Reprinted from the October 2011 Editions of

SW SOUTHWEST SE SOUTHEAST NE NORTHEAST MW MIDWEST

MANUFACTURING NEWS

Tooling Helps Firearms Manufacturer Hit Production Target

Kris Gallant, Manufacturing Engineer at Smith & Wesson, stands next to one of the four powRgrip tooling units situated around the company's manufacturing areas.

To support new product launches, Smith & Wesson needed to increase throughput of its production of revolver frames. However, the firearms manufacturer wanted to avoid, if possible, having to add new machine tools to accomplish its production goals.

After extensive evaluation, Smith & Wesson determined the best plan of attack would be to target aluminum revolver frames, the highest volume frames produced at the company. The strategy was to chip away portions of time from individual machining operations to reduce overall revolver frame cycle times. While the reduction of part cycle times is always a goal at Smith & Wesson, the challenge was to do so without compromising part quality.

Two years ago, Kris Gallant, Manufacturing Engineer at Smith & Wesson, took a hard look at the company's revolver frame machining operations and realized that toolholding was keeping machine tools from operating at their full potential, as far as cutting speed RPM was concerned. The culprits were cutting tool deflection and runout, which dictated that machines be run slower during heavy milling to maintain part quality.

Aluminum revolver frames are machined on 4-axis horizontal milling machines with CAT 40 spindles, and Gallant's department was using standard ER collets for holding cutters. Unfortunately, these holders lacked the necessary precision and rigidity, restricting machine spindle speeds during rough milling operations to just 5,000 RPM on machines rated to run at 10,000 RPM.

Gallant considered several other toolholding options but decided to incorporate high-precision REGO-FIX ER collets paired with that company's powRgrip press-fit toolholding system. As a result, his team was able to ramp up rough milling speeds to 10,000 RPM, maxing out machine tool capability and permitting higher feedrates. This reduced revolver frame cycle times, which helped the company gain a greater throughput, without having to add machine tool capacity. Additionally, overall cutter life was increased.

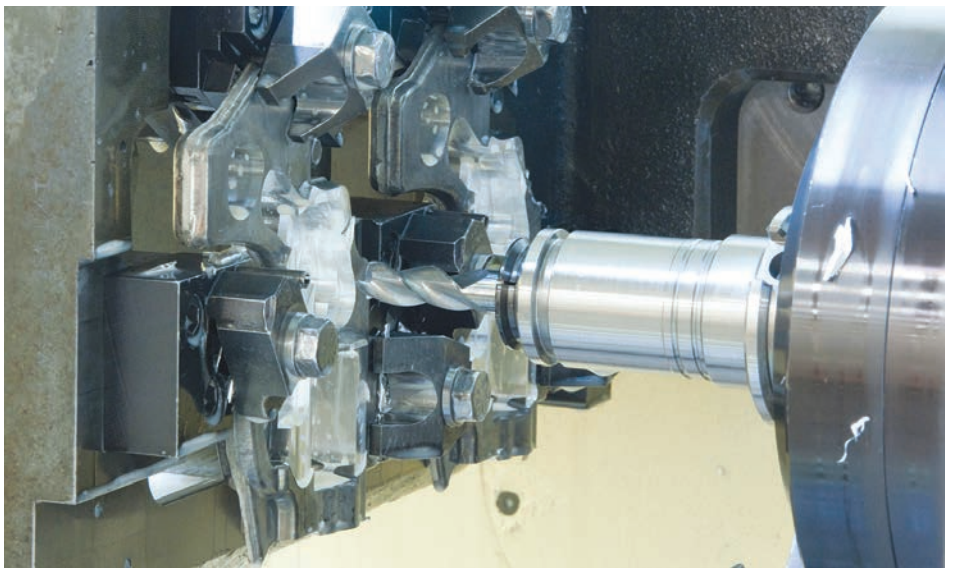
REGO-FIX offers its ER collets in two levels of precision - standard and ultra-precision (UP). Available in standard and metric sizes, both precision levels range from the ER 8 series to the ER 50 series. With this wide selection of ER collets, Smith & Wesson can accurately clamp tool shanks ranging from 0.2 mm (0.0079") up to 34.0 mm (1.3386").

