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Maintenance and Modification of Blow Injection Molding Process

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Abstract: *Blow moulding is a manufacturing process for forming and joining together hollow plastic parts. It is also used for forming glass bottles or other hollow shapes. The parison is then clamped into a mould and air is blown into it. The air pressure then pushes the plastic out to match the mould. Blow moulding uses a parison(a hollow tube) inserted into a mould and filled with molten plastic. When air is injected, the tube expands, conforming the plastic to the shape of the mould. While there are a few more moving parts involved in blow moulding, the result is a much faster and more precise cycle. This process enables the production of higher volumes of parts in shorter periods of time. These advantages also offer economies of scale, increasingly lowering the cost-per-part on larger runs.*

In this project we are going to analyse the Working of blow moulding process find the causes of the problems, identified causes of problems will be eliminated by Maintenance and modification inBlow moulding process. The idea was that instead of purchasing a costly new machine, the old one can be modified. In case of failure, however, the modification cost would only becommensurate to a tiny amount of a new machine's price. The study relies especially on the development of the single extruder and production of the container with translucent view strip.

Main objective of this project is- To increase the efficiency of blow moulding process, to remove the pressure variations in blow moulding process, to decrease the operational cost by using new mechanism, to decrease labour cost by blow moulding process, to increase the productivity, to save the time & materials. The machine modification constitutes a qualitative move in the factory. Compared to the high purchasing price of a new machine, the cost of the old machine's development is rather low. Moreover, the qualitative improvement of the produce has promoted the factory's stature, let alone the remarkable reduction in the product's cost

Keywords: Blow Moulding, Manufacturing Process, Failure, Extrusion, Injection, Blowing, Ejection, Machine Modification

I. INTRODUCTION

Blow molding (or moulding) is a manufacturing process for forming and joining together hollow plastic parts. It is also used for forming glass bottles or other hollow shapes. The parison is then clamped into a mold and air is blown into it. The air pressure then pushes the plastic out to match the mold. Blow molding uses a parison (a hollow tube) inserted into a mold and filled with molten plastic. When air is injected, the tube expands, conforming the plastic to the shape of the mold. While there are a few more moving parts involved in blow molding, the result is a much faster and more precise cycle. This process enables the production of higher volumes of parts in shorter periods of time. These advantages also offer economies of scale, increasingly lowering the cost-per-part on larger runs. In this project we are going to analyze the Working of blow molding process find the causes of the problems, identified causes of problems will be eliminated by Maintenance and modification in Blow molding process.

The idea was that instead of purchasing a costly new machine, the old one can be modified. In case of failure, however, the modification cost would only be commensurate to a tiny amount of a new machine's price. The study relies especially on the development of the single extruder and production of the container with translucent view strip.

The single extruders are used to generate a continuous flow of molten polymer in many industrial polymer processes, like blow molding. The extruder essentially consists of an Archimedean screw rotating within a stationary barrel. A die

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is attached to the output end of the extruder to shape the melt into the desired form. The out- put characteristics of the extruder can be expressed as sum of two components: 1) drag flow, this is the positive component of the output and is related to the motion of the screw relative to the barrel; 2) pressure flow, this is normally the negative component of the output and is related to the pressure generated at the outlet end of the extruder, this pressure being required to force the melted material through the shaping die.

The process of injection blow molding is used for the production of hollow glass and plastic objects in large quantities. In the IBM process, the polymer is injection molded onto a core pin; then the core pin is rotated to a blow molding station to be inflated and cooled. This is the least-used of the three blow molding processes, and is typically used to make small medical and single serve bottles. The process is divided into three steps: injection, blowing and ejection.

The injection blow molding machine is based on an extruder barrel and screw assembly which melts the polymer. The molten polymer is fed into a hot runner manifold where it is injected through nozzles into a heated cavity and core pin. The cavity mold forms the external shape and is clamped around a core rod which forms the internal shape of the preform. The preform consists of a fully formed bottle/jar neck with a thick tube of polymer attached, which will form the body. similar in appearance to a test tube with a threaded neck.

