Design and Development of Injection Molding Machine

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Abstract- *The project deals about the design and development of injection-moulding machine .The design is done by using the solid works and also thermal analysis is done by using Ansys. The main principle is to compress the plastic material in a barrel and pneumatic loading develops the compressing motion. The pneumatic circuit consists of a compressor, air tank, control valves and a cylinder. The compressor gives power to the system. The control valves controls the Air flow in the system. According to the valve position the piston moves downwards and upwards. The plastic materials are poured in a barrel. The heater surrounding the barrel heats the plastic material. Then it is converted into molten state. The molten plastic is injected through the nozzle in a barrel to the die by the compressing force. The die is placed just below the nozzle. After completing the process, we will get the product from the die. Different shape of the component can be made according to the die what are used. Commercial product like bushes, couplings, switches etc. can be produced.*

I. INTRODUCTION

The main principle is to compress the plastic material in a barrel and the compressing motion is developed by hydraulic motion. The heater surrounding the barrel the molten plastic is injected through the nozzle in barrel to the compressing force heats the plastic material.

FABRICATION TECHNIQUES:

The polymer material are converted in to plastics and used as tubes, sheets, foams, rods, adhesives etc. The theological properties, softening, tempering, stabilizing the size and shapes are important in describing the method. These methods are different for different kinds of plastics. Broadly speaking the methods may be discussed under the following headings.

1. MOULDING PROCESS.
2. FOAMING PROCESS.

1. MOULDING PROCESS:

In this process the plastics are fabricated under the effect pressure and heat and both thermoplastics and thermosetting plastics may be starting materials.

INJECTION MOULDING:

Thermoplastics are produced by this method. In this the heating softens material and the hot softened plastic is forced under high pressure into the mold, when cooling and the mold set it is ejected.

2. FOAMING PROCESS:

This involves the blowing of a volatile organic liquid, which is entrapped into a polymer network resulting in the formation of foamed plastics. Foamed polystyrenes are produced in this process.

II. METHODOLOGY

- The Pneumatic injection-moulding process is best suited for producing articles made of thermoplastic materials.
- The pneumatic injection – moulding machine is shown in the process consists of feeding the compounded plastic material as granules, pellets or powder through the hopper at definite time intervals into the hot molten plastics.
- Pressure is applied through a pneumatically driven piston to push the molten material through a barrel into a mould fitted at the bellow the nozzle.
- The molten plastic material from the Hooper is then injected through a nozzle material. The mould used, in its simplest form, is a two-part system. One is a movable part and the other stationary.
- The stationary part is fixed to the end of the cylinder while the movable part can be opened or locked on to the stationary part.
- By using a mechanical locking device, the mould is proper held in position as the molten plastic material is injected under a high pressure
- Furthermore, a proper flow of the molten material to the interior regions of the mold is achieved by preheating the

mould to an appropriate temperature. Usually, this temperature is slightly lower than the softening temperature of the plastic material undergoing moulding.

- After the mould is filled with the molten material under pressure, then it is cooled by cold water circulation and then opened so as to eject the molded article.
- The whole cycle could be repeated several times by the same procedure.
- The double acting pneumatic cylinder is used to inject the molten plastic material into the die.
- The flow control valve is used to control the flow of air in to the cylinder. The direction control valve is used to control the direction of piston movement.

