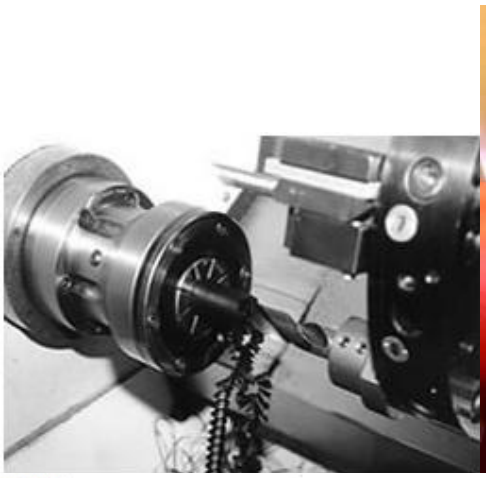
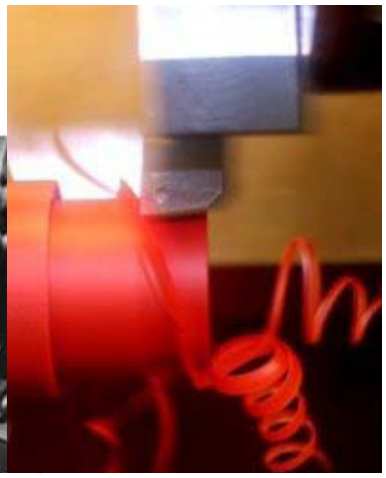
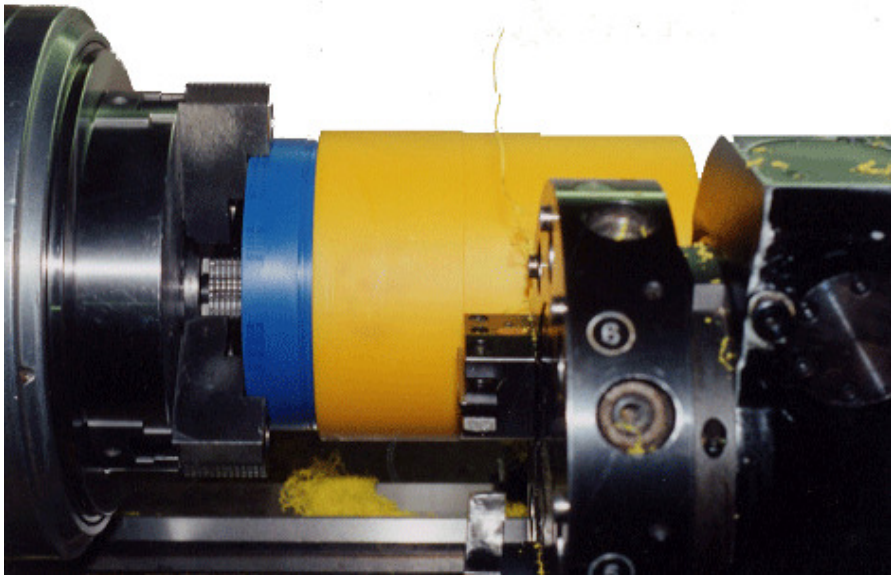
Machining Nylacast Materials







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Machining Nylacast Materials

Nylacast materials can be machined by conventional metalworking and woodworking machinery. They can be turned, drilled, tapped, threaded, reamed, milled, planed, sawn and blanked. The essential requirements are high speeds, high feed rates and sharp tools.
Machining procedures are basically the same as for soft metals, i.e. brass. The exceptions relate mainly to refinements in tool clearance angles and support of the workpiece. All Nylacast materials are extremely free cutting and slightly resilient in comparison with steels. Any tool ground for brass, provided it is sharp, will give satisfactory results.
Machining Nylacast materials without the use of coolants produces a much cleaner appearance to the finished component without detriment to the finish. Coolants such as soluble oil are recommended on long production runs where extended tool life is of prime importance.

Turning

Nylacast materials should be turned as a free cutting material, using high speeds of 3.0 – 4.5m/sec surface speed, with heavy roughing cuts at feed rates per rev. of 0.010 –0.25mm for small diameters and 0.08 – 0.18mm on larger diameters. A fine finishing cut is not advantageous and a high surface finish can be achieved with a cut of 0.025 – 0.041mm without any change to feed rate. All tools must be sharp and well backed off at all times, as any loss of edge will result in deterioration in surface finish.
The work piece must be supported as much as possible owing to the resilient nature of Nylacast compared with metals. Carbide tipped tools can be used for long production runs but must be honed to a very sharp edge. High-speed steel tools are generally found to be sufficient and a keen edge is easily maintained.
NOTE: Before commencing to bore any cast nylon rod above 75mm diameter, it is advisable to drill a 6mm or maximum of 10mm diameter pilot hole. Although all Nylacast materials are stress relieved during manufacture, it is nevertheless good practice to adopt the pilot hole procedure as an additional safeguard against stress. The drilling of a pilot hole has the effect of releasing any residual stress and thereby prevents possible fracture of the component.

Milling

Nylacast materials can be readily milled on all conventional machinery using most stock cutters. When selecting cutters, well backed off tooth forms are advantageous and under no circumstances should a non-cutting surface be allowed to "rub" against the component. For this reason, side and face, fly cutters and mills or slot drills are generally selected for Nylacast materials, but must be kept sharp. Cutter speed in excess of 5m/sec. with fast feed rates of 4mm/sec. and heavy cuts are commonly used. A light finishing cut will produce a fine finish. Single-point tools are again preferred.
The work piece must be fully supported during all milling operations. Care must be taken when clamping Nylacast material components, owing to its resilient nature compared with steel. Clamps should be even and extend over a wide area of contact. The use of a coolant is not generally necessary for milling Nylacast material.

