



A precise finish

Automated finishing triggers process and product improvements for RCBS

Ammunition reloading dies for use with firearms are user friendly, but producing the tools requires precise machining. Manual methods used for surface finishing the dies can cause repetitive motion injuries among workers, undermine productivity and impact product quality through operator-fatigue.

RCBS, Oroville, Calif., identified and established a goal to eliminate risk of injuries and operator fatigue problems associated with its manual surface finishing operation for its reloading dies.

RCBS is a member of ATK's Security & Sporting Group and a producer of high-quality ammunition reloading equipment for more than 60 years. ATK Security and Sporting, Anoka, Minn., develops technology and supplies ammunition for law enforcement, military

and sporting applications and manufactures optics, reloading gear, sport shooting and tactical accessories. The company serves sport shooting enthusiasts, law enforcement professionals, military and tactical markets worldwide.

The brass case of a spent bullet can be reloaded repeatedly. Hand-loaded ammunition offers significant cost savings and can be more accurate and reliable than factory ammo because the load can be customized, allowing the bullet to be tailored for performance and velocity. Smokeless gun powder makes the process safe. For hand-loading of brass cases, ammunition reloading dies are an essential tool. A set of dies is required for each caliber to be reloaded.

Sold in a range of sizes, reloading dies are used to decap or remove the spent primer from the case, resize the case to its original dimensions, expand the case mouth to accept a new bullet and seat the new bullet in the case. Any inconsistencies in the die can mark the brass case. The marks can reduce the life of the case and could result in poor ejection from the firearm's chamber.

RCBS Gold Metal dies are intended for competitive marksmen, precision shooters, varmint and big game hunters.

Eliminating injuries

"We produce hundreds of thousands of these dies every year," says Tim Taylor, a



RCBS engineer. “So the achievement of consistent, high-quality surface finish as well as avoidance of worker discomfort became a high priority that got a lot of attention.”

Workers at RCBS were hand-finishing steel ammunition reloading die bores by wrapping emery cloth on rods and polishing the internal surface of the dies. “The problems with this laborious process included some inconsistencies in the surface finishes,” says Taylor. “But this resulted from ergonomic factors, and those were a big, big consideration. Because this was a repetitive-motion job, some workers experienced discomfort or problems with wrists, shoulders and backs.” RCBS began to explore process improvement solutions, including CNC equipment and tools. Purchase of a CNC milling machine gave the company the capability to execute machining operations automatically using programs.

But the answer to its surface finishing and ergonomic challenges came in the

shape of a flexible ball-style honing brush called Flex-Hone developed and produced by Brush Research Mfg., Los Angeles. BRM is a full-line manufacturer of honing tools, abrasive nylon brushes, deburring brushes, automotive brushes, power brushes, twisted-in-wire brushes and the Flex-Hone tool. An innovator in brushing technology since 1958, BRM was one of the first companies to advocate the critical need for finer surface finishes for optimal performance. Its founder, Steve Rands, pioneered concepts such as plateau finishing.

The Flex-Hone tool is suited to deburring, edge blending, plateau honing, deglazing, polishing, surface finishing and chamfer operations. It has hundreds of abrasive grit globules mounted on nylon filaments extending from the tool’s shaft. The Flex-Hone is customizable and can be used on materials ranging from soft non-ferrous materials to carbide and ceramics.

RCBS uses multiple hone sizes and varying grit materials and number of strokes to achieve a smooth finish. RCBS produces more than 100,000 dies annually.





RCBS ordered its first Flex-Hone in April 2006. “We worked with RCBS to test different combinations of the Flex-Hones to determine which types of grits and abrasives performed best for their application,” says Michael Miller, vice president for BRM. “They had a requirement to finish a very complex shape with a series of cylindrical tools. A single case might require several different tools. The beauty of the Flex-Hone is that it is very versatile. We can manufacture the tool in nine different abrasive types and 11 grit choices. We can customize the tool to meet even the most rigid finishing tolerances.”

Better finish, performance

According to Miller, engineers typically use a surface roughness value to describe the final finishing requirements. Called “Ra” for roughness average, the acronym is attached to a number. The lower the number or Ra, the finer the finish. The Flex-Hone can deliver a finish down to a single-digit Ra.

Miller adds no other tool can create the microstructure finish necessary for maximum performance as easily, quickly and affordably. The tool has demonstrated its ability to extend the life of firearms. “The Flex-Hone produces a very consistent finish from part to part, operator to operator,” says Miller. “Better finishes result in superior performance.”

For RCBS, BRM’s ability to work with company personnel to match the tool to the required finish in both steel and carbide reloading dies was an important advantage.

“After we decided to test the Flex-Hone, BRM gave us some recommendations and basic guidelines,” says Taylor. “I had a spare CNC mill, so I made up a fixture and started trying the process at different speeds and feeds. It took several process changes before we were able to consistently achieve our stringent surface finish requirements.”

“We developed a series of fine grit models for die applications allowing RCBS to use progressively finer grits to achieve the necessary results,” says Miller.



Flexible ball-style hones made by Brush Research are tailored to meet RCBS’s die bore finishing requirements.

“Depending on the die, we use multiple hone sizes as well as varying grit materials and number of strokes,” Taylor says. He adds the surface finish of the RCBS steel dies is sub-micron (roughness value) when they come off the machine. After the Flex-Hone finishing operation, the surface finish is improved by a factor of eight.

Following the success of the Flex-Hone finishing process on the steel dies, RCBS decided to use the tool on its carbide dies, a much harder material. “On those, we use a unique Flex-Hone tool with diamond crystal grit and basically achieve the same type of results in terms of automation and finish,” Taylor says. “The finish looks like a mirror when we’re done.”

Increased efficiency

Combining the Flex-Hone tool with a CNC mill allowed RCBS to automate its finishing processes. Taylor first wrote a basic honing program for the CNC mill. To take the process online, Taylor wrote a parametric program automating it. Once



a CNC operator inputs four or five different parameters, such as bore length and ID, the milling machine calculates the input and selects the right Flex-Hone brush as well as the number of tool strokes and rotations per minute.

“The new automated process is a real game changer,” Taylor says. “It is probably 60 to 70 percent more efficient than doing it by hand. Also, there was a substantial increase in quality. It is better and faster. But the ergonomic improvement—removal of the potential for operator discomfort and injury—alone would have been enough to justify the new process. For instance, there are no more repetitive-motion injuries because there is no more repetitive motion in the polishing. So that is a 100 percent improvement.”

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