

DESIGN AND DEVELOPMENT OF GEAR SHIFT BOOT DIE

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Abstract - Shift boot is a part in the car that is attached to the gear stick. Never underestimate the importance of a small quality shift boot. Though not exactly small in size, most drivers tend to forget about their shift boot until these rubber boots require replacing. And even when they do require prompt replacing, some drivers still put the process off because they think loss of this component won't be such a big deal, well aside from standing out, a torn shift boot also invites trouble for your shifting mechanism.

There is no fixed machine design procedure when a new machine element of the machine is being designed. A number of options have to be considered. When designing machine one cannot apply rigid rules to get the best design for the machine at the lowest possible cost. Rubber shift boot also does not have any précised procedure for designing, in this project we are going to design the RSB according to the dimension given by the customer.

Key Words: Automobiles, Productivity, Stability, Reliability

1. INTRODUCTION

Rubber Shift boot is a rubber component which is mounted at the bottom of the gear stick of the automobile. Never underestimate the importance of a small quality shift boot. Though not exactly small in size, most drivers tend to forget about their shift boot until these rubber boots require replacing. And even when they do require prompt replacing, some drivers still put the process off because they think loss of this component won't be such a big deal, well aside from standing out, a torn shift boot also invites trouble for your shifting mechanism. You see that boot isn't just there to keep your unsightly shifter parts out of sight; this boot also protects your shift gears sensitive components against corrosive outside element. So in effect by keeping your shifter boot torn and unsightly, you are also lowering your vehicle's defence against damaging dust, debris and in some cases moisture build up. Protect your shifter from any

form of damage with a new shift boot. To get the best deals on high quality shift boots be sure to get this item from auto parts housewares. The rubber shift boot comes in various shapes, sizes and styles, rubber shift boots can easily be brought from online store, according to your gear stick dimensions.

Graphic design is also an aspect of automotive design; this is generally shared amongst the design team as the lead designer sees fit. Design focuses not only on the isolated outer shape of automobile parts, but concentrates on the combination of form and function, starting from the vehicle package.

Mainly designing is done in three steps, first is Per-production design which includes, research, analysis, specifications, design goals, problem solving. Then comes the design during production which includes development and testing and finally Post-production design which includes implementation, evaluation, conclusion, redesigning if necessary.

2. LITERATURE REVIEW

Michael F. Ashby (2005) has conclude that the mechanical design with which we are primarily concerned here; it deals with the physical principles, the proper functioning and the production of mechanical systems. This does not mean that we ignore industrial design, which speaks of pattern, color, texture, and (above all) consumer appeal but that comes later. The starting point is good mechanical design, and the ways in which the selection of materials and processes contribute to it. Our aim is to develop a methodology for selecting materials and processes that is design-led; that is, the selection uses, as inputs, the functional requirements of the design. To do so we must first look briefly at design itself. Like most technical fields it is encrusted with its own special jargon, some of it bordering on the incomprehensible. We need very little, but it cannot all be avoided. This chapter introduces some of the words and phrases the vocabulary of design, the stages in its implementation, and the ways in which materials selection links with these.

The number of engineering materials is large: tens of thousands, at a conservative estimate. The designer must select, from this vast menu, the few best suited to his task. This, without guidance, can be a difficult and haphazard business, so there is a temptation to choose the material that is “traditional” for the application: glass for bottles; steel cans. That choice may be safely conservative, but it rejects the opportunity for innovation. Engineering materials are evolving faster, and the choice is wider than ever before. Examples of products in which a new material has captured a market are as common as well as plastic bottles. Or aluminium cans or polycarbonate eyeglass lenses. Or carbon- fiber golf club shafts. It is important in the early stage of design, or of re-design, to examine the full materials menu, not rejecting options merely because they are unfamiliar.

Dr. H. “Jerry”Qi (2006) was conclude that the Conceptual Design of Transfer Mould Tool for Rubber Bumper Spring. This paper presents the conceptual design of transfer mould for rubber bumper spring, which is used as housing for auto parts. The fundamental aim of the designer is to achieve balance between productivity and design, by optimizing the design, process and manufacturing parameters, which results in the final cost reduction of the mouldings without compromising the quality of the product. The various parameters like processing temperature, pressure, moulding material, parting line selection, mould cooling, ejection system, etc. affects the design of mould and its functions with variation in cost and quality for producing optimized quality mouldings. By varying some of the above said parameters an effort is made to attain a cost effective conceptual design. The suggested material for rubber bumper spring is NR/BR (Natural & Polybutadiene Rubber) blend. Designing of mould is carried out by using computer aided designing software solid works.