The preform mold opens and the core rod is rotated and clamped into the hollow, chilled blow mold. The end of the core rod opens and allows compressed air into the preform, which inflates it to the finished article shape.After a cooling period the blow mold opens and the core rod is rotated to the ejection position. The finished article is stripped off the core rod and as an option can be leak-tested prior to packing. The preform and blow mold can have many cavities, typically three to sixteen depending on the article size and the required output. There are three sets of core rods, which allow concurrent preform injection, blow molding and ejection.

Fig 1. Blow Molding Machine

II. LITERATURE SURVEY-

TITLE: -Modification and Development of a Blow Molding Machine
AUTHOR: -1) Prof. Bassam A. Al-Helou **YEAR: -** 2012

The machine modification constitutes a qualitative move in the factory. Compared to the high purchasing price of a new machine, the cost of the old machine's development is rather low. Moreover, the qualitative improvement of the produce has promoted the factory's stature, let alone the remarkable reduction in the product's cost. Added to that, there are some positive advantages like reducing the waste to zero point, raising the production's efficiency as a result of new technology. In addition, the modifications allow using new desired plastic materials (HDPE) instead of PVC.

TITLE: -Timer Based Automatic Machine a Comparative Study
AUTHOR: - 1) Thorkar U.M.1, Karandikar 2) Prof. A.V.Bassam 3) A. Al-Helou
YEAR: - 2013

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Designing a blow mould is a very complicated and knowledge intensive process. This paper describes a feature-based, parametric-based, and knowledge-based design system for drawing blow moulds that requires only a minimum set of parameters to be set before it completes the design of the main parts of an injection, blow, and eject mould. This blow mould design system, implemented on top of the Power shape CAD, consistsof a machine type and cavity setting module, an injection designer, a blow designer, an eject designer, mould design creation module, molding database, and machine database. Through these modules, the moulddesigners are able to create a 3D blow mould design from customer requirements. This system is capable of reducing the lead-time of blow mould design as it integrates the three stages (injection, blow, eject) of the blow mould design process and can greatly improve the product quality through a standardization of the design process.

TITLE: -Bottle Blow Molding

AUTHOR: -1) Milind H. Mahajan1, 2) Girish M. Lonare2 **YEAR: -** 2019

This analysis covers work carried out to substantiate deformation, principle stresses induced in Polypropylene (PE) Medicine Bottle of 100 ml which influenced by the Internal pressure, Hydrostatic pressure, stacking load and transport load. The work demonstrates that stresses in the specified areas are within allowable limits and that the (PE) Medicine Bottle of 100 ml is therefore satisfactory for the intended service as per client's technical specification.

III. SCOPE OF THE PROJECT

The Scope of this machine is to reduce the Operational difficulties in blow molding process. To remove the excess pressure, decrease the operational cost, labor cost, time & Materials.

IV. NEED OF THE PROJECT

While it is relatively easy to find information about accumulator head blow molding, very few people discuss the importance of the air valves as part of the process. Many people do not realize that the number of valves on the machine used for accumulator blow molding may be insufficient. For that reason, you should gain some basic insight into the number, size, and function of the valves for your **blow molding machine.** This is also why buying a machine from a trusted source is so crucial.

For this type of machinery to operate properly, which in turn produces precision blow molded parts and components, constant air supply pressure is essential for every molding cycle. To accomplish that, the machine needs the proper air valves. You also need the correct programming sequential for additional valves.

To quickly inflate the parison once the mold closes, the machine must produce the right air pressure. For that, you want to make sure there is sufficient flow-capacity coefficient and capacity. For your company to manufacturer superior products, it is also critical for air to discharge quickly before the mold opens, which vents through the quick-exhaust vents close to the air exhaust location.

V. OBJECTIVES

1. To increase the efficiency of blow molding process.
2. To remove the pressure variations in blow molding process.
3. To decrease the operational cost by using new mechanism.
4. To decrease labor cost by blow molding process.
5. To increase the productivity.
6. To save the time & materials.

VI. METHODOLOGY

Various Problems are associated with Air pressure supplied to the blow mold. It effects on product quality and also causes frequent breakdown of Air valve due to uneven air pressure. Proposed methodology is as given below

6.1 PROPOSED METHODOLOGY 1:

Clean or repair air passages and check for air leakage through the air shaft. Increase. Rear barrel zone temperature slightly to prevent voids forming in the melt. Check the Manitrol valve for proper setting.

