Plastic Recycling Machine With Multiple Product

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Abstract- *Design Development ,fabrication of a small injection moulding machine for Forming a small plastic articles in small-scale industries . My project which entailed design, construction and test small injection moulding machine that will capable of forming small plastic articles by injecting molten resins into a closed, cooled mould, where it solidifies to give the desired products will be made. The machine will design and constructed to work as a prototype for producing very small plastic components. Design concept, operation, and assembly of components parts will be made. Also, working drawings and materials selection will be made based on calculations of the diameter of injection screw conveyor, number of teeth required, number of revolution, torque and power obtained from the electric motor selected. The machine parts/components will then assemble in line with the designed made, thereafter the constructed machine will be tested using high density polyethylene and master batch. The results will obtain from the test were satisfactory.*

Keywords- Design and Development, Plastic moulding die, Band heater, Screw conveyor.

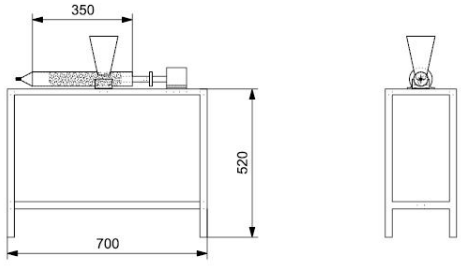
I. INTRODUCTION

Injection moulding machine offers many advantages to alternatives manufacturing methods, including minimum losses from scraps (since scrap pieces can be melted and recycled), and minimum finishing requirements. Injection moulding machine differs from metal die casting, in that molten metal's can simply be poured, and plastic resins must be injected with force . It is most common used method for mass production of plastic articles of a heated cylinder, heating the materials in the heating chamber, and forcing the molten metal into a closed mould, where the final solidification of the molten metal in form of the configuration of the mould cavity takes .

The intending injection machine will be made from mild steel and medium carbon steel. It can only be used for the production of small components such as key holder, bottle cap, tally, ruler, and clothes peg. The mild steel is used for the construction of supporting plates, hopper, mainframe, mould, and platens, handle, and tie bars. This is because; they are not subjected to constant heat. It is easily weldable, and has good workability but show poor response to heat treatment. An injection moulding machine is a piece of equipment consists of two basic elements, the injection unit and the clamping unit. Injection moulding can be used with a variety of plastic resins.The chosen resins for this process are polyethylene; polypropylene, ABS, and fluorocarbons, because of characteristics of intricate shapes can easily be produced .

The advantages of small injection moulding process include good surface finish of the product can be produced, less scrap and flashes are produced, and the process has relatively low labour costs The main aim of the research work is to design, construct and testing of small injection moulding machine while the specific objectives of the research work are to design and construct a small injection moulding machine, and testing. The scope of the work is to design and construct a cost effective and environmentally friendly small injection moulding machine for them production of small plastic articles.

The project work will involve design concept, operations, design analysis that will entail design of injection plunger, motor selection, design of the handle, and the leverage on the handle of the machine. Also, assembly drawings of the machine, recommended materials and equipment for the construction of design machine will be provided to assist investors that want to venture into construction of this machine. Development of small injection moulding machine for forming small plastic articles in small-scale industries was borne out of the fact that most injection moulding machines were of big size and most small-scale industries in developing countries could not avoid buying them due to their costs. In solving this problem, there is a need to design small injection moulding machine that avoidable bysmall scale industries for production of small plastic articles, this is the rationale behind this work.



II. LITERATURE REVIEW

A. Alexander Parkes

The first man-made plastic was invented in Britain in 1851 by Alexander Parkes. He publicly demonstrated it at the 1862 International Exhibition in London; calling the material he produced "**Parkesine.**" Derived from cellulose, Parkesine could be heated, molded, and retain its shape when cooled. It was, however, expensive to produce, prone to cracking, and highly flammable.

B. John Wesley Hyatt

In 1868, American inventor **John Wesley Hyatt** developed a plastic material he named Celluloid, improving on Parkes' invention so that it could be processed into finished form. Together with his brother Isaiah, Hyatt patented the first injection moulding machine in 1872.

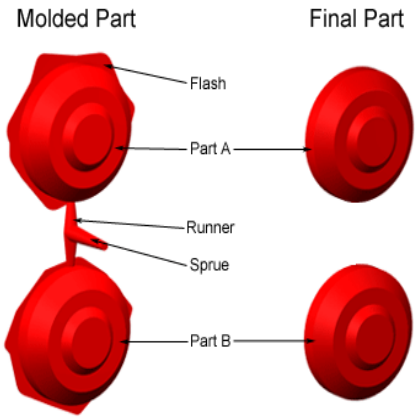
This machine was relatively simple compared to machines in use today. It worked like a large hypodermic needle, using a plunger to inject plastic through a heated cylinder into a mould. The industry progressed slowly over the years, producing products such as collar stays, buttons, and hair combs. In 1946, American inventor James Watson Hendry built the first screw injection machine, which allowed much more precise control over the speed of injection and the quality of articles produced. This machine also allowed material to be mixed before injection, so that colored or recycled plastic could be added to virgin material and mixed thoroughly before being injected. Today screw injection machines account for the vast majority of all injection machines. In the 1970s, Hendry went on to develop the first gas-assisted injection molding process, which permitted the production of complex, hollow articles that cooled quickly. This greatly improved design flexibility as well as the strength and finish of manufactured parts while reducing production time, cost, weight and waste.

