

# **EXTRU-INJECTION PLASTIC MOULDING MACHINE**

**Mr. D. S. Wagh<sup>1</sup>, Mr. P.V. Dongre<sup>2</sup>, Mr. S.S. Jadhav<sup>3</sup>,**

**Ms. A.K. Patil<sup>4</sup>, Mr.M.A.Deore<sup>5</sup>**

<sup>1,2,3</sup> *Diploma in ME, Guru Gobind Singh Polytechnic, Nashik, Maharashtra, (India)*

<sup>2</sup> *Lecturer in Mechanical Engineering Department,  
Guru Gobind Singh Polytechnic, Nashik, Maharashtra, (India)*

## **ABSTRACT**

*Extru-Injection plastic molding machine is the combination of two different plastic molding processes i.e. Extrusion molding (Horizontal Single Screw) & Injection molding (Vertical Hand Operated). This machine includes the advantages of both Extrusion & Injection Process. This machine is designed to overcome the restrictions occurs in Injection & Extrusion of plastic. It is the simple plastic molding machine which is use at primary level of production i.e. Home purpose. According to present conditions machines are not suitable for primary use, for the reason that are containing high investment cost as well as adaptation cost (Cost requirement for new Mould designing & machining or manufacturing).This Machine is able to work at two different situation or processes (parallel / serial) that is ,it can make extrusion products & injection products at the same time as well as combine products of extrusion & injection, which will economical affordable for primary production.*

**Keywords: Extrusion (Horizontal Single Screw), Injection (Vertical Hand Operated),Plastic Moulding, Primary production**

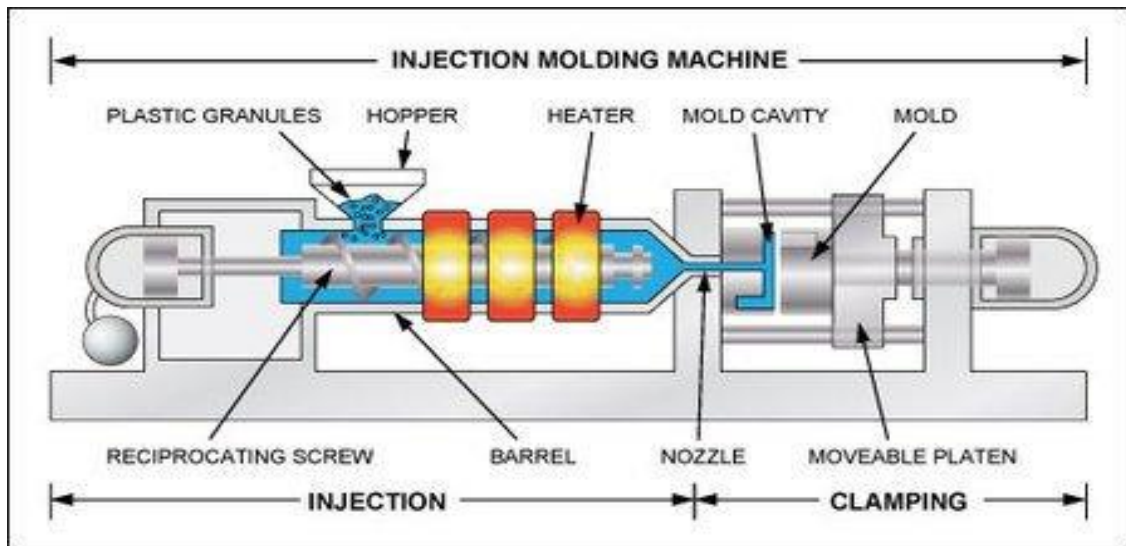
## **I INTRODUCTION**

For producing parts by injecting material into a mold, Injection molding process is used. Injection molding can be performed with a host of materials, including metals, (also called as die-casting), elastomers, glasses, confections, and most commonlythermosetting andthermoplastic polymers. Substantial for the part is fed into a heated barrel, mixed, and forced into a mould cavity, where it cools and hardens to the shape of the cavity.

### **1.1 Injection Molding**

Injection moldingmaybe the most common and important of all plastic processing processes. The process is extremely versatile. With the use of multi-sided molds, one can produce very complex shaped parts. Even parts

with metal inserts can be produced. While injection molding dies are expensive to produce, each die can be used to make thousands of components at very rapid rate, so that per-part cost is very low. The simplest form of injection molding is shown in the schematic below.