The powRgrip toolholding system is suitable for high-speed machining applications and is applicable to an extensive taper selection, including CAT, BT, HSK and TC versions. PowRgrip toolholders are balanced by design, improving part quality and surface finish and lowering manufacturing costs, the company said.

Smith & Wesson's machine operators insert collets into the powRgrip holders using the system's tabletop press that generates nine tons of force. Available in both metric and inch diameters, the system relies on the interference between the holder and collet to create its clamping force.

Different from other clamping systems where heat or hydraulics are used to expand the material, the powRgrip system uses the mechanical properties of the holder material to generate tremendous gripping force with runout below 0.0001". Designed for easy operation, powRgrip allows operators to press in or remove a tool from a holder in less than 10 seconds. Because no heat is used, tools can be used immediately after a tool change.

Smith & Wesson aluminum revolver frames start as forgings that then advance through two machining cells, a broaching operation, two more machining cells and then finishing operations. Machining cells are organized according to frame manufacturing operations and, for the most part, are dedicated to specific frame components. Each frame machining operation involves about 50 tools with diameters of 0.750" or less, and all heavy milling tools run in powRgrip holders.



With slim-profiled REGO-FIX ER collets and powRgrip holders, Smith & Wesson easily maneuvers around fixturing to access tight spaces and cavities in its aluminum revolver frames without having to use long cutters that might runout or deflect.

With REGO-FIX ER collets and the powRgrip holders, Gallant was able to reduce the first operation of revolver frame machining by five minutes. He said that while that does not seem like much on its face, it has a ripple effect through the remaining roughing and finishing operations, improving workflow and reducing the last two machining processes by two minutes.

"The ER collets and powRgrip holders are so rigid, we are able to run faster and reduce cycle times without fear of cutters deflecting and producing bad parts," said Gallant. "Plus, we not only get increased speed, but also better surface finishes. And with practically no cutter runout, cutters last much longer and wear more evenly.

"We've been filtering in more ER collets and powRgrip wherever applicable. With the new Body Guard revolver product line, for instance, powRgrip is used extensively, in practically every machining operation."

In addition to precision, rigidity and speed, the slim-profiled REGO-FIX ER collets and powRgrip holders allow Smith & Wesson to maneuver around fixturing to access tight part spaces and cavities without using long cutters that might increase the risk of runout or deflection, the company said. The company fixtures revolver frames to cut as many as possible in one setup and often has to contend with numerous clearance issues as a result.

Smith & Wesson has four powRgrip units situated around its shop floor. Tools are preset and tagged with RFID chips that store all of an individual tool's preset information. Once tools are loaded into machines, this information is displayed to machine operators who then make the necessary offset adjustments. As production of frames runs 24/7 and must not stop, the shop keeps racks of powRgrip preset tooling readily available. The system's quick operation time and ease of use make the job of keeping the racks fully supplied significantly more efficient, said the company.

The powRgrip system is basically foolproof, according to Gallant. He said that because there are no components that require manual tightening, it is impossible for his people to over-torque holders, as often happened with the shop's standard ER collets and holders. Also, powRgip holders are designed to eliminate the risk of contamination between collet and holder, which maintains the integrity of the toolholding interface.

"The purchase of the REGO-FIX ER collets and powRgrip system was easily justified when we realized the resultant production savings," said Gallant. "And so far, we've had absolutely no problems with wear as far as the powRgip collets are concerned. And the powRgrip holders provide as many as 100,000 cycles of use."

"I have to admit that I was a bit skeptical that a simple tooling change to powRgrip would really make that much difference. But the proof is in our reduced revolver frame cycle times," said Gallant.

Smith & Wesson uses end mills secured in REGO-FIX powRgrip toolholders for the various stages of machining aluminum pistol frames.

For more information contact:
Bill Obras, VP, Sales
David McHenry, Product Engineer
REGO-FIX Tool Corp.
7752 Moller Rd.
Indianapolis, IN 46268
800-REGO-FIX
800-734-6349
info@rego-fix.com
www.rego-fix.com

Smith & Wesson
800-331-0852
www.smith-wesson.com