The plastic injection moulding industry has evolved over the years from producing combs and buttons to producing a vast array of products for many industries including automotive, medical, aerospace, consumer products, toys, plumbing, packaging, and construction.

III. PROCESS CYCLE

The process cycle for injection moulding is very short, typically between 2 seconds and 2 minutes, and consists of the following four stages:

Clamping - Prior to the injection of the material into the mould, the two halves of the mould must first be securely closed by the clamping unit. Each half of the mould is attached to the injection moulding machine and one half is allowed to slide. The hydraulically powered clamping unit pushes the mould halves together and exerts sufficient force to keep the mould securely closed while the material is injected. The time required to close and clamp the mould is dependent upon the machine - larger machines (those with greater clamping forces) will require more time.



Injection moulded part

Injection - The raw plastic material, usually in the form of pellets, is fed into the injection moulding machine, and advanced towards the mould by the injection unit. During this process, the material is melted by heat and pressure. The molten plastic is then injected into the mould very quickly and the build-up of pressure packs and holds the material. The amount of material that is injected is referred to as the shot. The injection time is difficult to calculate accurately due to the complex and changing flow of the molten plastic into the mould.

Cooling - The molten plastic that is inside the mould begins to cool as soon as it makes contact with the interior mould surfaces. As the plastic cools, it will solidify into the shape of the desired part. However, during cooling some shrinkage of the part may occur. The packing of material in the injection stage allows additional material to flow into the mould and reduce the amount of visible shrinkage. The mould cannot be opened until the required cooling time has elapsed. The cooling time can be estimated from several thermodynamic properties of the plastic and the maximum wall thickness of the part.

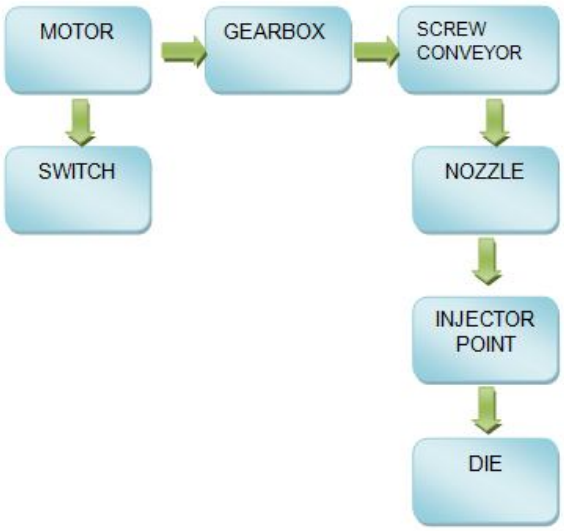
Ejection - After sufficient time has passed, the cooled part may be ejected from the mould by the ejection system, which is attached to the rear half of the mould. When the mould is

opened, a mechanism is used to push the part out of the mould. Force must be applied to eject the part because during cooling the part shrinks and adheres to the mould. In order to facilitate the ejection of the part, a mould release agent can be sprayed onto the surfaces of the mould cavity prior to injection of the material. The time that is required to open the mould and eject the part can be estimated from the dry cycle time of the machine and should include time for the part to fall free of the mould. Once the part is ejected, the mould can be clamped shut for the next shot to be injected

MATERIAL LIST OF PROJECT

SR. NO.	NAME OF MATERIAL
1	Screw conveyor
3	Gear box
4	Washers
5	Heater
6	Plastic raw material
7	Die
8	M. S. square pipe
9	Washers
10	Nut / bolts
11	S. S. material
12	Tool (M. S.)
13	M. S. sheet

Block diagram



VI. CONCLUSION

The project describes the design of very budget small scale plastic recycling machine as compared to other plastic recycling machines. Small injection moulding process include good surface finish of the product can be produced, less scrap and flashes are produced, and the process has relatively low labour costs

We produce different varieties of products by just changing the die design. We have made washer by using plastic recycling machine can be used in assembling to absorb the vibrations like the plastic spring are used in suspension system. The manufactured recycling machine was found to very useful absorbing the huge waste material in our country.

The main aim of the research work is to design, construct and testing of small injection moulding machine while the specific objectives of the research work are to design and construct a small injection moulding machine, and testing. The scope of the work is to design and construct a cost effective and environmentally friendly small injection moulding machine for them production of small plastic articles

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