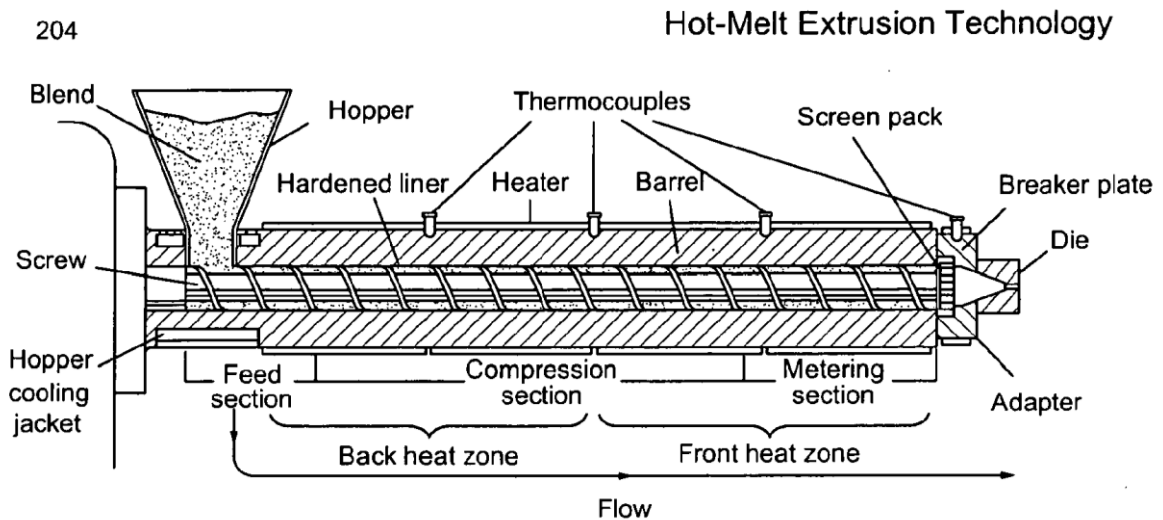
**Figure 1. A simple reciprocating screw injection molding machine**



**Figure 2. Examples of Injection Molding Parts**

### 1.2 Extrusion

Extrusion can be used for thermoplastics. The raw material can be used in the form of mattress (~10mm sized pieces), granules (~5 mm), or powder. Extrusion machines are used to make long pieces of constant cross-section. The cross-section geometry is available in complex shapes, may be solid or hollow. Usually, extruded parts are used as raw stock for use in manufacture of other products (e.g. channels on the sides of windows, etc. Plastic extruded parts are used in many fittings). Figure 3 shows a typical extrusion machine. Figure 4 shows some examples of extruded shapes.



**Figure 3. Extrusion machine schematic**



**Figure 4. Parts made by extrusion**

## II LITERATURE REVIEW

### 2.1 Markus Gottfried Battisti<sup>[1]</sup>– Walter Friesenbichler<sup>[1]</sup> explained that,

The preparation of PP polymer nanocomposites has been carried out with an intermeshing, co-rotating twin-screw extruder of the PNC-IMC in order to improve Young's modulus and thermal conductivity; 11 or 13 barrel segments were used for the compounding process, and the PNC-IMC was used for processing of injected parts in a single heat, single plasticizing process.

### 2.2 Shi W. Lee<sup>1</sup>, Seokyoung Ahn<sup>[2]</sup>

More recently, there has been a consistent increase in customer demands which requires materials with better engineering properties including electrical, mechanical, magnetic and thermal capabilities while enjoying many benefits of injection molding technology. These trends have enabled the development of better injection molding machines with higher forces, pressures, high operating temperatures and precision controls. Finally, the accumulated knowledge of this shaping technology, which is previously restricted to polymers, has enabled a new

technology known as powder injection molding (PIM) to emerge to be applicable to metal and ceramic powders. Taguchi method has been effectively applied to a study of understanding the differences and similarities among plastic injection molding, MIM and CIM. The PIM with metals and powders is more sensitive to the filling time, the shear-rate, the temperature controls, thermal diffusivity and switch-over than plastic injection molding.

### **2.3 Nik Mizamzul Mehat<sup>[3]</sup> and Shahrul Kamaruddin<sup>[3]</sup>**

To predict and overcome problems in selecting the appropriate processing parameters, the Taguchi optimization method integrated for conducting simulation experiments in the preliminary stage that can support plastic manufacturers. In PIM, incoherent processing parameters during the manufacturing process can either lead to the degradation of accuracy, shape, and surface finish of the final parts, as well as other part characteristics related to mechanical properties or significant improvement of the injection-molded plastic parts. In the preliminary stage, utilization of simulation packages can facilitate the selection of the appropriate materials and improve part and mold design. Hence, before the real process manufacturing takes place the performance of the plastic part can be predicted. Integrated simulation packages using the Taguchi method reduces acrimonious conditions during optimization and reduces the number of replications in conducting the experiment.

