Extrusion Blow Molded Gun Stock

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Introduction

The majority of rifle stocks were always made of wood, but synthetic stocks are becoming more and more popular. The change from wooden to plastic stocks began about fifteen years ago. Although not as popular back then, these plastic stocks may soon take over the industry with advances in technology. Many hunters that are old fashioned and some gun buffs that are stuck in their ways are reluctant to make the change to synthetic stocks, even though they have many benefits over wooden stocks. These synthetic stocks are lighter in weight while still holding its durability. They also have a good dimensional stability in different climates, and have good weather resistance.

My project is going to redesign the idea of synthetic gun stocks by the process of foam-filled extrusion blow molding. Extrusion blow molding will allow for a fast production rate while wooden gun stocks take a long time to be fabricated. Extrusion blow molding also allows for a smoother finish because of the smooth mold surfaces which would make the gun stalks more aesthetically pleasing. Color changes and other patterning can also be done quickly and easily.

Co-extrusion can be done to add multiple layers of different plastic resins in order to add the needed strength or other properties the gun stock might need. After the part is molded polyurethane foam would be injected into the hollow areas of the stock which will add strength and stiffness. The foam will also prevent any possible leakage of water or any other liquids into the gun stock which could damage the weapon.

Application of Blow Molding

The process of creating a wooden gun stock is very long and tedious. The wood must be found and graded before the process even begins. Once the right wood is found it needs to be shaped and machine inleted. Inleting is referring to the inside cuts in the stock for the gun to fit into. Sometimes they even need to be hand-fitted which takes years of hands on experience.

Most synthetic stocks are injection molded which is an expensive process. The tooling costs are high because of the high pressures the mold will see during the process.
Extrusion blow molding is an excellent process for creating hollow parts and can also be foam-filled which is idyllic for this product. Foam-filled extrusion blow molding is a process for fabricating work which will have a rigid foam core and a resilient outer plastic shell. This process is ideal for the product at hand because it will have to produce either better or equal properties as the injection blow molded gun stocks. Another advantage of this process is that it is much cheaper than injection blow molding. The tooling costs are much lower allowing for a lower part cost.

**Design Details**

The gun stock I chose is a generic rifle stock that any standard gun can fit into. There are not necessarily any sharp corners that would cause major problems but the radiiuses of the rounds are not generous enough to eliminate the chance of any wall thickness or filling problems. Since the butt of the stock is larger than the nose some parison programming might have to be done in order to achieve a more uniform wall thickness. Also, some secondary operations will need to be done to remove any flash created and to remove the excess material in order for the gun to be fitted properly.

There are a couple of options for the type of material that can be used. One is to make the initial part with Polycarbonate (PC) and the second a high density polyethylene (HDPE). The PC will allow for hunters to clean their rifles with some bore cleaners because alcohol is one recommended solvent for cleaning grease and oils from PC. Yet one should stand clear of using any cleaners with methyl ethyl keytoine or methanol because they will damage the PC. It also has a fairly good chemical and heat resistance as well as a fair resistance to radiation and UV rays. PC is also very strong, abrasion resistant and easily colored as well. The HDPE provides for good chemical and heat resistance. Also has a good environmental stress crack resistance. It is strong and flexible and will not allow any water to penetrate its surface. HDPE is also a fairly cheap material. The part will then be filled with polyurethane foam. The urethane foam causes the stock to become much stiffer and stronger than a typical injection blow molded stock.
Mold & Tooling Details

The mold will be made of Aluminum because it is easily machined and cheap. It also has good thermal properties allowing it to be heated and cooled quickly. Steel inserts would be used in high wear areas in order to prolong the life of the mold. Moving the die or mandrel, also called parison programming, would need to be done in order to achieve a more uniform wall thickness since parts of the gun stock are thicker than others.

Manufacturing Details

Possible problems with blow molding a gun stock would be the inletting that is traditionally done with wooden stocks. There are tight dimensions and some small radiuses on corners that could cause problems with the material not being able to form these regions. The blow molded stock might also need to be wrapped with fiberglass or even Kevlar to add the final physical and chemical properties it will need to withstand any gruesome hunting trip. Secondary operations will need to be done to remove any flash that is created or any aesthetic problems created during the manufacturing process.