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### DESIGN AND FABRICATION OF BENCH TOP INJECTION MOULDING MACHINE

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#### ABSTRACT

Injection Moulding is the one of the most common methods in producing plastic products for many purposes. This work is concerned with the design of parts and manufacturing, Prototype of Bench top Injection Moulding Machine. From analysis of design, manufacturing and production in Plastic materials from a long time, it was found that injection moulding system using Pneumatic pressure gives us better results than traditional approach. A simple experimental approach suggested the difference in quality of product cavity. The Experimental work is mainly concentrate on to observe the conditions for maximum use of Raw material with less material wastage The final Result shows by doing experimental analysis of output come from machine in the form of mould product, their quality as well as importance of machine & product economy specially designed with the concern of Small Scale Industries.

**Keywords:** *Prototype, Injection Moulding, Design.*

## I. INTRODUCTION

The main objective of the paper is to compress the plastic material in a barrel and the required compressing motion is developed by piston and cylinder arrangement. The heater surrounding the barrel the molten plastic is injected through the nozzle in barrel to the compressing force heats the plastic material.

Moulding operation is carried out with the help of compressed air in pneumatically operated plastic injection moulding machine. It is cheaper than the hydraulic machine and more efficient as compared to the manual machine, Hence, the problem of small and medium scale industries solves in well manner. In pneumatically operated plastic injection machine one cylinder are used for injection of plastic. The increased productivity is the benefit of this machine as compared to manual machine. Also, lesser space requirement, no oil leakage and fire hazards and lesser cost are the advantages of this machine as compared to hydraulic machine[1-3]. The major supporting industries for plastic manufactures are machinery Suppliers, raw materials suppliers, chemical suppliers, mould and die makers.

### **Problem Definition:**

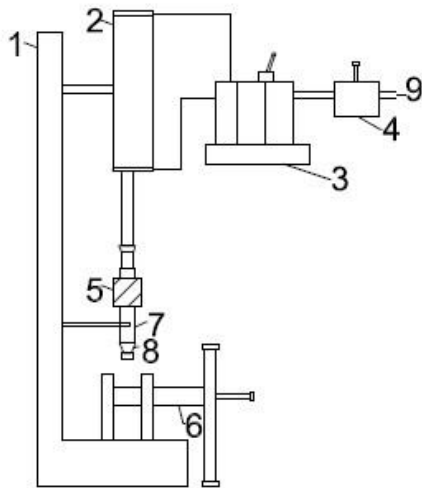
For small scale industry the requirement of semi automatic plastic injection machine demand with low cost day by day increasing production so there is need of solution so my project is based of design and fabrication of bench top injection moulding machine for small scale industry.

## II. MACHINE COMPONENTS DESIGN

In Pneumatically operated bench top injection moulding machine the moulding operation is done with the help of compressed air which is cheaper and more efficient than manual machine. The advantages of this machine are the productivity increased as well as less wastage of plastic material. The schematic of the model for bench top injection moulding is presented in Fig. 1.

- *Cylinder:* Injection cylinder is composed of cylinder body, piston, and piston load. The upper cylinder is employed for up and down motion of the plunger through which plastic material is injected in to barrel.
- *Heater:* The Plastic resins are moulded at higher temperature at about 150-200°C and a band heater is usually used.

- *Nozzle*: A Nozzle is the end part of the barrel which is used to inject the heated plastic material into the mold.
- *Die*: A die is a part which is normally made in two halves and a cavity is formed after closing the die which is similar to required casting. The half part of die is stationary (cover die) and the another half part is movable (ejector die).



- |    |                         |
|----|-------------------------|
| 1. | Stand                   |
| 2. | Pneumatic cylinder      |
| 3. | Direction control valve |
| 4. | Flow control valve      |
| 5. | Heater                  |
| 6. | Screw                   |
| 7. | Barrel                  |
| 8. | Nozzle                  |
| 9. | Compressed air inlet    |

**Fig. 1 Design of Model**

#### IV. WORKING OF MODEL

The Bench top injection – moulding machine is shown in Fig. 2. The compounded plastic material as pellets or powder or as granules are fed at a definite time intervals through the hopper into the hot molten plastics. A pneumatically driven piston applied the pressure for pushing the molten material through a barrel into a mould fitted at the below the nozzle. From the hopper, the molten plastic material is further injected through a nozzle material. The mould used, in its simplest form, is a two-part system. By employing a mechanical locking device, the mould is proper held in position as the molten plastic material is injected under a high pressure. The locking device has to be very skill fully designed to withstand high operating pressures. A proper flow of molten material to interior regions of the mold is achieved by preheating the mould to an appropriate temperature. Normally, 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 further opened so as to eject the moulded article. The complete cycle could be repeated several times by the same procedure.



*Fig.2 Working Model*

## V. TRIAL ON WORKING MODEL

The machined mold in closed and open condition is shown in Fig. 4 and 5, respectively. The grooves are made by machining. The micro textures are also possible to etch on the die as per requirement using non conventional machining methods like chemical etching, photochemical machining [4-8], laser machining, etc. The final product manufactured using the developed set up is presented in Fig. 5.



*Fig. 3 Mold in closed condition*



*Fig. 4 Mold in Open Condition*



*Fig. 5 Final Product*

## VI. RESULT & DISCUSSION

- The problem of product or molding that was not fully injected; and this was due to the melt temperature either too low or injection has been started before the necessary temperature has been reached. It may also be due to either the sprue channel is too weak, and or difficulty in the air escaped from mould .
- The problem of sinks or blisters on the product or molding was due to the melt temperature too high, the sprue channel too weak or unsuitably located, and the mould is insufficiently cooled.
- Also, the problem of product discolors observed may be due to the overheated of the melt and the colour fastness of the material.

## VIII. CONCLUSION

The bench top pneumatic operated machine is most suitable for small and medium size industries. It eliminates all the drawbacks of manual machine. The productivity is increased, manual labour required is less. The operation is simplified. Hydraulically operated machine could solve the problem, but cost is too high to bear for small and medium sized industries. The hydraulic machine is used where large-scale production is required. So pneumatic machine solve the problem very well.

## IX. FUTURE SCOPE

- The scope of this project is to design and fabricate a bench top injection moulding machine, cost effective and environmentally friendly bench top injection moulding machine for the production of small plastic product that is less than one gram of weight. The bench top injection moulding machine is simply function by using the Pneumatic cylinder the injection plunger in order to inject the molten plastic in to the mould cavity.

- Speed up all the moulding machines. For this point we need to be sure that our machines are suitable for high speed running.
- 3) Even if our machine are high speed, but if we are in shortage of automation system in our injection moulding plants, then we need a lot of labour to pick up the moulded plastic components from the machine and we need to stack or collect them before packing. All these need labors and this will reduce the production capacity, in the same time the labour cost will be highly increased.
- It can be easily modified into hydraulic mechanism.

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