Iheoma .C. Chukwujike & its all (2015) had concluded that the The mechanical properties were found to improve further with carbonized filler of smaller filler particle sizes. The use of carbonized cornhub powder as fillers in the blend samples revealed significant improvement in the vulcanizate properties of blends at low carbonized cornhub powder filler loading of 10 phr comparable to the results obtained with blend samples reinforced with only carbon black. . Consequently, carbonized cornhub powder can serve as potential substitute filler to carbon black in the rubber industry, in the production of low-cost/high volume rubber products where strength is not critical. Huge foreign exchange spent on importation of carbon black will be saved with concomitant reduction in the price of rubber products. Carbornized cornhub was also found to be good reinforcing filler for blends such as natural rubber/acrylonitrile butadiene rubber where oil resistance is of great importance.

3. MOLDING

Molding is a process of manufacturing by shaping liquid or pliable raw material using a rigid frame called a mold or matrix. This itself may have been made using a pattern or model of the final object

A mold is a hollowed out block that is filled with a liquid or pliable material such as plastic, glass, metal, or ceramic raw material. The liquid hardens or sets inside the mold, adopting its shape. The very common bi valve molding process uses two molds, one for each half of the object. Articulated molds have multiple pieces that come together to the complete mold, and then disassemble to release the finished casting. They are expensive, but necessary when the casting shape has complex overhangs. Piece molding uses a number of different molds, each creating a section of a complicated object. This is generally only used for large and more valuable objects.

A manufacturer who makes a mold is called a moldmaker. A release agent is typically used to make removal of substance from the mold easily. Typical uses for molded plastics include molded furniture, molded household goods, molded cases, and structural materials.

3.1 Compression Molding

In this project we are building a rubber part for an electrical company whose dimensions are given. With the help of compression molding we are going to manufacture the part. We have done the detailed study on the compression molding. Compression molding process is a suitable process for the defined requirements. Compression molding primarily utilizes short fibers. Continuous fiber can also be molded but in order to avoid the fiber damage continuous fiber is not generally used. Compression molding process lead to quicker cycle times and intricate shapes can be processed along with ribs and bosses.

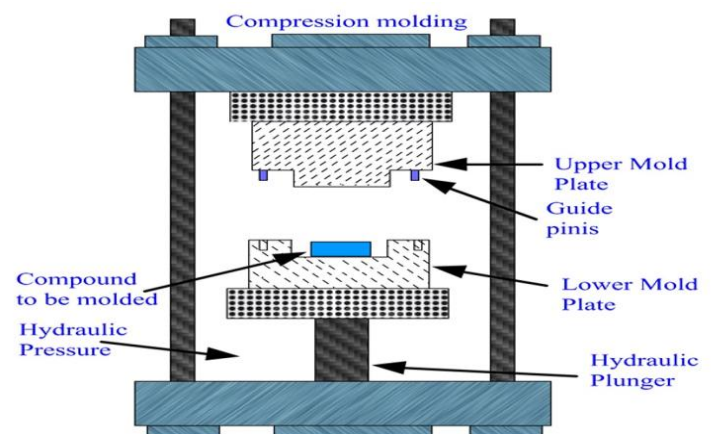


Fig -1: Compression Molding

4. IDENTIFICATION OF PART AND RAW MATERIAL SELECTION

4.1 Expectations from the part development.

When the order of rubber shift boot came to the Pooja Industries. There were some expectations from the ordering company, they gave us a rubber shift boot of different dimensions and their expectations were to manufacture a similar component only with different dimensions, along with that the design we are going to sketch should be attractive and it should be durable as it is going to be under regularly applied force, so that it have a long life. The shift boot must be light in weight, and should have a good shine to it. Also when force is applied from top of rubber shift boot, the boot should go a minimum of 30 mm deflection, basic dimensions were given like the rectangular base length and breadth, the diameter of the holes on the base of the boot through which the screws are going to be placed and the above hole diameter through which the gear stick is going to be passed Hence the Rubber shift boot we are going to manufacture should be strong, attractive, according to the dimensions and should have a long life.

