

# Automotive efficiency

JTEKT Corp. was formed in 2006 through the merger of bearing maker Koyo Seiko and automotive parts maker and machine tool builder Toyoda Machine Works. Today, Plymouth, Mich.-headquartered JTEKT North America Inc. produces automotive steering systems, driveline components, bearings and machine tools.

As do other parts manufacturers, JTEKT strives to maximize cost savings and part quality. Tom Derkos, manufacturing engineering supervisor at the JTEKT facility in Morristown, Tenn., said the way to reach those goals is to “keep trying to improve.”

As an example of a typical improvement effort, Derkos cited milling a die-cast aluminum power steering pump housing. Beginning with a casting made

at the facility’s foundry, the operations included milling a sealing surface on the housing’s mount face. JTEKT had been milling the face with 3"-dia. milling cutters tooled with five carbide inserts. Each indexable insert had eight cutting edges. The operation involved two passes: a 0.8mm-deep roughing cut and a 0.3mm-deep finishing pass. The cutters ran at 5,000 rpm and a feed rate of 3,000 mm/min. Roughing and finishing were performed on two different machines.

The 9 to 12 percent silicon aluminum workpiece material, roughly equivalent to an ANSI 383.0 die-cast aluminum alloy, wore inserts out quickly in the high-volume operation (about 300,000 pieces annually). “Every 10,000 pieces you had to index the inserts,” Derkos

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said. That process involved stopping the machine, removing and cleaning the cutter and indexing and adjusting the inserts. After the cutter was returned to the machine, a test piece was run and further cutter adjustments were made if necessary. “You’re talking a minimum of 10 minutes downtime, and that’s if you are hustling,” Derkos said. “It’s probably closer to 15 minutes.”

The operations represented a production bottleneck. To handle such issues, Derkos consults a select group of suppliers. “When we need to increase throughput and get our efficiencies up, they bring in an engineer to have a look at the operation with us. If they feel like they have a solution, they suggest it, and we work with them.”

When milling the pump housing, Derkos sought the advice of Todd

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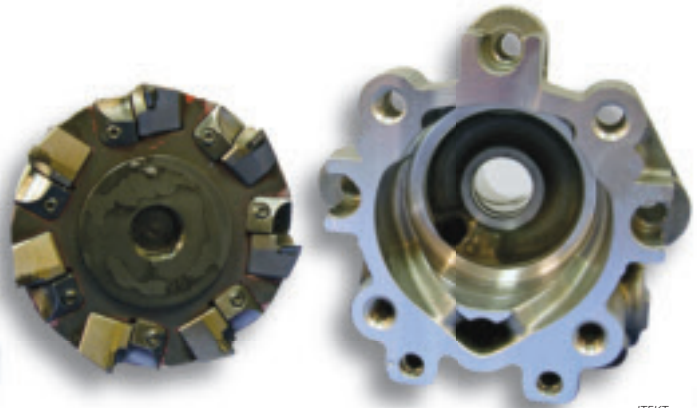
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Seabolt, Southeast regional manager for Mapal Inc., Port Huron, Mich. Seabolt recommended a 3"-dia. aluminum cutter body tooled with seven PCD-tipped cutting cartridges, two of which featured a wiper design.

The metal-removal rate improved immediately. The Mapal cutter ran at 6,000 rpm and a 4,500-mm/min. feed rate. Derkos said the cutting speed represented the machine's maximum capacity.

More importantly, the wiper edges enabled JTEKT to elim-



When milling a die-cast aluminum power steering pump housing (right), auto parts maker JTEKT replaced a carbide-tooled milling cutter with a 3"-dia. Mapal milling cutter tooled with seven PCD-tipped cutting cartridges. The change saved 125 hours of shop time a year via productivity improvements and downtime reduction.

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inate the roughing pass and mill the surface to the required 12.5µm R<sub>z</sub> surface finish in a single 1.1mm-deep pass.

Tool life also improved. "We ran the Mapal cutter more than a year without changing cartridges," Derkos said. "Conservatively, that was about 300,000 passes."

Another benefit was elimination of downtime and setup time. "It's hard to put a dollar figure on that," Derkos said. "If you count 15 minutes of downtime per tool change every 10,000 pieces, that's 7½ hours for 300,000 pieces." Combining productivity improvements and downtime reduction, Derkos said, time savings totaled 1½ seconds per piece, or 125 hours for 300,000 housings.

With the move to the PCD cutters, edge cost per piece increased slightly. The carbide inserts for the two cutters used previously cost \$100 (\$10 each and five per cutter), and each load of inserts milled 80,000 housings, resulting in an insert cost per piece of \$0.00125, or \$375 for 300,000 parts. The PCD cartridges cost \$546 (\$78 each for seven in one cutter), and processed 300,000 parts for a cutting edge cost per piece of \$0.00182. The productivity gains and savings in shop time far outweighed the \$171 difference in cutting edge cost.

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