



# FLEX-HONES DEBURR COMPLEX AEROSPACE PARTS

ARTICLE PUBLISHED BY AEROSPACE MANUFACTURING AND DESIGN  
APRIL 2021



# AEROSPACE

MANUFACTURING and DESIGN

Dedicated to the Design, Manufacturing, and MRO of Aircraft and Aerospace Components



INGERSOLL CUTTING TOOLS' TwistSFeed Drill Family



BOWMAN'S P Series Benchtop XRF Spectroscopy Instrument



ROLLOMATIC'S ShapeSmart NP30 Pinch/Peel Grinding Machine

## FLEXIBLE HONES FOR CROSS-HOLE DEBURRING

Delta Machine relies on flexible honing for smoothing holes in complex aerospace parts.

# FLEXIBLE HONES FOR CROSS-HOLE DEBURRING

Delta Machine relies on flexible honing for smoothing holes in complex aerospace parts.

**R**emoving burrs and sharp edges in cross-drilled holes and other difficult-to-access machined areas such as undercuts, grooves, slots, or internal holes can be tedious and time consuming. A particular challenge: deburring the intersection of cross-drilled holes in jet engine components.

Despite challenges, removing burrs is a must for high-quality, precision parts. Cross-drilled holes act as conduits for fluids, lubricants, and gases, so failing to remove burrs can block critical passages or create turbulence in the flow. Burrs can also lead to part misalignments, affect dimensional tolerances, and limit overall component efficiency.

Huntington Beach, California-based Delta Machine Co. LLC, a machine shop specializing in complex, tight-tolerance aerospace parts made of titanium, nickel, exotic alloys, stainless steel, aluminum, and plastics, pays close attention to deburring tools.

Delta Machine President Janos Garaczi still runs manufacturing to ensure everything is working well. He started with the company as a machinist, eventually working his way to president and owner and remains responsible for much of the programming, setups, and purchasing.

## Flexible hones

In the past decade, the machine shop has relied on flexible hones for cross-hole deburring, cylindrical honing, surface finishing, edge-blending, and cleaning.

“Eliminating burrs is critical, because if any loose material gets dislodged during use, there can be serious consequences,” Garaczi says.

By integrating flexible hones in the machining process, complex aerospace parts with difficult-to-access features can be deburred, honed, and surface finished in-house, at less cost.

Garaczi uses the Flex-Hone from Los Angeles-based Brush Research Manufacturing (BRM). Characterized by the small, abrasive globules permanently mounted to flexible filaments, it offers cross-hole deburring, honing, surfacing, and edge-blending. Available in a variety of abrasive types, sizes, and grit selections, the tools can cost-effectively smooth edges and produce a blended radius for cross-hole deburring.

The machine shop incorporates Flex-Hones in various sizes in its tool carousels.

“We might use two to three different-size hones for a part, depending on the number of cross-port intersections and different hole sizes,” Garaczi explains. “However, it’s really easy to put a Flex-Hone in a toolholder, give it a simple toolpath cycle, and let it run.

“For deburring holes and honing when we need to clean up a component, it’s the easiest tool for us to use,” Garaczi adds. “I haven’t found another tool that can do what a Flex-Hone can, whether for multiple cross holes or internal grooves. There’s really no way to effectively reach those areas with any other tool. We’re making more complex aerospace parts, especially housings with ports all over the part. That’s where the hone comes in really handy.”

For best results, the deburring tool is typically rotated into the main bore where the cross holes break. After a few clockwise strokes, the tool is removed, and the

Automated setup for cross-hole deburring

## Minimal grit

Even though these are abrasive tools, a distinction must be made between abrasives used for aggressive material removal and those for finishing. Delta Machine President Janos Garaczi says finishing tools release little to no abrasive grit during use, and the amount generated is comparable to the metal chips, grinding dust, and tool abrasion created during the machining process. Even if minimal fine solids are produced, the filtration requirements for abrasive tools are not much different than for machining. Any particulate can be easily removed using inexpensive bag or cartridge filtration systems.

“When you use the Flex-Hone for deburring, all you are doing is removing the burr. It doesn’t create much dust,” Garaczi adds. “I wouldn’t do anything to jeopardize the accuracy or lifespan of the equipment.”

spindle reversed to rotate and stroke the flexible hone counterclockwise for a few more strokes. The forward and reverse rotations create a symmetrical deburring



pattern. Coolant keeps metal cuttings and deburred metal in suspension.

### Deburring superalloys

According to Garaczi, removing burrs can be particularly problematic when dealing with aerospace superalloys such as titanium, Monel, Inconel, Incoloy, Invar, Rene, and Hasteloy – some of the most difficult materials to machine.

“Even during grooving, if you cut the material from one side, it just pushes the burr to the edge; and if you approach it from the other side, it just pushes it back,” Garaczi says. “It doesn’t want to break off the material cleanly. As soon as the tool gets a bit dull, it gets a lot worse. So, sharp tools with the right geometry are key.”

Garaczi notes that the Flex-Hone is available with a premium nickel coated diamond abrasive for materials such as carbide, ceramic and aerospace steel alloys; as well as a cubic boron nitride (CBN) option that is even harder for superalloys which can exhibit high ductility and work hardening that produce a gummy machining behavior if the correct abrasive tool isn’t used. When deburring superalloys such as titanium or 13-8 stainless alloy, the



Cross-hole deburring before and after.

hone has been very helpful.

“Most of the 13-8 we machine is heat-treated, so it’s subject to significant burrs. The hone is ideal for removing even the most stubborn burrs,” Garaczi says. He’s installing the flexible hones into CNC equipment to automate the process and reduce the time required to finish superalloys and stainless steels.

Using the hone is helping Delta Machine cope with COVID-19 by accommodating more automated work.

“It’s difficult for a person to reliably repeat deburring to the level of quality required. Automating this work with the CNC machine usually will produce more consistent results, while enabling greater social distancing among our staff on the production floor,” Garaczi says. **A**

**Brush Research Mfg. Co. Inc.**  
<http://www.brushresearch.com>

**Delta Machine Co. LLC**  
<http://www.deltamachineco.com>