4.2 About Rubber Shift Boot.

Rubber Shift boot is a rubber component which is mounted at the bottom of the gear stick of the automobile. Never underestimate the importance of a small quality shift boot. Though not exactly small in size, most drivers tend to forget about their shift boot until these rubber boots require required replacing. And even when they do require prompt replacing, some drivers still put the process off because they think loss of this component won't be such a big deal, well aside from standing out, a torn shift boot also invites trouble for your shifting mechanism. You see that boot isn't just there to keep your unsightly shifter parts out of sight; this boot also protects your shift gears sensitive components against corrosive outside element. So in effect by keeping your shifter boot torn and unsightly, you are also lowering your vehicle's defense against damaging dust, debris and in some cases moisture buildup. Protect your shifter from any form of damage with a new shift boot.

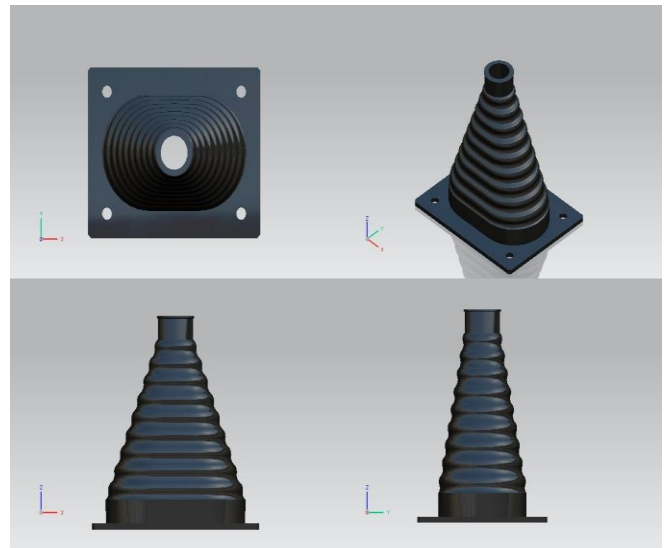


Fig -1: Rubber shift boot

5. CALCULATION

The thickness of rubber shift boot needs to be 3mm and the shrinkage factor of nitrile rubber is 2.5% so the clearance required is,

$$2.5\% \text{ of } 3\text{mm} = 3 \times (2.5/100) \\ = 0.075 \text{ mm.}$$

So the clearance between the molds to achieve the 3mm thickness is,

$$\text{Clearance} = 3 + 0.075 \\ = 3.075 \text{ mm}$$

So hence from the above calculation the clearance between the molds is 3.075 mm

6. ADVANTAGES AND DISADVANTAGES

6.1 Advantages

1. Low labour cost and shorter lead time
2. Holes, flanges, non-uniform thickness can be created in the part thereby reducing additional processes like welding and drilling.
3. Produces near net shape parts eliminating secondary operations
4. Production rate is high as the mold cycle time is in few minutes
5. Good surface finish with different texture and styling can be achieved
6. High part uniformity is achieved with compression molding process

6.2 Disadvantages

1. Due to expensive machinery and parts, the initial capital investment associated with compression molding is high.
2. The process is suitable for high production volume. It is not economical for making a small number of parts or for prototyping applications
3. Sometimes secondary processing (trimming, machining) of product is required after compression molding
4. Sometimes uneven parting lines are there
5. There is limitation on mold depth.

7. CONCLUSIONS

Three key areas influencing the compression molding process are studied and the systems are designed and process conditions are predicted through the Rubber Shift Boot development. With the mold design and the associated systems in place manufacturing of the part can take place. The next step in the development is manufacturing and testing of the part. Some of defects which might be encountered during manufacturing are blisters, chipped edges, drag marks, fiber pull, flow lines etc. These defects can be avoided by close control in the process parameters. Troubleshooting of compression molding process for various defects which are found during the process must be worked in the future.

In future the process simulation will play a key role in designing the part and mold. In future part developments by compression molding process, process simulation in addition to structural analysis can be done to evaluate the process variables.

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