### **2.4 Jennifer Baker stated<sup>[4]</sup> that**

Current molding methods require time for tempering and cooling of the chocolate product, whereas it has been proved that the shear pressures within the barrel of the single-screw machine are enough to eliminate the need for tempering and allow for lower melt temperatures. With this, the data also proves that the cool time is decreased, as the injection-molded samples required less than 120 seconds to solidify. In addition to an improved production process, the consistency of a screw and barrel machine would allow for regulation of the crystal formation of the chocolate in the early stages of molding, thus ensuring that physical properties such as fat bloom development would be avoided in the final product. In conclusion, the proven benefits of injection molding chocolate should be considered for the future of the confectionary industry.

### **2.5 J. Vlachopoulos<sup>[5]</sup> and D. Strutt<sup>[5]</sup> explained in the paper**

After a brief introduction to the various types of polymers in size and use and its impact of the polymer processing industry, an overview focuses on the specific processes for thermoplastic materials, namely extrusion and injection moulding. Single and twin screw extruders are used for melting and pumping of polymers and for die extrusion for the production of film, sheet, pipe, tubing, profiles and fibres. Injection molding process is used for the production of numerous parts either small or large, by injecting a molten polymer into mould cavities. Various problems associated with these processes are discussed. Other processes described include: compression moulding, rotational moulding, powder injection moulding and thixomoulding. The overview concludes with a brief discussion of current trends and future challenges faced by the polymer industry.

### III CONCLUSION AND FUTURE SCOPE

Plastics extrusion is one of the high-volume manufacturing process in which raw material like plastic is melted and formed into a continuous profile. Extrusion produces items such as pipe/tubing, weather stripping, fencing, deck railings, window frames, plastic films and sheeting, thermoplastic coatings, and wire insulation. In Plastics extrusion raw plastic is melted so as to form a continuous profile. Extrusion produces items such as pipe/tubing, weather stripping, fencing, deck railings, window frames, plastic films and sheeting, thermoplastic coatings, and wire insulation. While Injection molding is a manufacturing process for producing parts by injecting material into a mold. Injection molding is used to create many things such as bottle caps, wire spools, packaging, automotive parts and components, Gameboys, pocket combs, some musical instruments (and parts of them), one-piece chairs and small tables, storage containers, mechanical parts (including gears), and most other plastic products available today. Injection molding is the most common modern method of manufacturing plastic parts; it is ideal for producing high volumes of the same object. Injection molding is widely used for manufacturing a variety of parts, from the smallest components to entire body panels of cars.

So we are working with a model of extru-injection molding machine. In extru-injection molding machine we are working on combine process of extrusion and injection with minimum cost of investment. Untrained worker, less initial and running cost, easily available scrap, simultaneous operation of injection molding and extrusion, less process time, etc. are some advantages of the project.

### REFERENCES

- [1] Markus Gottfried Battisti\* – Walter Friesenbichler, “Injection-Moulding Compounding of PP Polymer Nanocomposites”, *Journal of Mechanical Engineering* 59(2013)11, 662-668
- [2] Shi W. Lee<sup>1</sup>, SeokyoungAhn, “Effects of process parameters in plastic, metal, and ceramic injection molding processes”, *Korea-Australia Rheology Journal* Vol. 23, No. 3, September 2011 pp. 127-138  
DOI: 10.1007/s13367-011-0016-4
- [3] Nik MizamzulMehat&ShahrulKamaruddin (2011) Investigating the Effects of Injection Molding Parameters on the Mechanical Properties of Recycled Plastic Parts Using the Taguchi Method, *Materials and Manufacturing Processes*, 26:2, 202-209, DOI: 10.1080/10426914.2010.529587
- [4] Jennifer Baker “THE APPLICATION OF SINGLE-SCREW PLASTIC MOLDING TECHNIQUE IN CHOCOLATE PRODUCTION
- [5] Dr Vlachopoulos (vlachopj@mcmaster.ca) is at the Centre for Advanced Polymer Processing and Design (CAPPAD), Department of Chemical Engineering, McMaster University, Hamilton ON L8S 4L7, Canada and DrStrutt is with Polydynamics, Inc., 1685 Main St. W., Suite 305, Hamilton, ON L8S 1G5, Canada. Manuscript received 8 November 2002; accepted 10 January 2003.
- [6] Tim Spieringa,n, StephanKohlitz, “Energy efficiency benchmarking for injection moulding processes”, 2015 Elsevier
- [7] López, J. Aisa, A. Martinez, D. Mercado, “Injection moulding parameters influence on weight quality of complex parts by Means of DOE application” <http://dx.doi.org/10.1016/j.measurement.2016.04.072>