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Fabrication Corner

Drilling Aluminium – Back to Basics

This article is based on an excellent piece from the USA's "Cutting Tool Engineering" magazine.

When drilling, perhaps no variable is as important as the workpiece material. It dictates drill geometry and substrate, tool coating, coolant application, as well as speeds and feed rates.

While known for its relative softness and ductility, misconceptions abound among those who regularly drill aluminium.

"Aluminium is considered by many to be one of the easiest machining materials, but it does present its own unique challenges"—particularly when drilling, explained Elliott Frazier, a product manager at Tungaloy America Inc. "Aluminium is a generally soft, nonferrous, ductile material with low density and naturally high resistance to corrosion. Aluminium is difficult to drill because its ductility and softness causes the material to make constant prolonged contact with the rake face, or cutting edges, of a drill."

The two main issues when drilling aluminium, explained Chad Lynch, field sales engineer for Allied Machine & Engineering Corp., are chip formation and chip evacuation. "If you approach it without the proper tool geometry, without the proper coating, without the proper coolant, it can very quickly turn into a situation where long, stringy chips are wrapping themselves around the tool."

Frazier added edge build-up to the list of primary challenges when drilling aluminium alloys. The aluminium will build up and adhere to the cutting edge and interfere with the formation of new chips from the parent material, which can lead to chip packing, as flutes become clogged. This leads to deposits of aluminium adhering to the drill, promoting even further adhesion and chip packing.

The main difference between drilling aluminium and harder materials, noted Jason Hout, global deep hole machining and application specialist for Sandvik Coromant Co.,is that the shear point of aluminium is low enough that it can be sliced by the tool's cutting edge, as opposed to being pushed

out of the way when machining harder materials. This means an upright, high shear angle with a minimal edge hone is ideal for drilling aluminium.

“Usually, coatings are not applied to drills in aluminium applications, as a majority of coatings contain aluminium," he said. Because the majority of coatings contain aluminium as one of their base constituent elements, some manufacturers have begun using a titanium-zirconium-nitride coating in aluminium applications. “But the conventional wisdom in this field is to use a sharp, high-polished, uncoated carbide drill.

Source: Cutting Tool Engineering (www.ctemag.com)