

CASE STUDY

Cummins Inc. Jamestown Engine Plant

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How Cummins is improving production efficiency

The Cummins Jamestown Engine Plant with 1200 employees turns out approximately 500 heavy-duty diesel engines a day. MAG Mega 800 horizontal machining centers machine the cylinder heads and blocks for the 12-liter engines – eight for the cylinder head machining line and 10 for the engine block line. Each machine has 30-40 tools, and 70% of the tools used in the critical machining processes use heat-shrink holders for extreme rigidity during heavy cutting.

Cummins engineers saw that valuable production time could be saved by investing in ZOLLER tool presetting and heat shrinking technology. Avoiding tool setting on-machine saves about 5 minutes per tool, engineers estimated. Typically 6 tools a day are changed on each machine, which means comes to a half-hour production saved per machine per day. Cummins estimates it is achieving about 20% greater efficiency in production, thanks to the ZOLLER off-line presetting. The plant now changes its heat-shrink cutting tools and accurately sets key dimensions to within microns without interfering with production.

The ZOLLER »redomatic 600«, a universal presetting, measuring, and heat-shrink system, was the choice of the Cummins plant. Used by up to 8 operators to exchange the mostly carbide cutters and preset those tools in their heat shrink holders, the ZOLLER has dramatically changed the speed and accuracy of tool exchanges, presetting and accuracy. With a 13kVA induction coil, tailstock and cooling system, the »redomatic« requires only 5 seconds to heat-shrink and 30 seconds to cool a tool in a single setup.

“A big advantage the ZOLLER brings us is the elimination of operator error, judging and entering offsets manually,” pointed out David Malone, tool engineer at the plant. “And we eliminate tool setting on the machine tools. Compared to the previous manual setting of our boring bars and milling cutters, such as for a chamfer width for example, the ZOLLER saves hours a day and is very consistent.”

“I love the thing. If you had any experience the old way, you would really appreciate this. No manual intervention,” said Joe Barto, Cummins machine technician.

Ideal for the large tools used to machine the heads and blocks at Cummins, the measuring range of the »redomatic« is 600 mm in Z, 175 mm in X with a swivel-mounted heating element diameter of 440 mm. The snap gauge is 200 mm. The largest tool measured at Cummins is referred to as ‘Big Blue’, a crank boring tool.



Cummins Jamestown Engine Plant located at Lakewood, NY



ZOLLER »redomatic«



Crank boring tool ‘Big Blue’

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A carrier system adjacent to the heat-shrink unit includes the heat-shrink control, cooling bodies, location holder, ZOLLER »masterPiece« heating element and tool length adjustment rods. These adjustment rods are used to automatically adjust tool length and position the cutters in the heat-shrink holders easily, quickly, and precisely to correct length within +/- 10 µ accuracy. "On tool regrinds, this helps us keep the cutting tool at the correct length, accounting for the material ground away," said David Malone, tool engineer at the plant.

The ZOLLER image processing software »pilot« allows Cummins operators to measure and preset standard tools without data input or previous knowledge. Included in the software is a library of more than 200 cutter shapes the operator can use to select the type of tool to be measured. He is next prompted to confirm selection, and then start the automatic measuring sequence. The complex milling cutters used on the head and block lines are completely measured and inspected in very short cycles.

Measured tool data is printed on a label, which identifies the measured tool and its specifications. Afterwards the data can be read via scanner or stored on an RFID chip in the tool holder with the ZOLLER tool identification system and is read by the machine control once the tool is replaced in the tool changer. Tool data may also be directly transferred from the tool presetting and measuring machine to the machine control. ZOLLER offers the connection to more than 100 different machine-readable output formats.

From an inspection viewpoint, the automatically generated inspection reports, detail on tool life and tool usage, and the number of parts a holder has cut, has been valuable information to Cummins, which has used the data to improve its efficiency and control tools costs.

Cummins uses the RFID chip to provide tool identification info to the machine tool, including how heavy the tool is which affects, how quickly tool change can occur. There is also a read/write station for manual reading and writing the tool ID chip, so we can change the tool life assigned to each tool, if necessary.

"The data we can get from the ZOLLER is having a big positive impact on our machining efficiency and tool cost," Dave pointed out.

"It not only allows us to closely inspect each cutting edge and precisely set them, but also tracks and reports tool life," Dave said. "We put the data on each tool automatically into the chip so the machine tool can read the presets, targeted tool life between changes, and any offsets. This data is also stored in the presetter so we can review tool runouts and other details to get a good look at tool usage and relate that back to part quality and machine productivity."



ZOLLER image processing software »pilot«



Induction coil for heat-shrinking



µ-exact measuring



Separate read/write station for manual reading and writing the tool ID chip.

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The ZOLLER can also automatically graph the runout of a tool, based on a program in the »redomatic«, Joe said. “Setting up the wipers on face milling cutters, which are generally 20 microns higher than the inserts, and then get all the wipers adjusted to be the same height is extremely important. This is shown on the shadow display so you can see precisely the adjustment you are making.”

“I was really impressed at the many capabilities of the system, and we are still discovering additional ways the »redomatic« can help us save time, improve tool setting, and maximize tool life on the line”, said Dave.

The system has also been very helpful with accurately setting valve seat tooling before running production, eliminating a lot of potential rework. “The ZOLLER has caught incorrectly sized tools which would not have been noticed with handsetting.”

Tool inspection and presetting after regrinding

In the plant cutter grind department, Cummins uses a ZOLLER »venturion« for complete tool inspection after cutter regrinding. “We can input tolerancing for the tool and it can tell you if a tool is in spec and generate tool inspection data very quickly. All the reground tools are inspection and tracked. With the ZOLLER, we reduced tool inspection time by at least 50%, and measurement is much more consistent. If there is ever an issue with a tool we will have the detail on its history,” Dave said.

The »venturion« combines outstanding flexibility and precision for checking a wide range of tools and is ideal for every CNC production, and uses ZOLLER »pilot« image processing software. The machine generates measuring setting sheets/tool lists at the push of a button with direct transfer to the tool machine and storage in the presetter. The operators appreciate the adjustable LED lighting that displays cutting edges in sharp detail for careful inspection.

With its investment in ZOLLER tool presetting and measuring technology, Cummins is well on its way to further improvement of its production efficiency and product quality.

*The Arnesen Company in cooperation with Cummins and ZOLLER Inc.
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