

## MACHINING OF URETHANE (POLYESTER)



### Introduction

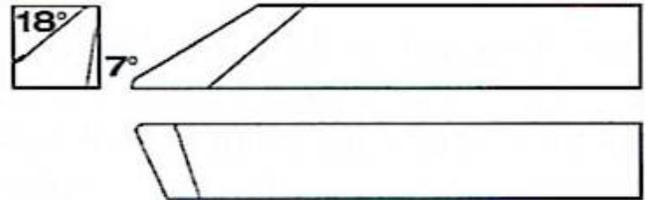
From time to time the need arises to make bushes from bar stock or to modify existing bushes for a specific application. The machining operations to make new bushes or modify stock bushes will all be carried out on a lathe. The concept used in machining urethane is completely different than machining grey iron, steel or ductile iron. You use only the basics of machining such as surface feed, RPM, etc.

The theory of machining urethane is "get in quick and get away" - this is best done by hand and feel. Machining urethane is an art of turning by feel - in most cases, other than turning, you do not use feed. To machine urethane from our experience is best carried out with high speed steel grade tooling. You need tools specially ground for the durometer of the urethane to be machined. Tool clearance is very critical. The material has to slide away with no resistance at all, avoiding chips. You want to leave the material in one piece, like a ribbon, if possible.

### Turning of Urethane

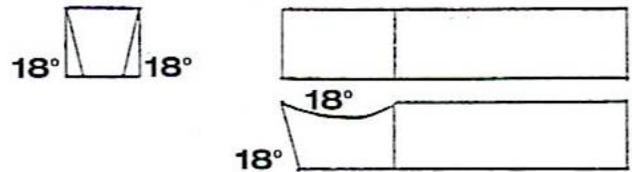
The two primary grades of urethane that we work with are 70 durometer and 85 durometer (Shore A). The softer 70 duro material does not lend itself to machining and thus we recommend all machining operations be carried out using 85 duro material. It is best to bore the solid rod and mount it on a mandrel for the best turning results - the same applies when modifying moulded bushes. Having the tool approximately 1mm below centre height removes material a lot easier. No coolant is necessary if these procedures are followed. A feed rate of approximately .017" (0.4mm) per second is acceptable. Head speed of the lathe should run at 980 to 1200 RPM, resulting in a surface feed of between 100' to 150' (30 to 50 metres) per minute - this will be ultimately determined by the outside diameter of the part you are turning.

Grind your tool with a seven (7°) degree front rake and an eighteen (18°) degree top rake. Rapidly plunge into the material, up to .050" (1.25mm) per second hand feed. It is almost impossible to go too fast. Remember to remove the tool quickly to keep from leaving tool marks and urethane build-up on the finished urethane cut. When machining urethane, any resistance from your tool when cutting will result in melting or burning of the material.



### Grooving Urethane

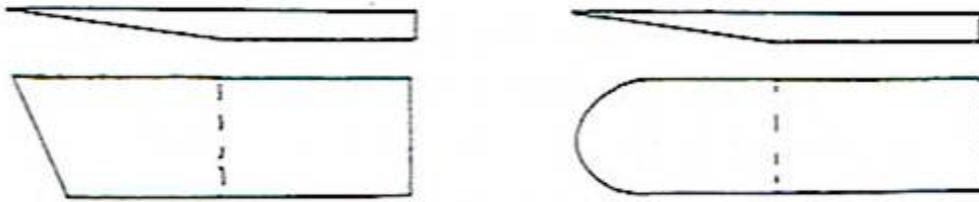
In some applications you will want to machine a groove or recess into the outside dimension of the part you are making. This is best carried out by plunging a shaped tool into the part. Head speed and surface feed should be the same as for turning procedures. Rapidly plunge into the material, up to .050" (1.25mm) per second hand feed. You must get in and out fast so shaving does not wrap back around the work piece. Your tool will be shaped to the configuration of the groove you want looking approximately from the top of your tool down it will resemble the cut you are seeking. Allow approximately 1/16" (2mm) wider width on your tool to compensate for the urethane pushing away from the tool and then contracting back. Your tool needs as much rake on the sides and the top as you can get, eighteen (18°) degrees if possible.



This procedure must be carried out by a qualified person

### Parting (Knifing) Urethane

The hardest thing about knifing urethane is that the material wants to pull into the tool causing a dishing effect - this makes it very difficult to hold any tolerances. The best procedure is to cut the bulk of your material away in your first cuts, leaving a 1/32 / 1/16" (1-2mm) finish cut, which you do at a slow feed, usually by hand. Either a parting tool or old power hacksaw blade can be used. For best results sharpen your tool to a razor edge point - a bull nose or flat nose with slight back rake can be used.



### Drilling Urethane

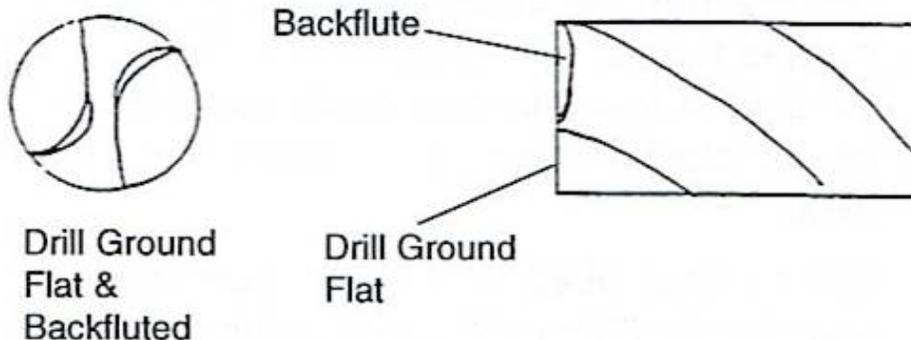
Drilling urethane can be a frustrating experience. There are so many variables that can effect the end result, such as durometer hardness, thickness of material, size of hole, size of drill, RPM and feed. We have found two methods of drilling that are effective:-

- 1) Good results can be achieved by grinding a 60 degree angle on a standard high speed drill - then grind a special razor sharp point as per the diagram.
- 2) Grind a standard high speed drill flat nosed like a mill cutter - then backflute the two spirals to a razor sharp edge. Either of these two methods will permit the swarf to be drawn up the fluting and not cause excessive heat build-up. The urethane will melt, so use a slow RPM drill and a fast feed.



### Installation of Machined Urethane Component

It is strongly recommended before installing the new Urethane components that all mating components are checked for damage/cracks and are free from any contamination. Failure to do so can cause premature component failure. Noltec strongly recommends that its "Goop Grease" should only be applied to the bores and outer flanges of all bushes and components.



This procedure must be carried out by a qualified person