Proper colleting and collet maintenance in CNC routing of plastic

by Van Niser

Rigidity is a key factor in the routing of plastic material. The problems associated with rigidity involve the part, as well as the machine. Parts must be held solidly with established fixturing techniques, and the machine must be appropriately maintained to ensure the cutting tool is following the proper tool path in a rigid and concentric fashion. One of the elements that aids in this whole process lies in the area of proper colleting of the router bit and the ongoing maintenance procedure associated with router collets.

Types of collets

The half grip and full grip collets are the two basic types found in CNC routers. Half grip collets are identified by slits running from the bottom or mouth of the collet toward the top for about 80 percent of the collet length. These collets are often counter bored at the top not allowing the shank of the tool to contact the entire length of the collet. The force holding the tool is primarily generated at the mouth of the collet, and proves ideal in situations where the shanks of the router tools are not long enough to fill the entire collet. (See Figure 1.)

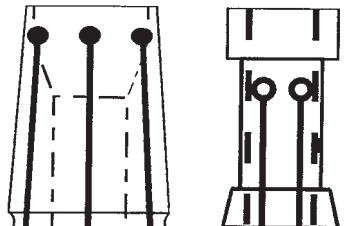

Figure 1.
HALF GRIP COLLETS

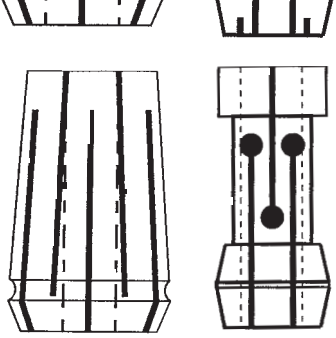

Figure 2.
FULL GRIP COLLETS

The full grip collet is identified by slits running from both ends of the collet, which creates specific collet sections. Full grip type collets allow for squeezing pressure to be exerted over the entire length of the collet. (See Figure 2.)

Proper colleting

The proper method of colleting a router bit in the full grip collet is to fill at least 80 percent of the depth of the collet. This allows the tool to be equally distributed on all sections of the collet and provides an environment where the tool runs in a true circle or concentrically. Without concentricity, the finish of the plastic part is adversely affected, and tool failure can occur. There are situations where the 80 percent rule cannot be maintained because of inadequate shank lengths or extreme reach problems. Consequently, it becomes necessary to fill the void in the top of the collet with a filler or collet life plug. This is a practical solution to avoid collapsing of the collet, which may result from not following the 80 percent rule. (See Figure 3.)

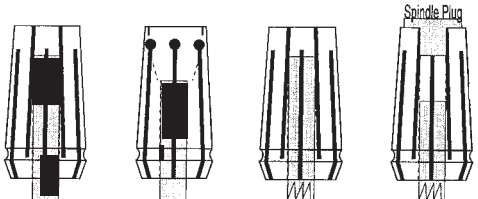

Figure 3.
PROPER TOOL COLLETING

In all router bits, there is an area known as the flute fadeout section of the tools. This is formed when the grinding wheel utilized in the manufacturing of the tool exits the work piece. In order to properly collet a router bit, the mouth or bottom of the collet must contact the router bit slightly above the flute fadeout. Overcolleting or allowing the flute

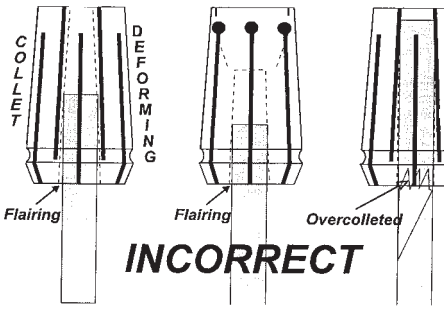

Figure 4.
INCORRECT TOOL COLLETING

fadeout portion to extend inside the co
let can damage the collet and is a com
mon cause of tool breakage. (See Figure 4

Collet maintenance

Router bits and collets are expected to o
erate accurately in a work environme
inundated with heat and grime. Plast
chips formed by the cutting action
the router bit carry with them resins th
migrate through the slits of the colle
and adhere to the inside of this close
toleranced mechanism. The resin buildu
usually concentrates nearest the mout
of the collet. At this point, the tool is n
longer being equally gripped causing
loss in concentricity and tool run ou
Once again, the lack of a router tool ru
ning in a true circle affects the finish
the part and may cause the ultimate d
mise of the tool. (See Figure 5.)

Fortunately, this problem is easily r
solved by cleaning the collets after eve
tool change. The procedure involves th
use of non-abrasive brass tube brus
applied inside the collet in combinatio
with a cleaner such as Rust Free. All su

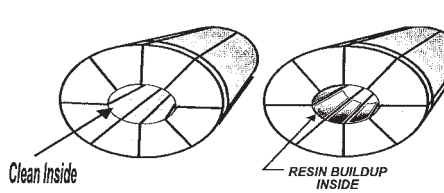

Figure 5.
COLLET EXAMPLES

faces inside and outside the collet, inside the spindle taper, and matching and mating surfaces of quick-change toolholders, should be thoroughly cleaned and dried before being reassembled. Also, the collet nut should be cleaned of resin and chip buildup, and regularly replaced to ensure the integrity of the whole collet system. (See Figure 6.)

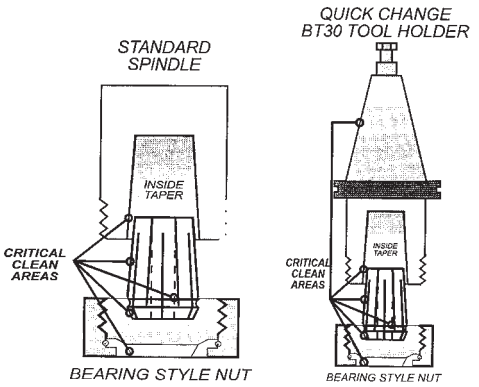

Figure 6.
SPINDLE TYPES

Collet replacement

Collets are manufactured from spring steel and regular usage causes a loss of elasticity. Therefore, it becomes necessary to replace collets on a regular interval as a part of an ongoing maintenance procedure. With diligent attention to proper collet maintenance, the average collet should be replaced about every 400-600 hours of run time. Avoiding regular replacement can lead to brittle collets, which may crack or break, and cause permanent damage to the spindle. Replacement of collets is a much more economical alternative than replacing router bits or expensive spindles.

Rigidity and concentricity are the key elements in any routing application. The simple process of properly colleting router tools, maintaining collets and replacing them at regular intervals will safeguard the productivity of the operation and ensure that the finish of plastic parts is not jeopardized. ■

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