

MULTI-FUNCTION JOB SHOP WORK CELLS LEAD TO INCREASED PRODUCTIVITY

Cottondale, Alabama might seem an unusual place for German machine tools to be making automotive components for a German car, but Smith's Machine proves again how much of a world market the automotive industry has become in recent decades. This 30-person shop, founded here in 1974 by Woody Smith and run today by his sons Robert and Tim Smith continues to supply high quality machined parts for the massive Mercedes Benz U.S. International (MBUSI) facility in Tuscaloosa County.

Case Study • Smith's Machine / DMG

DMG Twin machines, used for turning and pre-milling operations, are fed by robotic articulation. The robot loads and unloads the turning center, loads and unloads the four-axis milling machine and rotates the parts through a queuing station before engraving and placing the part on the engraver.

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CASE STUDY

SIEMENS

Siemens Energy & Automation Case Study • Smith's Machine (continued)

Part of this story originates through a joint venture that began in the year 2000 between Smith's Machine and two German companies, Eberspaecher Formenbau and Hummel Formen, both of Stuttgart, Germany. Through contacts made during that joint venture process, as well as the long-standing Smith's commitment to buying the very best machinery and equipment available, the primary operation became familiar with DMG machine tools. Today, more than a dozen such machines operate in highly controlled work cell environments to produce CNC-machined bar stock and castings for the automotive and other markets including indirect sales to MBUSI. In addition, according to vice-president Tim Smith, the shop supplies other automotive as well as tire manufacturers and additional OEMs in the HVAC compressor, agricultural machinery, propane valve, stainless pipe fitting, marine diesel engine and underground mining industries.

In order for Smith's Machine to maintain a versatile family of services, they have just added a five-axis DMG 80U. The main focus is being able to reduce the number of operations in production parts, as well as being able to enter more complex markets such as defense and aerospace applications.

At the heart of the shop's operation are specialized work cells for dedicated long runs, comprising DMG Twin mill/turn centers, fed by robotic parts handlers. All machine motions are controlled by Siemens SINUMERIK 840D CNCs for twin spindle, twin turret bar feed, four-axis turning and four-axis milling on castings. The CNCs incorporate the Siemens ShopMill and ShopTurn software suites for graphical programming, DIN/ISO programming, full machining simulation, machine set-up and tool management. As for the Twin Spindle machines, Smith's utilizes the MF Programmer software especially designed by DMG for their Twin product for real simulation and full cycle utilization that the Siemens 840D offers. Tim Smith explains the benefits to his shop.



Smith's Machine in Cottdonale, Alabama is a supplier of various automotive components to the nearby Mercedes facility in Tuscaloosa County as well as other OEMs. Shown here are representative parts produced including a tow bushing, valve block, spare tire arm, stainless spinnerette, steering knuckle, propane valve and several marine diesel turbocharger parts.

"The HMI controls on these machines offer us a virtually unlimited amount of options in the cycles and control of the work planes. This enables us to run nearly all the advanced features on the machine tool control itself. For our production run machine cells, this is very beneficial because we're able to keep the number of lines of code to a minimum using these features, as opposed to making standard ISO code from a CAM system." He further noted how the operators and programmers at Smith's can revise programs while running and implement changes on the fly. "The standardization of the control and layout are taking effect in our shop now and the similar architecture between the controls, even on different generations of machines, helps us greatly in the cross-training of our staff."

Smith also noted that the training from both the machine tool builder (DMG) and CNC supplier (Siemens) were at a very high level, ranging from application engineering assistance to service issues and part refurbishment.

Owing to the full PC with hard drive onboard, Smith's engineers can store all programs on the machines and currently utilize routing back-up via a PC and Cisco wireless network.

"An excellent example at Smith's of how the Siemens SINUMERIK 840D control has been seamlessly applied is on the DMG Twin machines," says Smith. "Offset tables can be generated and stored locally on the machine, while the use of RG variables makes the set-up simple and fast. In each group of programs, we have one program of user-defined RG variables that carries all our set-up information such as stock size, part projection, transfer information, load/unload cycles and other relevant automation factors. With just these two items, we can pull up the program and offsets, change our collets/jaws and bar feeder. Then, we're ready to go without any further setting of workshifts or master offsets. We simply set up and run."



Siemens SINUMERIK 840D CNCs control the operation of the DMG machines at Smith's Machine.

Siemens Energy & Automation Case Study • Smith's Machine (continued)

Through the use of the supplied ShopMill and ShopTurn software, additional programs are created offline where training also occurs. Real-time, plain language commands and high-resolution 3D graphical simulation are highlights of these software suites, according to the manufacturer, Siemens. Thus, the end-user is afforded short online set-ups, the result of simple operator prompts for determining workpiece zero points and tool lengths.

Smith further noted the DMG production cells and Siemens controls offered his company great flexibility and allowed Smith's Machine to aggressively seek additional large production runs from the automotive sector and others in its customer base.

"I also believe these robotic work cells will provide us longer equipment utilization due to the current speeds and available options," Smith observed. "Overall, these cells have

not only made us more competitive in automotive, but also are helping us remain so. Automotive is one of our most lean manufacturing market segments, so we see our future in multi-function machine tools and greater use of the robotic cells,"

Smith's Machine produces most parts from low-carbon steels, including 1018 and 12L14, 1045 and 1144. It runs 303 and 316L stainless, as well. Castings machined here are mostly Class 30 grey iron and ductile iron, 60-45-12 and 80-55-06. A Zeiss CMM is in-house for quality checks and Smith's Machine utilizes a network of local partners to plate, chrome, paint and heat treat parts.

In addition to the main production work cells, Smith's Machine also operates a job shop that specializes in serving its local market with jigs, fixtures and spare parts. Smith's Machine is ISO9001:2001 Certified.



The production and quality control at Smith's Machine are monitored and data analyzed via an internal PC and Cisco wireless network for full part production validation.



Utilizing Siemens ShopMill and ShopTurn software suites, the Smith's engineers can create programs and run actual 3D part machining simulations offline on a PC.