Introduction

Plastic parts are becoming more and more common in American industry. Thousands of parts that a few years ago could only be made of metal are now commonly fabricated of plastic. Plastics are finding increased application for two reasons: because they usually offer distinct performance advantages, such as longer wear, no lubrication, or reduced costs. And secondly, a switch to plastic for fabricated parts requires no new equipment, and only minor changes in fabrication procedures.

In addition, fabricated plastic parts offer these distinct advantages:

1. A small number of parts can be produced at relatively low cost.
2. Prototype parts can be produced and tested at comparatively little cost.
3. Large parts, even with close tolerances, are economical to produce.
4. Many identical parts can be produced in a few operations.
5. Secondary operations are generally not necessary for good surface finish and close tolerances.

Important Machining Considerations

Although fabrication techniques for plastics are similar to those employed with metals, there are important differences in the way plastics react to machining. Suggestions on handling specific plastics will be covered in the process descriptions, but some general facts are relevant to groups of plastics.

General

All thermoplastics, and especially the engineered plastics such as polyolefin, nylons, acetals, polycarbonates, and TFE's, can be machined. Standard wood and metalworking equipment and tools can be utilized, although for best results, different techniques than those used for metals and woods must be employed.

Machining characteristics are similar to soft metals, such as soft brass. However, for optimum results, certain characteristics common only to thermoplastics must be recognized, and allowances made for these differences.

The most outstanding of these characteristics is the generation of frictional heat.

Heat generated by surface friction is slow to dissipate and will build up during machining if proper care is not taken. (Although the softening temperature of nylon and TFE is high for thermoplastics, they are still relatively low when compared to metals).

Virtually all of the heat generated by the cutting friction between the plastic and the metal cutting tool will be absorbed by the cutting tool. Consequently, very little heat is transferred to the core of the shape. This heat must be kept to a minimum or be removed by a coolant for best results. If the heat generated during machining is allowed to build up, the surface of the plastic will expand, increasing friction, and the amount of heat produced. This will result in poor tolerance and finish, oxidation, and discoloration.

For this reason, adequate cutting tool clearances are essential. Stock temperature must be kept to a minimum to avoid excessive thermal expansion, which is about 10 times that of steel.

Plastics are relatively resilient when compared to metals, and machining procedures must be adjusted accordingly. Stock material should be properly supported to minimize distortion.

Elastic recovery occurs in plastic materials both during and after machining, so provisions must be made in the tool geometry for sufficient clearance to provide relief. The expansion of compressed material due to elastic recovery causes increased friction between the recovered cut surface and the cutting tool. In addition to generating heat, this abrasive action also causes tool wear and poor tolerance control.

General Machining Instructions For...

Section	#1	Acetals, Nylon
	#3	Fluoroplastics
	#4	Polycarbonates
	#5	Polyolefins
Section	#1	Acetal, Nylon
	#5	Polyolefins

Drilling

More heat is generated in drilling than in any other operation, so extra care is necessary to insure good results. Many difficulties not found with metals, such as gumming, melted surfaces in the drilled hole,

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