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Mission To Mars: CAM System Aids Rover Production

Shop owner Rodney Babcock says he relishes the challenges of manufacturing complex, difficult-to-machine parts for the aerospace and defense industries. "Everybody knows there will be challenges, nearly insurmountable deadlines and the possibility that a project will get complex. We thrive on that," he explains. "It elevates us to new levels, and our employees, knowing their role in a successful project, gain a lot of pride."

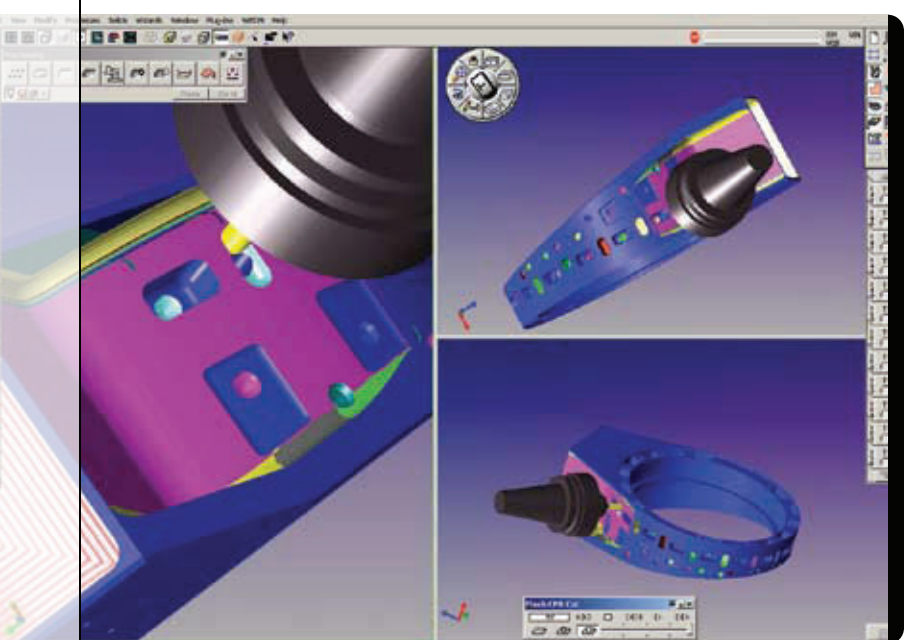
The enthusiasm of Mr. Babcock and his 28 employees is understandable—parts produced at his 8,500-square-foot California shop, Next Intent, have withstood extreme environmental conditions millions of miles from Earth. As a supplier to NASA's Jet Propulsion Laboratory (JPL), Next Intent manufactured components for Spirit and Opportunity, robotic vehicles that have been exploring the surface of Mars since 2004 and endured long past their expected life spans. In 2007, JPL provided the shop with a similar opportunity—manufacturing parts for the Mars Science Laboratory (MSL) Rover, which is scheduled for

Next Intent

PROBLEM Needed to effectively program and verify tool paths for Mars rover components

SOLUTION GibbsCAM CAM software

RESULTS Toolpath verification and model editing capabilities helped achieve tight tolerances, quality finishes



GibbsCAM enables programmers to choose multiple perspectives for display. Here, the Mars Science Laboratory rotor housing undergoes toolpath verification with Cut Part Rendering. For easier visualization of multiple operations, each operation can be displayed in a different color.

launch in 2011. In both projects, GibbsCAM CAM software played an important role in the shop's ability to machine these vehicles' complex components to stringent tolerance and surface finish requirements.

According to JPL's Web site, the MSL Rover aims to establish whether the red planet has (or has ever had) conditions conducive to supporting microbial life. To do so, it will incorporate a laboratory that will analyze the chemical composition of rocks and soil and transmit the data back to Earth. The nearly car-sized vehicle is larger than either Spirit or Opportunity, and it is expected to travel farther and faster than the two previous rovers during its year-long mission (that's a Martian year, which amounts to 687 Earth days). To date, Next Intent has produced components for the vehicle's soil-scooping mechanism as well as a rotor housing and titanium strut weldments used to connect the wheels to the chassis.

However, the shop hasn't always machined parts like these. In 1996, when Mr. Babcock opened Next Intent in San Luis Obispo, his goal was to become an upper-echelon supplier of complex, titanium components to the semiconductor industry. Beginning with his previous employer, which became his first customer, Mr. Babcock had some success in this endeavor. Soon after, though, he sought to diversify and expand into new areas as a hedge against the cyclical nature of the semiconductor business.

An opportunity to do just that presented itself in 1998, when the company accepted a job to make fuel pump components for an aircraft supplier that taught the shop a lot about aerospace and defense. Later that year, Next Intent machined its first components for JPL. The company began with non-flight parts before earning its way into

MTM MODULE EASES TURN-MILL PROGRAMMING

To save time on long-term contracts for aircraft fuel pumps and other part families, Next Intent recently moved into multifunction machining with the purchase of a Mori Seiki NL2500SY/700 turn-mill. Mr. Babcock says the Mori can complete one part family in approximately half the operations as the shop's previous method. Rather than using two lathe setups followed by two or more mill setups, the shop uses the turn-mill to fully machine many parts in a single setup. Even on low-volume jobs, which often require longer, more complex setups, the machine pays off, Mr. Moyer says. "It may be faster to make a few parts with lathes and mills, but the more complex, lengthier single setup is justified because of the tolerances and accuracy achieved," he explains.

The shop has realized these productivity benefits despite being new to multifunction machining. In large part, that's thanks to GibbsCAM's Multi-Task Machining module. So far, programmers have been able to program every capability of the turn-mill the shop has encountered. The module integrates milling and turning into the same interface, so there's no need to jump from turning to milling software and then cut and paste the programs together. Additionally, icons, windows, tools and dialogue boxes in GibbsCAM are consistent from module to module, which shortens the learning curve because the company is already familiar with the program.

"We know GibbsCAM milling and turning, so MTM programming is easy because it combines the two," Mr. Moyer says. "Some of the machinists have manually programmed the Mori Seiki, but because I prefer toolpath verification, I rely strictly on GibbsCAM."

According to Gibbs, the module's most valuable asset is its Sync Manager, a graphical tool that separates the program into separate "flows," or sequences of machining operations for each turret. Sync Manager handles time-dependent aspects of the program, managing all details that are introduced when multiple tool groups are cutting simultaneously. Users can view turret operations side by side and move operations around in order to minimize non-cutting time and to control parallel operations by placing synch, or "wait," codes wherever needed. Synchronizing the turrets and spindles in this way helps prevent collisions and optimizes programs to run in the shortest possible amount of time.