Section #1 Acetal, Nylon #5 Polyolefins

Shearing

Guillotine squaring shears, preferably power operated, are used to shear plastics. Blade angle should be parallel when practical but a variance up to 1½° is permissible.

Work supports are needed to produce clean, sure cuts. Nylons up to ⅛" thick, acetal up to 1/16" and polycarbonate up to ¼" can be sheared.

If cracking occurs in nylon, it may be necessary to preheat the strip or moisture condition it to approximately 2% moisture content.

Sawing

The greatest single problem in the sawing of plastics is the dissipation of heat. Plastics are poor thermal conductors with low softening temperatures. A cooling agent (liquid or compressed air — see page 11) is usually needed, unless the cut is very short.

Most saws used for cutting metals (manual and roller hack saws, hand, circular, and jig saws) can be used for cutting plastics. However, reciprocating saws generate considerable heat, causing excessive cracking and producing very rough cut surfaces.

Conventional radial or swing saws are quite satisfactory for cut-off work on rods, bars, bushings, plate, etc.

Circular saws are widely used in the plastics industry, and are ideal for making straight cuts in sheet and plate. Traveling circular saws or panel saws are ideal for sawing stacks of several sheets. Hollow ground blades with a set are recommended for cutting plastics, to minimize the friction between the saw and the work. The buttress type tooth form, having 45° to 60° clearance and 0° front rake should be used. Although the hollow ground saw without a set produces a smoother cut, it exhibits more rapid wear because of its lesser side clearance and may result in unsatisfactory surface after a short period of use.

Blade diameter and number of teeth per inch will vary with the thickness and the properties of the material being cut. However, 3 to 6 teeth per in., 1/32" to ⅛" thick, is a good general purpose blade.

Band saws are preferred because, by their nature, they are versatile and the long blade length causes less overheating. Band sawing can be used for irregular or curved contours as well as straight cuts.

Best results are obtained with skip tooth or buttress type tooth having a zero front rake and (raker) sets of teeth. Thick stock can be cut using 4 to 6 teeth per inch.

Band saws and jig saws should have enough set to give good clearance to the back of the blade. Plastics will tend to close in behind the cutting edge if enough set is not used. Chrome plating reduces friction and gives a better finish.

Saw speed ranges depend on the type of material involved and are only limited by the amount of heat generated. Saw speeds range from 500 to 6,000 fpm. The highest speeds produce the smoothest cuts. Cutting speed is important, but only experience will teach proper speeds, depending on material shape, saw used, and tooth design.

Medium to light feed is recommended. Pressure near end of cut should be reduced, to avoid chipping. Force feeding will result in blade heating, gumming of the material, loading of the saw teeth, poor cut, and excessive blade wear.

Lubricants and coolants should be used, preferably a water-soap solution. An air jet or suction hose can be used to remove dust and chips, for a cleaner and smoother operation.

Tapping/Threading

Most plastics are "notch sensitive," so sharp V-threads should be avoided. A thread with a rounded root, such as a British Standard series (Whitworth Thread), or American Standard Unified Thread form with rounded root is recommended.

In tapping holes, use high speed oversize taps on the order of H-3 oversize for small diameters, to H-5 oversize for larger diameters. Plating is sometimes used to convert standard taps to oversize for this purpose. However, taps should be purchased to proper size for best results. A chamfering operation is sometimes necessary after tapping, to remove burrs.

When tapping deep holes (over 3:1), the tap flute area should be enlarged for greater chip clearance. Four flute taps are generally preferred due to their greater flute area. For close thread size control, bottom taps should be modified by grinding a 50° chamfer angle on the face measured from the axis of the tap. Chips from tapping can be removed from the bottom of the tapped hole by redrilling with the tap drill.