Information Resources for the CNC Router User

Guide to available Web sites and other information.

By Van Niser

Not so many years ago, the machining of plastics was more of an art than a science. The typical sheet fabricator or vacuum former utilized a variety of innovative techniques to perform some very challenging secondary machining functions.

Unique fixturing of parts and positioning of machinery to attain the necessary results was commonplace. The use of electric and air driven routers and drills was the mode of operation, with cutting tool selection based on availability at the local supply house. Metal and woodworking cutting tools were utilized without regard to effectiveness or efficiency. Basically, the plastic machining industry was accomplishing a great deal without the benefit of much outside information or assistance.

This situation changed significantly with the advent of the CNC router in both the 3-axis and 5-axis mode. It became evident almost from the beginning that the method of holding parts and cutting tool selections of the past would not perform in the feed and speed environment associated with these new era machines. Plastic fabricators demanded, and the cutting tool industry responded with, application-specific tooling and far more information on how these tools functioned.

Web Resources

Today the resources available to those machining plastic are enormous. The Internet has had a tremendous impact on the availability of such information along with trade publications, magazines and periodicals. However, there are relatively few sources germane to machining or routing plastics and those ancillary functions which facilitate sound machining principles.

Consequently, it was good news when the first site on the Internet relative to the routing of a plastic was jointly launched by IAPD and Onsrud Cutter and appropriately named http://www.plasticrouting.com. It is the culmination of years of investigation, planning and testing to pinpoint the proper router tool to machine various types of plastics. The process of testing was facilitated by a group of plastic material producers, who provided material for testing at the CNC router lab at Onsrud Cutter. The material tested was classified by brand and generic name, with specific tool recommendation made for each product. Another available Web site, http://www.plasticsusa.com, provides a detailed list of plastics by the aforementioned classification for those unsure of the material being machined.

Plasticrouting.com also includes manufacturer contact information, material color and/or color code, and thickness. After an initial registration process, the CNC router user can quickly ascertain the best information regarding: tool selection, feed and speed, cut direction, cutting techniques, tool diameters and helix, recommended depth of cut, roughing and finishing passes, and expectations for surface finish of material being cut.

Don’t Assume

As users browse within the Web site, they discover, as the engineers on the project did, that all assumptions based on previous experiences may not be necessarily valid.

First, not all plastics within the same generic classification cut the same. The tool selection process was heavily impacted by the variance among processes of the respective manufacturers. The color of the material also had a profound effect on the cutting properties and the resultant finish. In addition, conventional cutting was not always the best direction of cut, but climb cutting seems to be more effective finish-wise in some materials. With the melting tendency of plastic being a critical factor, climb cutting was again a surprise during the testing process.

Secondly, there was no great deviation in feed rate range. The tool diameter was the controlling factor in feed rate, but a larger diameter was not necessarily better in terms of finish. This is contrary to conventional thought, which assumes that larger diameter provides more stability and better finish. In terms of feed rate, the general finding was 1/8-inch tools ran best at 50 – 100 IPM, 1/4 inch in the 75 –150 area, 3/8 inch in the 150-200 range and 1/2 inch at 200-300 IPM. The best overall diameter of tool seems to be the 3/8 inch, followed by the 1/4 inch and 1/2 inch. In all cases, the desired chipload range was 0.004 - 0.012 to achieve maximum finish. It is common knowledge in the plastic machining business that finish is paramount.

Additional Resources

As the user continues to maneuver the site, he will find additional resources available through a searchable FAQ section and a message board encouraging users to share ideas and concerns. The site is a dynamic process and will continue to evolve as new materials are tested and innovative plastic cutting tools are developed. Presently, the following plastic material producers are participating in the database:

A.L. Hyde Co., Allen Extruders Inc., Alusuisse Composites Inc., Aristech Acrylics LLC, Atofina, Compression Polymers/ Vycom, Cyro Industries, Eastman Chemical Co., Enflo Corp., GE Structured Products, Gilman Brothers Co., HPG International Inc., Ineos Acrylics, Kleerdex Co., Plaskolite Inc., Poly Hi Solidur, Quadrant Engineering Plastic Products, Roechling Engineered Plastics, Sheffield Plastics Inc., Spartech Plastics Corp., Sustaplast LP and Westlake Plastics Co.

Machinery Maintenance

Once the tool selection process has been verified, the CNC router user should concentrate on maintaining the machine to ensure rigidity and concentricity of the spindle, while building fixtures that hold parts rock solid to the work area. These are all critical issues relative to the production of parts with acceptable surface finishes at maximum productivity.

The best source for maintenance procedures regarding machinery is the respective Web sites of the various CNC router manufacturers. Beyond those recommended procedures, the user can aid the issue of concentricity by instituting a collet and tool holder maintenance procedure, which includes periodic cleaning of these holding systems and replacement at designated intervals. A helpful Web site regarding this subject with a comments and question section is provided by Techniks at http://www.techniksusa.com. Gasketing material and professional advice relevant to spoilboards and fixturing for CNC routers is also available from All-Star Adhesive Products at www.allstaradhesives.com. The site includes application inquiry and contact information for specific problems.

The Web site associated with Plastic Machining & Fabricating can be visited at www.plasticsmachining.com. The site includes past articles from this column on the routing techniques and a multitude of links relative to the plastic industry. It is a valuable resource to update knowledge on machining practices and keep abreast of new technological trends.

Plastic machining continues to be an art, but is strongly enhanced by the technological advances and information available to perform at the highest level. Consequently, when the need arises, surf the web; access plasticrouting.com and the other aforementioned sites to improve machining applications.