

Engis' Single-Pass Bore Finishing

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GEAR SUPPLIER

When a motorcycle component manufacturer needed gears with bores manufactured to tight tolerances for use in performance motorcycle transmissions, it contacted Engis Corp. of Wheeling, IL, for advice.

The specification requirements included removing 0.050 mm of material from a 20 mm gear made of hardened steel (Rc 58–64). Bore tolerance was 0.015 mm, the finish requirement was an average surface roughness (Ra) of 0.8 mm, and cylindricity needed to be held to 0.008 mm.

“The first alternative they considered was installing a number of conventional honing machines, where multiple passes of an expanding mandrel achieves a precision finish,” says Robert Marvin, Engis product manager. “But they also had to be as cost-competitive as possible in producing these parts, which led to our discussing single-pass bore finishing.”

Marvin explains that the manufacturer learned it would need at least six conventional honing machines to handle production, but only two Engis machines for the same volume.



Conventional honing uses a hone that reciprocates many times while expanding and contracting the cutting stones during each cycle. By comparison, single-pass bore finishing on an Engis SPM-series machine is performed with pre-set barrel-shaped tools that pass once through the bore while the tool, part, or both rotate. Engis estimates that the perishable tooling costs for the single-pass process to be half of what it would be for conventional honing. Additional benefits are less operator involvement and less downtime, says Marvin.

Also, tooling on the Engis machine features a proprietary slow-wearing dia-

mond coating that, together with the single-pass system, can achieve bore-finishing tolerances within 0.5 μm in a single finishing cycle. For the motorcycle component supplier, actual bore tolerance achieved was 0.007 mm, Ra finish was 0.6 mm, and cylindricity was 0.005 mm.

Since the single-pass process uses a pre-set barrel shaped tool that does not have to expand and contract the cutting stones during each cycle, the process allows for near-perfect repeatability and size control, according to Engis.

The supplier obtained two single-pass Engis SPM machines, each configured

with six tool spindles able to finish two parts at a time. However, Marvin says the application and stock removal determine the number of tools that can be used, this number usually falling between two and six.

With its two Engis machines, the supplier is producing 14,000 gears a day.

According to Engis, tooling in conventional honing machines needs to be changed every 2,000 pieces, whereas Engis tooling—with its slow-wearing superabrasive diamond coating—can routinely finish more than 60,000 parts, even in hardened steel. Also, the tooling finishes the bore's full periphery, so interruptions—such as keyways or splines—do not affect performance.

The Engis tooling could be used on a conventional honing machine, but Marvin says it isn't recommended: The single-pass process and its tools should be used on machines specifically designed for single-pass finishing.

But when single-pass machines and tools are used together, like the motorcycle parts supplier is doing?

“The result is much more machine uptime and a tool cost reduction of more than 50% while providing the precision finish these gears require,” Marvin says. “Total perishable tooling costs are approximately \$0.01 per finished gear.” ■

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