

Hold your fire

Colt Defense LLC is the only company contracted to manufacture M4 carbine rifles for the U.S. government. To maintain the necessary support for the U.S. armed forces, the company can produce up to 1,000 M4s—complete—per day. Colt Defense, West Hartford, Conn., also manufactures 240B machine guns, M16 rifles and barrels for M249 machine guns.

The company's 300,000-sq.-ft. facility, with 350 employees, houses more than 60 horizontal and vertical machining centers.

According to Director of Manufacturing Engineering Ashot Ghokasiyan, Colt was not comfortable with its standard endmill holders because of serious part accuracy and tool runout concerns when machining faster than 9,000 rpm. Some of the high-speed machining at Colt involves milling small, intricate, tough-to-reach cavities in aluminum workpieces using long cutters run at 14,000 rpm. Standard toolholders were bulky, created interference issues and could not accurately hold the long, small-diameter cutters, mainly because there was too much

END USER: Colt Defense LLC
(800) 241-2485
www.colt.com

CHALLENGE: Eliminate concerns about part accuracy and cutting tool runout when machining faster than 9,000 rpm.

SOLUTION: A press-fit toolholding system.

SOLUTION PROVIDER:

REGO-FIX Tool Corp.
(800) 999-7346
www.rego-fix.com



A machinist at Colt Defense prepares a tool in one of the company's powRgrip press-fit toolholding units from REGO-FIX as part of the process in manufacturing weapons, such as these Colt Law Enforcement Carbines.

runout and the cutters would push off center, Ghokasiyan noted.

To overcome those issues, Colt standardized its ER collets to those made by REGO-FIX Tool Corp., Indianapolis. The compact, lightweight ER collets are available in standard and ultraprecision versions from ER 8 to ER 50 sizes in inch and metric sizes to clamp tool shanks from 0.0079" (0.2mm) to 1.3386" (34.0mm). At Colt, the ER collets range from ER 16 to ER 32 and accept cutters from 0.125" to 1.25" in diameter.

Later, the weapons manufacturer began using the REGO-FIX powRgrip press-fit toolholding system. Today, about 80 percent of the tooling loaded into the shop's machines is from REGO-FIX.

When assembling tooling with powRgrip, operators insert PG collets into the holders using the system's tabletop press, which generates 9 tons of force. Suitable for various taper styles, including CAT, BT, HSK and TC, the system relies on the interference between the holder and collet to create its clamping force. The use of the powRgrip system increases tool life and allows for more aggressive roughing, according to Ghokasiyan.

He noted that any small imperfection in how a tool is held is magnified as the spindle rotates faster. This, in turn,

has a negative impact on cutter performance, can ruin a toolholder, transfers vibration into the machine tool spindle and—most importantly—degrades part surface finish.

"With PG collets and powRgrip holders, we get less than 0.0001" runout at 12,000 rpm," Ghokasiyan said. "If we didn't use powRgrip, we would have to run additional finishing passes or even grind parts after milling to achieve our required surface finishes." He noted that the parts require a surface finish of 32 μ in. R_a or finer.

Ghokasiyan added that the minimal runout also allows the use of long cutters.

The company has two mechanical tabletop presses that service about nine machine tools apiece. The units are strategically placed on the shop floor near machines, with plans to add more units in the near future.

As opposed to one or two people pre-setting all of the tooling at Colt, machinists set up their own tooling for each job using a powRgrip press. The system allows them to press in or remove a tool from a holder in less than 10 seconds.

Colt considered shrink-fit toolholders, but determined they did not lend themselves well to Colt's operations because the induction heating devices used to ex-

pand a holder's bore could not be readily positioned around the shop floor, according to Ghokasiyan.

"Our concern is logistics, and with shrink-fit systems, we would have had to worry about where we located the heating units," he said. "They could not be located anywhere that a person passing by would risk getting burned by the heater. The powRgrip unit has no burn risk, so we can place it in high-traffic areas and near machines. We've already relocated one of our powRgrip units three times within one department."

In addition to aluminum, Colt primarily machines steel, such as families of 4140 and P-6. Most of its cutters are carbide and have through-coolant capability, but the shop does some dry machining.

Regardless of the job, the powRgrip toolholding system enables Colt to boost roughing productivity, according to Ghokasiyan. He noted that for some previous applications, the company might have held a 0.500"-dia. cutter in a standard toolholder for roughing. "Today, we run that same cutter in a powRgrip holder and significantly increase our roughing feeds and speeds," he said. "Our goal is to always push cutters to run faster, yet maintain tool rigidity." CTE

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