

CUTTING TOOL SELECTION

The Right Tool for the Job. The best production system will never achieve its potential with the wrong tools. A wide range of cutting tools are available to provide the best tool for any cutting job. When selecting a cutting tool, several options should be considered.

1) Tool Material

- a) Solid Carbide. Provides the best rigidity and long tool life.
- b) Carbide Tip. Incorporates wear resistance of carbide and the toughness of an HSS body.
- c) HSS. Provides a tough body and sharper cutting edge.

2) Flute Geometry

- a) Straight Flute. Highest force. Provides a neutral cutting action.
- b) Upcut Flute. Provides the best surface finish and allows for good chip extraction.
May cause part lifting if vacuum or fixturing is not sufficient.
- c) Downcut flute. Provides a downward force to help eliminate part lifting.
Chip re-welding may occur if there is no space below the part for chip expansion.
- d) Compression. Used for laminated materials. Produces a good top and bottom finish on the part.

3) Number of Flutes

- a) Single Flute. Allows for larger chip loads in soft materials.
- b) Double Flute. Allows for better part finish in hard materials.
- c) Multiple Flutes. Allows for an even better part finish in hard materials.

4) Optimizing Feeds and Speeds

- a) Use the recommended chip load and RPM for the material being cut.
- b) Increase the feed rate until the part finish starts to decrease. Decrease the feed rate by 10%. This can prevent moving the part off the vacuum.
- c) Decrease the RPM by a set increment until the surface finish deteriorates. Increase the RPM until the finish is acceptable.
- d) Taking the largest chip possible occurs when the cutting speed and feed rate are optimized.

Note: As the number of cutting edges increase, the feed rate should increase to prevent burning and premature tool dulling.

1) Tool Heat

- a) Optimization of feeds and speeds should be done in the first sheet of material to prevent tool dulling due to excessive heat.
- b) If a feed rate is too low, heat will cause the cutting edge to break down and dull quickly. To check this, run a nest of parts and stop the spindle. When the spindle has stopped rotating, carefully gauge the tool's temperature. It should be at or near room temperature. If the tool is hot, revisit "Optimizing Feeds and Speeds."

TOOL GEOMETRY TERMS

SINGLE FLUTE – A tool with only one cutting edge. Can be used at higher feed rates.

DOUBLE FLUTE – Two cutting edges allow tools to provide a better finish, sepecially when cutting harder materials.

UPCUT SPIRAL – Allows for upward chip evacuation. Well-suited for grooving, slotting, or any application where the best finish is required on the bottom side of the the material.

DOWNWARD SPIRAL – Allows downward chip evacuation and reduced vibration. This is ideal when the best finish is required on the top side of the material.

UP/DOWN SPIRAL – Ideal for double-laminated materials. Produce a good finish on the top and bottom sides of the material.

ENGRAVING CUTTER – Ideal for three-dimensional cutting, standard engraving, and fine detail cutting.

O-FLUTE – Ideal for cutting soft to medium woods and flexible, non-abrasive plastics. Designed to provide optimum chip removal at high feed rates. Identifiable by its half-moon shape; classified as a single flute cutter.