



Machining of plastic parts

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Abstract

Plastic materials have good mechanical properties. Price and weight of plastic products are less as compared to metallic products. Therefore plastic is replacing to metals in various applications. Most of the plastic products are primarily produced by molding process. For large scale production molding process is preferred, whereas small scale production and requirement of surface quality, machining is preferred. Turning, drilling and milling these are the machining operations mostly carried out in plastic machining. Plastic injection molding is the process primarily used for manufacturing of large quantities of plastic products and suffers through the problems of warp age, poor weld lines, sink marks and poor surface finish. So, post processing or recycling is required in these cases. In majority of the cases, post processing is limited to removing burr, runners, flash etc. However, wherever dimensional accuracy and surface finish requirements cannot be fulfilled by molded components, they are required to be finished by machining. Also quantity requirement of products does not justify investment in tooling, particularly molds; plastic components become economical, if produced by machining. Polymers are organic materials having excellent formability and mouldability. The term plastic is synonymously used for polymers. Depending upon the nature of the intermolecular bonding, plastics can be classified as thermoplastics and thermosets. Generally plastic products are manufactured by molding processes like injection molding, blow molding, compression molding, transfer molding.

Keywords: computational, transfer, performance, dynamics

Introduction

Polymers are organic materials having excellent formability and mouldability. The term plastic is synonymously used for polymers. Depending upon the nature of the intermolecular bonding, plastics can be classified as thermoplastics and thermosets. Generally plastic products are manufactured by molding processes like injection molding, blow molding, compression molding, transfer molding, etc. Plastic injection molding is the process primarily used for manufacturing of large quantities of plastic products and suffers through the problems of war page, poor weld lines, sink marks and poor surface finish. So, post processing or recycling is required in these cases. In majority of the cases, post processing is limited to removing burr, runners, flash etc. However, wherever dimensional accuracy and surface finish requirements cannot be fulfilled by molded components, they are required to be finished by machining. Also quantity requirement of products does not justify investment in tooling, particularly molds; plastic components become economical, if produced by machining. Dimensional accuracy and superior surface smoothness are desirable characteristics of plastic products in the applications of precision machinery, electronics and optics. To acquire these characteristics, plastic products need to undergo machining process. Higher form and shape accuracies may be achieved by the precision machining processes like turning, drilling, milling, etc. Machining also enables a high flexibility in the production of asymmetric plastic products.

During turning process, measure of the technological quality such as surface roughness is influenced by cutting parameters. These cutting parameters are like cutting speed, feed rate, depth of cut, etc. For drilling process, thrust force and surface roughness of hole are considered as process and quality measure respectively.

While performing milling operation, surface roughness and machining force can be affected by spindle speed, feed rate and helix angle. This paper discusses plastic machining, particularly, machining processes like turning, drilling, and milling

What is Plastic Machining?

Machining Plastic is an Art. As the price of metals continues to rise, more and more product designers are looking for ways to replace machined metal parts with plastic parts, and machine shops are getting more opportunities to bid on jobs that call for machining plastics, and they are finding it profitable. Plastic materials have good mechanical properties. Plastic materials have less price and weight. Therefore plastic is replacing metals in many applications. Mostly plastics processing can be done by molding process. Molding processes are like injection molding, blow molding, compression molding, transfer molding, etc.

For manufacturing of large quantity plastic products, molding is preferred. For requirement of small quantities plastic products, molding process is not preferred, because, cost of making mold, process setting time and wastage of material do not justify cost of product. Hence machining of plastics can be adopted in this case. Machining methods primarily used are like turning, drilling and milling. In the production of plastic products like gears, cams, bearings, bushes, valve seats, these machining methods can be used. Whereas in the production of precision machinery, electronics and optics, there is need of high dimensional accuracy and good surface finish. Where precision machining is preferred. Today, use of non- conventional machining processes like laser cutting are also used for precision cutting.

Plastic Processing Technique

- Plastics can be machined, cast, formed, and joined with relative ease requiring little post-processing or surface-finish operations
- Plastics melt or cure at relative low temperatures
- Plastics require less energy to process than metals
- Raw materials most commonly are pellets, powders
- Also available as sheet, plate, rod, and tubing (produced by extrusion, etc.)
- Liquid plastics used to make reinforced plastic parts (composite materials).

Plastic CNC Machine

Connecticut Plastics specializes in CNC plastic machining and turned components, precision plastic machining and plastic fabrication for precision CNC plastic machining requirements, we have developed lathe tooling technology capable of delivering superior surface finishes and optical clarity. Our continuous upgrades on CNC equipment have allowed us to maintain our position as a premier CNC plastic fabricator. Equipped with milling heads and sub spindles, Connecticut Plastics' CNC lathes can produce many components complete with efficient cycle times. CNC plastic machining equipment can process a wide range of components from micro turning to 20 inches in diameter. The best and most consistent CNC plastic components are produced without secondary operations such as deburring.

CNC Lathe Capabilities Include

- General purpose and Swiss turning
- 2, 4, 5, & 6 axis lathes
- Prototype through long run quantities
- Lights-out operation
- Mill turn capabilities (Live mill tools with full C axis)
- Programming via MasterCam
- Plastic compatible coolants
- Micro components to 20 inches in diameter
- Length up to 12 inches
- 10 -16 micro inch finishes
- Near Optical quality turning
- Deep-hole drilling

Conclusion

Mechanical properties (like toughness, rigidity, abrasion resistance and heat resistance) of some polymers are like metals. So these types of polymers can replace metals. Also price and weight of plastic products are less as compared to metallic products. For achieving high dimensional accuracy and desired surface roughness of plastic components, plastic machining is preferred. Generally plastic machining has processes like turning, drilling, milling and unconventional methods like laser cutting, etc. Study of machining on plastics shows, machining nature of all plastics is not same. Hence effects of machining parameters need to be studied for different plastic material separately. In the field of machining, many investigations are carried out on various metallic materials and metal alloys. Literature on machining of metals and alloys are widely available. Very few investigations are carried out on plastic machining. Hence, literature in this area is comparatively less. Therefore, plastic machining needs to study very widely.

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