Reaming

Nylacast materials can be machined reamed using any conventional reamer, but owing to its resilient nature, reamers of the expandable type are preferable. It is difficult to remove less than 0.05mm when reaming and it is therefore recommended that at least 0.13mm should be left for final reaming. The work piece should be well supported throughout reaming operations. Soluble oil as a coolant could be advantageous when reaming long holes with conventional reamers but it is not a necessity.

Tapping

Tapping can be performed by machine or hand. The tapping drill should be slightly larger than that normally used for metals. Due to the more resilient nature of Nylacast materials, the hole will close a small amount when the drill is withdrawn. Use of a first tap is not necessary but it may be of some advantage when hand tapping to square the first two or three threads.

To achieve a close tolerance when tapping, high speed taps from 0.05 – 0.13mm oversize should be employed. Standard chrome-plated taps can be used as an alternative to give an allowance for the natural recovery of the material, although procedures of this nature are rarely found to be necessary in practice.

Threading

Threads can be cut by all conventional methods providing the tools are kept exceptionally sharp and well backed off to avoid any non-cutting surface contacting the component. For this reason single-point tools are recommended wherever possible. Light cuts below 0.015mm should be avoided and a maximum cut of 0.25mm is recommended, provided the workpiece is well supported either at the centre or on long lengths by steadies. Speed should be as high as practicably possible. When machined “dry”, this combination has been found to give the best possible results, but care must be exercised regarding swarf clearance when employing fully automatic equipment since there is no known “chip breaker” which is entirely satisfactory for these materials.

Drilling

The most important factors in drilling Nylacast materials are that the drill is kept sharp, that the swarf is not allowed to build and pack in the flutes of the drill, and the use of a small pilot hole when drilling large solid components. The workpiece must be well supported during all operations. General purpose drills are found to be quite adequate for Nylacast materials, but it is recommended that they are ground to an included angle of 80o – 110o with 10 – 15o lip clearance. Drill speeds and feed rates should be high, and the drill must be frequently withdrawn to prevent swarf build-up.

As already stated, a drilled hole will close down slightly when the drill is withdrawn, but size holes with extremely good finishes can be easily achieved in two operations. The second or size hole must be a minimum of 0.25/0.5mm greater in diameter than the first hole to allow sufficient material for the drill to bite. Counter-boring and countersinking operations are easily carried out by use of “spade” or “D” type cutters or a counter-drill. It is advisable that these operations are carried out by a fast “plunge” type action which will necessitate a depth stop.

Blanking

Tooling for Nylacast materials follows the same basic formulation as steel. Both punch and die should be hardened to Rockwell C62 or C63 and die clearances should be in the order of 0.013mm. This operation is generally restricted to the manufacture of washers, grommets etc., from thin sections of Nylacast materials.

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Sawing

All conventional types of woodworking or metalworking machine saws are suitable for Nylacast materials, provided the blades are coarse set and sharp. The material will cut quite freely under light pressure. Power hack saw: - Coarse blade of approximately 4 -6 teeth per 25mm with light pressure. Band saw: - Skip or Buttress tooth 2-3 teeth per 25mm. Circular saw: - Buttress tooth 2-3 teeth per 25mm 225-300mm diameter. Soluble oil or soap/water solution can be used as a coolant but is not normally required.

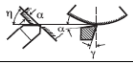
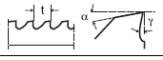
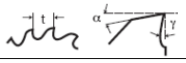
Planing

Woodworking planning machines are used for Nylacast plate, where non-standard thicknesses are required. Cutters must be sharp and cutter speeds and feeds high. The use of tipped planer blades is recommended although not essential.

Bonding Nylacast Material

Nylacast materials may be bonded by suitable adhesives to themselves, many other plastics and most metals. The bonding agents employed should be chosen on the requirements of a particular application, and we therefore suggest that we are consulted at an early stage so that we may advise on the most suitable all-round method available.

Additional Guidelines

				PA	POM
	TURNING 				
a	Side Relief Angle	°	*a*	6 - 10	6 - 8
y	Rake Angle	°	*y*	3 -5	0 - 5
n	Side Cutting Edge Angle	°	*n*	45 - 60	45 - 60
v	Cutting Speed	am/min	*s*	200 - 500	300 - 600
s	Feed	mm/rev	*v*	0.1 - 0.4	0.1 - 0.4
Peak radius r to be min.		0.5mm			
	MILLING 				
a	Relief Angle	°	*a*	10 - 20	5 - 15
y	Rake Angle	°	*y*	5 - 15	5 - 15
v	Cutting Speed	m/min	*s*	<0.05	<0.05
s	Feed	min/tooth	*v*	250 - 500	250 - 500
	DRILLING 				
a	Side Relief Angle	°	*a*	15 - 15	5 - 10
y	Rake Angle	°	*y*	10 - 20	15 - 30
p	Top Angle	°	*p*	90	90
v	Cutting Speed	m/min	*s*	50 - 150	50 - 200
s	Feed	mm/rev	*v*	0.1 - 0.3	0.1 - 0.3
	BELT SAW 				
a	Relief Angle	°	*a*	10 - 15	10 - 15
y	Rake Angle	°	*y*	0 - 8	0 - 8
t	Pitch	mm	*t*	4 - 10	4 - 10
v	Cutting Speed	m/min	*v*	50 - 500	50 - 500
	CIRCULAR SAW 				
a	Relief Angle	°	*a*	10 - 15	10 -15
y	Rake Angle	°	*y*	0 - 15	0 - 15
t	Pitch	mm	*t*	8 - 45	8 - 45

(All information contained in this literature is to our current knowledge)

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