III. DESIGN AND ANALYSIS

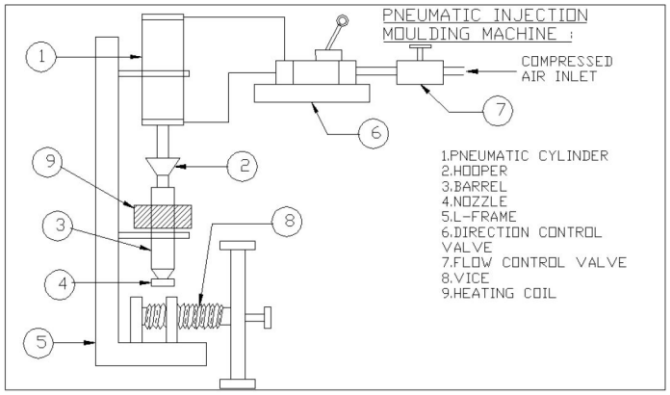

FIGURE 1 **– 2D DESIGN**

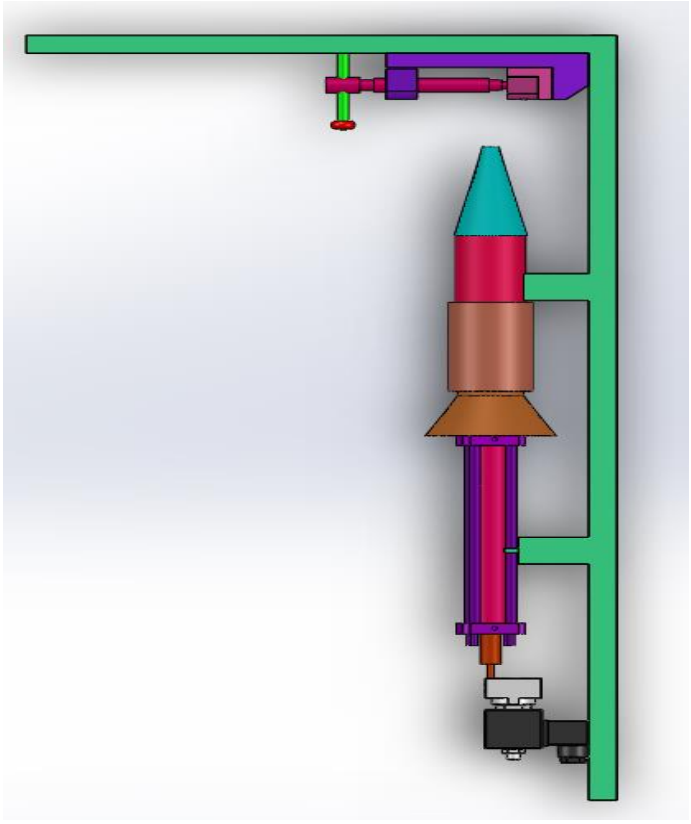

FIGURE 2-**3D DESIGN**

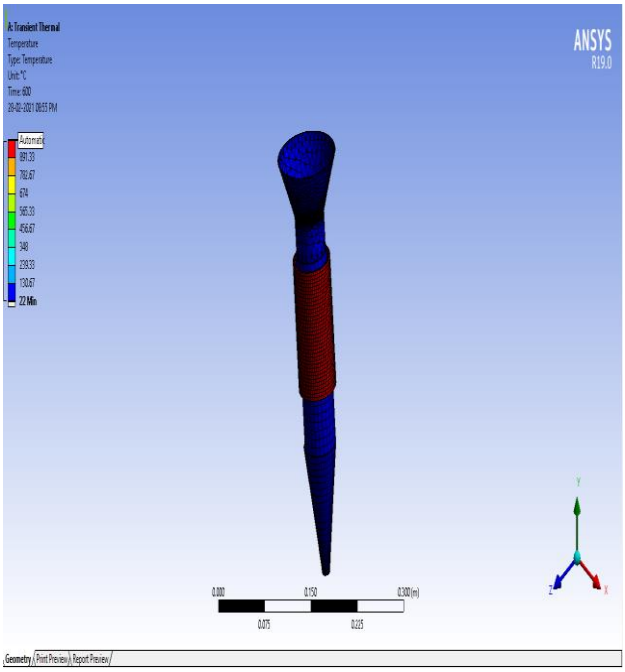

FIGURE 4 – **THERMAL ANALYSIS**

FACTOR INFLUENCING THE FABRICATION WORK

The following are the factors influencing the fabrication work,

WORKING STRESS
WORKING STRAIN

ELASTICITY
HOOKES LAW
BULK MODULUS
POISSON'S RATIO
FACTOR OF SAFETY

SPECIFICATIONS

1.Pneumatic cylinder :
outer diameter:- 45mm
stroke length:- 160mm

2.Barrel:
Diameter:- 65 mm
Length:- 170 mm

3.Pressure:- 6 to 8 bar
hand liver valve:- 5/2 way-1/4 inch

IV. CONCLUSION

This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We feel that the project work is a good solution to bridge the gates between institution and industries.

We are proud that we have completed the work with the limited time successfully. The "**PNEUMATIC INJECTION MOULDING MACHINE"** is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities.

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