the mold design to reduce the cooling rate and improve the quality of the final product.

II. PROPOSED METHODOLOGY

1: Basic Information &amp Literature survey.

This project report discusses about how to use literature data and identify the problems from field. By studying the literature of previously available system that help in maximizing the output by minimizing the effort, cost, time and money in future develop new machine.

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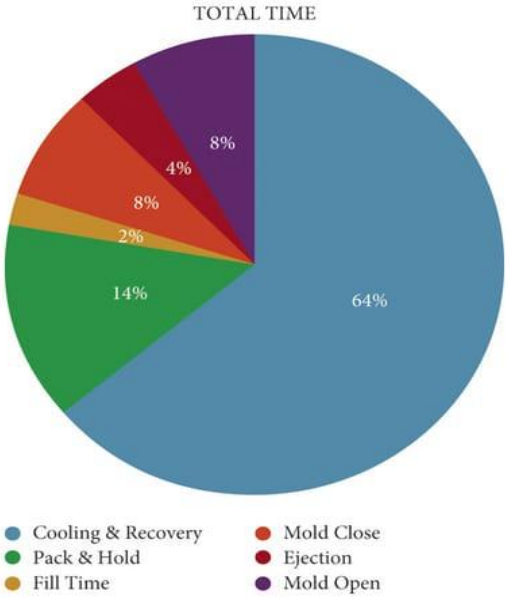
2: Identify and Design of Machine Components Available in Market.

This project work will first introduce the background of the study. Presents the design constraints that influence on the use, efficiency and benefits their impacts on machine After that machine part design all different existing machine assembly unit swill done to make a probable machine model.

So, injection molding offers an excellent material choice.

One of the significant advantages of injection molding is its higher production rate. The injection process can be automated, and as a result, the production capacity can be tremendously improved. Usually, injection molding is utilized in the production of smaller parts. More extensive parts required more giant molds and more material to fill the mold, impacting its production rate and efficiency. So, the speed of injection molding depends on the size and complexity of the mold. Labor costs are also drastically reduced due to the automation of injection molding. Another advantage of injection molding is that complex parts can also be molded. Thus, injection molding offers design flexibility. Injection molding is capable of producing accurate parts, maintaining good dimensional stability. So, as a result, the scrap resulting from production is meager. Since injection molding is mainly used to produce parts from non-biodegradable materials like plastics and polymers, keeping the scrap rate minimum is essential. The postproduction or finishing work required after production is also low as high dimensional stability is maintained, and surface finish is also good.



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Cost of the machine

Sl. No	Part	Rate
Material Cost		
1	Injection unit-Barrel, Screw, Nozzle, Heater band, Barrel insulator, Tip insulator	RS 8000
2	Clamping unit-Mold, Clamping Vice	RS 10000
3	Heating systems- Heating bands specifically designed for polypropylene,Voltageregulator-temperaturecontrollerspecifically Designed for polypropylene	RS 10000
4	Frame and base, Frame members, Base plate, Leveling feet	RS 8000
Manufacturing Cost		
5	Lathe, Welding and Other Machining Cost	RS 9000
Overhead Charges -10% o fMaterial & Manufacturing Cost		
Total Cost=Material Cost + Manufacturing Cost + Overhead charges= RS. 45000		

III. CONCLUSION

1. By achieving these objectives, these machines empower businesses to meet increasing demands for high-quality plastic products while optimizing production efficiency and minimizing costs.

Maximize productivity

* Ensure consistent quality
* Enhance workplace safety
* Reduce operational costs
* Increase manufacturing flexibility
* Faster cycle

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