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6.2 PROPOSED METHODOLOGY 2

To Maintain the Proper pressure of compressed air, use of pressure control valve in blow molding process.To prevent air entrapment, increases fill pressure until drooling occurs at dies, and then reduce pressure a little until drooling just stops.

6.3 PROPOSED METHODOLOGY 3

Repair the mold and adjust the cooling temperature of the mold above “dew point”. Repair mould edges and pinch-offs to prevent holes forming along the seam.A higher mould coolant temperature will result in a higher bottle temperature and greater shrinkage.

6.4 PROPOSED METHODOLOGY 4

Adjust the air release time or delay the starting time of mold. Reduce mould closing speed to prevent formation of weak welds at the seams which may split when the bottle is trimmed and/or use clamp pause.

VII. RESULT

After maintenance and addition of pressure valve in blow molding machine the system has the following advantages:
A solenoid valve is an electro-mechanical controlled valve. The valve features a solenoid, which is an electric coil with a movable ferromagnetic core in its centre. This core is called the plunger. In rest position, the plunger closes off a small orifice. An electric current through the coil creates a magnetic field. The magnetic field exerts a force on the plunger. As a result, the plunger is pulled toward the centre of the coil so that the orifice opens. This is the basic principle that is used to open and close solenoid valves.
Solenoid valves are among the most used components in gas and liquid circuits. The number of applications is almost endless. Some examples of the use of solenoid valves include heating systems, compressed air technology, industrial automation, swimming pools, sprinkler systems, washing machines, dental equipment, car wash systems and irrigation systems.

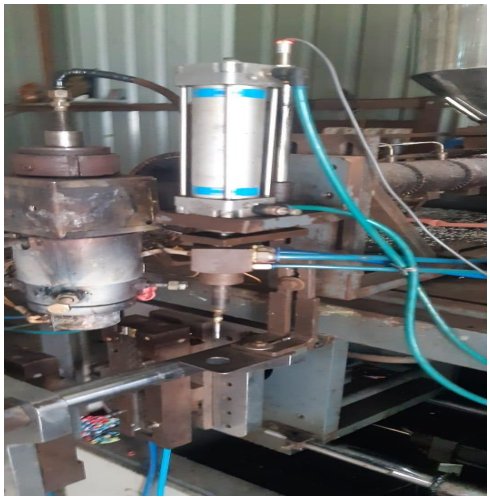

Fig.2: -After pressure regulator valve installed

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Fig.3: -After pressure regulator valve installed

Fig.4: -After pressure regulator valve installed

VIII. CONCLUSION-

The machine modification constitutes a qualitative move in the factory. Compared to the high purchasing price of a new machine, the cost of the old machine's development is rather low. Moreover, the qualitative improvement of the produce has promoted the factory's stature, let alone the remarkable reduction in the product's cost. Added to that, there are some positive advantages like reducing the waste to zero point, raising the production's efficiency as a result of new technology. In addition, the modifications allow using new desired plastic materials (HDPE) instead of PVC

To reduce lead time and expenses, Finite Element Modeling (FEM) analysis is needed. It will predict and virtually assist the blow molding process design and very useful to support the foundry industry especially in designing a new product, redesign of existing products and detect the defects. By inputting blow pressure and temperature characteristic data, this analysis is able to simulate and visualize the blow molding process for achieving a uniform wall thickness in the final product.

IX. FUTURE SCOPE OF THE PROJECT

Proper designs were prepared and directly applied on spot. Tangible results were obtained. Among others, the modification of some components of the machine, e.g. the extruder, has led to the possible re-use of the milled

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(recovery) and extra material from the manufacturing processes. That was also conducive to an effective reduction in the cost of production to 50% in some cases. Prior to its modification, this old machine was used to produce polyvinyl chloride (PVC) containers that have become prohibited these days for their damaging effect on man's life.For now, and after modification, it has become possible to use High Density Polyethylene (HDPE) material, a fact that has improved labor conditions, too.

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