Routing & Trimming Polypropylene

Polypropylene is what many people mean when they say "plastic" because it is the base of many products and capable of being fabricated by many processes. From fiber to film, from injection molding to thermoformed sheet polypropylene is as versatile as it is varied. It can be formulated to result in a wide range of melt points, weights, stiffness and machineability. Formulations can provide a substance somewhere between traditional rubber and conventional plastics. Other possibilities may be filled or reinforced grades which offer good stiffness and stability.

One property of polypropylene, chemical or solvent resistance, makes it ideal for tanks, vessels and bottles used in the chemical industry. PP is also used for clean room furniture and fixtures. Some other auto interior and trim parts, shrouds, covers, storage bins are all PP products which may be trimmed or routed in the fabrication process.

Most PP products are machined on CNC routers. Hand held electric or air routers do not normally give satisfactory results. In most instances, PP is a difficult material to work with because of its gummy nature. It is always susceptible to reweldment or wrap around of waste material on the cutting tool. It can be challenging to obtain a proper finish on the end product. Feed rates are critical for productivity and cutting tool selection is critical for best results. Anyone who has cut or trimmed anything but the most dense and stable PP can attest to the above. Machining PP is a continuous improvement process often initiated by a basic trial and error process.

There are a few principals to employ when machining polypropylene. Every attempt should be made to cut large chips. This can be accomplished by use of slow helix tools shown in figures 1 and 2. Slow helix tools tend to take a larger chip than conventional helix tools and are available in single or double flutes in both upcut and downcut spirals. Here is where some trial cuts should be made to determine whether single or double flutes and up or down spiral works better in a specific application. A single edge O flute, shown in figure 3, may also be the best answer for a particular job. Slow helix tools are also available with a bearing pressed on the end of the cutting edge for guided trimming operations if a CNC router is not available. Because of the gummy nature of PP and the inherent heat generated by cutting action, high-speed steel tools are not recommended. Solid carbide bits will outperform high-speed steel, carbide tipped or diamond tools and are the only type recommended for cutting PP.

FIGURE 1

FIGURE 2

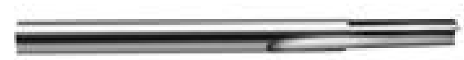


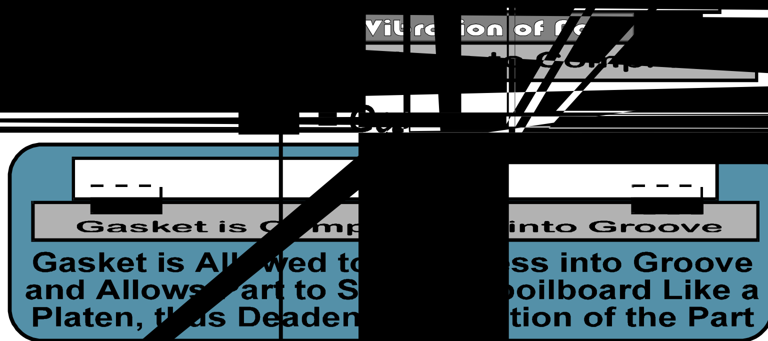
FIGURE 3

FIGURE 4

High feed rates should be employed along with lower spindle speeds. This will tend to abate reweldment behind the cut and waste wrap around. Feed rates should be increased until such time as the finish is unacceptable. Spindle speed should then be reduced until the finish is once again acceptable. The process can then be repeated until the optimal result is achieved. This process should be repeated, then catalogued, for each unique set up.

One may want to consider a two-pass process to optimize both feed rate and piece part finish. If a tool changer is available, the second pass can be taken with a finishing tool such as shown in figure 4. In all instances, when the depth of cut exceeds the cutting edge diameter of the tool by more than a factor of three, multiple passes should be taken. When such is the case, the second pass should be taken with the same tool as the first cut.

improve hold down. Many times, however, the tape is just placed on the spoilboard surface. When the vacuum is turned on, the foam has no place to go but a flat compress. The result is the tape loses its memory and allows the part being cut to vibrate.



Any inconsistency or warpage in the part will also be exaggerate[illegible]ned gasket tape. Either situation will facilitate tool breakage and less than achievable fi[illegible]blem can be mitigated by making a channel in the spoilboard before applying the gasket ta[illegible] the channel should be one half the thickness of the gasket tape. Grooving the spoilboard w[illegible]part to achieve a better vacuum and will prolong both the life of the tool and the gasket [illegible]re 5 for a description.

Polypropylene can be cut effectively in a CNC router en[illegible]t is, however, a more complex environment than we have previously discussed with ro[illegible]mming either PET or ABS.