TECHNICAL - SOLID CARBIDE DRILLS

SOLID CARBIDE DRILLING

Drilling Performance Features

The most valuable property of solid carbide is that it offers a safer and more dependable solution to the toughest problem engineers contend with; reliability. The reliability of a cutting tool's performance is often a problem associated with tool wear, and the properties of cemented carbide are well-known in providing an optimal solution to the wear problem.

Solid carbide tools can be used more aggressively than high speed steel tools due to their superior wear resistance. Solid carbide has more rigidity than high speed steel cutting tools, resulting in less deflection leading to improved dimensional accuracy and positioning. Because solid carbide can operate at higher metal removal rates, work hardening, which is usually associated with the machining process, is diminished.

Solid carbide round tools compare favorably to indexable insert tooling as the product selection is broader, set up is easier, the tool is more rigid, the purchase cost is lower, and smaller diameter holes are achievable.

Benefits of Solid Carbide Material

The products contained within PTD's solid carbide are produced from "extra fine" grain materials which have toughness approaching that of high speed steel, and the wear-resistance required for demanding metal cutting applications. The overall benefits of the premium material results in:

- Better tool finishes
- Superior wear-resistance
- Increased thermal resistance
- Better coating adhesion
- Sharper edges
- Higher speeds and feeds

Solid carbide tools, due to their superior wear resistance, have the capability to operate more aggressively than high speed steel cutting tools.

How To Drill Effectively

Solid carbide drills provide the opportunity to improve drilling productivity when used under the right conditions. Drilling performance is optimized due to the ability to machine at a more rapid rate while withstanding wear. Thus, longer tool life is realized and the metal removal rate is increased in comparison to high speed steel drills. The advantages also include:

- Less runout and more accurate hole quality
- Improved surface finish of the hole
- Less work hardening of the workpiece material

To achieve optimum performance, it is important to comply with the following:

Machine Capability

The machine must have the necessary rigidity to minimize spindle deflection and backlash and sufficient horsepower to perform at the recommended speeds and feeds.

Holders

Tool holders and collets must provide good concentricity between the drill and the machine spindle. Use a positive back stop to prevent the tool from backing up into the holder. Never collet the tool over the flutes or over-tighten the holder. Static runout in the tool assembly must be accurately checked and maintained. (Refer to chart 1A)

1A Static Runout Parameters

Diameter Range (")	Maximum Limit (")
.0312 - .125	.0004 FIM
> .125 - .375	.0008 FIM
> .375 - .500	.0010 FIM
> .500 - .750	.0012 FIM

(**Note:** FIM = Full Indicator Movement)

Workpiece

A secure and rigid workpiece to minimize deflection is needed, particularly on through-hole applications.

Drill Selection

Use the shortest drill as the application will permit in order to achieve maximum tool rigidity. (See AMG charts)

Note:
The AMG charts establish a recommended starting point for operating speed and feed per revolution. They can be used as a guide to select the best drill and the recommended operating data. Alternatives to the best drill are also identified.

Warning:
Cutting tools may shatter. Always wear approved safety glasses and mask when using or regrinding. Solid Carbide cutting tools may contain or produce a chemical(s) known in the State of California to cause cancer (Proposition 65).

Speeds

Solid carbide drills are normally run at substantially higher speeds than high speed steel drills. When drilling holes deeper than three times the diameter, reduce the speed between 10-30%.

Feeds

The feed rates for solid carbide drills are normally comparable to that of high speed steel drills. It is important not to underfeed the drill which will cause it to dwell and dull. This is particularly true in work hardening materials. If improved surface finish is required in the hole, the feed rate should be lowered.

Coolants

Coolants are recommended when drilling mild steel and high temperature alloys. The purpose of the coolant media is to direct the chips away from the cutting tool and workpiece. Excessive coolant pressure and/or too much volume can negatively affect performance. When using coolant fed drills, the coolant pressure that is required should be higher than normal. Suggested pressure for coolant fed drills is minimally 150 P.S.I. As the diameter of the drill is reduced, the higher the pressure. This is to assist the chip in evacuating from a more confined area.