



Kansas-based Spirit AeroSystems is a primary supplier to Boeing and other aircraft builders

■ Spirit AeroSystems, USA

Do-it-yourself Retrofit

Spirit AeroSystems, a primary supplier to Boeing and other aircraft builders, utilizes the capabilities of Sinumerik 840D in the retrofit of its machine tools.

Faced with the challenging economic situation and the resulting budget tightening, many aerospace component suppliers are seeking ways to improve their productivity and bottom-line results. At Spirit AeroSystems in Wichita, Kansas, the strategy to accomplish those goals has been in place for decades. Facility manager Ed Fenn and his team of retrofit and machine shop specialists are among the many reasons for this situation. Through a systematic predictive maintenance program and continuous upgrades to the controls, motors, drives and other components on the huge multi-axis gantry mills that produce many of the structures here, Spirit has realized substantial productivity gains without the capital investment of new machine tool purchases.

Every retrofit planned or in progress and every machine tool in the facility, approximately 575 cur-

rently, is monitored under a predictive maintenance program. Through this program, all machine parameters of wear, uptime, routine maintenance and even environmental impact are closely monitored, with an eye on the day when a planned retrofit or complete overhaul of the machine will be required. By doing this, Spirit has conserved millions in new capital expense, while actually improving the performance of its machine tool fleet.

Exploiting control capabilities

Several Cincinnati (now MAG/Cincinnati) gantry mills are key to the manufacture of the large metal aircraft components, as well as materials handling structures such as nacelles. Originally equipped with Siemens Acramatic controls, the forerunner to the advanced

Sinumerik 840D CNC platform that is now used on most of the machine tools here, these gantry mills machine the majority of the metal parts made, primarily from various grades of aluminum, titanium and tool steels.

“Because we have periodically upgraded our machine controls, along with the motor and drive packages, gear boxes, spindles, encoders and column structures on our gantry mills, we have tracked better productivity numbers on all of them. This is the result of newer controls, which have faster processing speeds, as well as the higher-accuracy positioning drives, linear motors and encoder technologies we utilize,” Fenn explains. “The performance and flexibility of the Sinumerik 840D makes it the perfect controller to be used in almost all retrofits.” Other non-metal cutting equipment such as riveters, hydraulic presses and robotic materials handling devices equipment often get retrofitted with this CNC, as well as Siemens PLC and other control gear. “On some of the largest machines at Spirit, such as our Brötje riveters, used to join the fuselage to the spars and ribs, all the axis and ancillary equipment control capability of the Siemens Sinumerik 840D comes into play,” Fenn said in regards to the power and flexibility of the CNC technology.

In process, there is also constant evaluation of the machine tool performance at Spirit. Through the onboard CNC, the VLAN and ICS protocols employed here, all machine parameters, including vibration and thermal characteristics, are monitored and entered into a database for evaluation by the CBM team engineers. In total, over 25,000 points are monitored throughout this 11,119,000-square-foot campus.

**Upgrading a Cincinnati machine with retrofit:
one of the Spirit retrofit/machine shop specialists at work**



Therefore monitoring of machining processes in real time is possible for further documentation of the machine’s performance, as needed.

A cost-effective performance boost

For cost comparison, the typical retrofit project on a large gantry mill at Spirit might run \$1,000,000 or more, but that amount typically represents only about 30-40 percent of the cost of a new machine. According to Fenn, “We keep the steel and replace everything



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Edward Fenn, facility manager at Spirit AeroSystems

else,” though he noted a recent retrofit of a Z-axis column on a Henri Liné five-axis machine. However, “The performance we are getting is every bit as good as a new machine’s,” he noted.

Fenn notes that the onboard control is the top priority in gauging obsolescence on any machine at Spirit. “The control technologies have progressed so far and so rapidly in the last 20 years that we would be foolish to remain in a fixed time mode for retrofitting any machine we operate here.” Following the initial studies, a comprehensive assessment of the retrofit versus buy value proposition is conducted. Upon the decision to retrofit, the team develops a procurement package and initiates the buys through corporate purchasing. The scheduling of offline time for a machine tool at Spirit is a major responsibility, as the building of an aircraft fuselage requires the precise integration of many departments working in concert.

As is true throughout the aerospace industry, composites technology is rapidly making a huge impact on machine builders, shop operations and controls personnel alike. Spirit is no exception and leads the way in advanced composites buildup and machining, according to Fenn. Not surprisingly, his retrofit team also plays a key role here, because there is a 25-year-old Cincinnati machine tool functioning perfectly on hard metal components that support the composite structures, having been retrofitted with a new control system, coolant system, hydraulics and all-new operator station. Another Cincinnati machine is on deck for retrofit with new ways, racks, control station, accelerometers and pressure transducers. ■

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