



### Application Story: M2 Race Systems

## M2 Stays Out Front in Ported Cylinder Heads

M2 Race Systems is a niche player in a very fast-paced industry. As a supplier to cylinder head designers and manufacturers, primarily in the racing business, this Farmingdale, NJ shop produces CNC ported cylinder heads. M2 uses a variety of Fadal multi-axis machining centers that have rotary tables for five-axis part articulation.

As President Ron Mielbrecht explains, "Most of our customers are either race engine builders, racing teams or the drivers themselves. We do have some OEM contracts, as well as production and aftermarket work, but we're specialists in a highly specialized industry. This means the responsiveness and technical skill levels of our suppliers must be absolutely first-class."

The majority of the work done at M2 involves aluminum and cast iron five-axis machining. A port shape is digitized on a Renishaw Cyclone, then fed through the Windows-NT-based shop network system to one of four Fadal CNCs. M2's spotlight machine tool is a five-axis Fadal 4525 with a Siemens SINUMERIK 840D controller and Nikken rotary tables. The Siemens control features that company's ShopMill software, which enables operators to quickly monitor actual cutting conditions through on-screen graphic imaging of the workpiece and tool path.

"All of our porting work requires simultaneous five-axis machining," as Ron Mielbrecht explains. "This was the reason we selected the more advanced controller on our latest CNC machine. Occasionally, we manufacture billet throttle bodies and, for such jobs, the speed of the machine and the ability to use the rotary as a live fourth axis make part production much better and faster. Integrating these additional functions on the Siemens controller was simple."

"Typically at M2, all our part programs are in the 15-25 MB range, so we drip feed everything. The PC architecture on the machine controls make integration with the other equipment in this shop much easier, as well. The control allows us to run the program directly from the hard drive. The machine is connected directly to the shop network, so accessing a program becomes a routine cut-and-paste operation."

"Furthermore," he explained, "the Siemens 840D allows us to tune in the machining parameters, thus creating better machining transitions and quicker run times. It processes information at lightning fast speed, much better than others we've investigated. Though very powerful, it can be run by our operators with only a modest amount of training."

On the machining center, the control manipulates all aspects of operation, including spindle orientation, five-axis movement, tool changes, table motion etc. The data are stored in both the memory of the control and the hard drive of the PC. M2 usually utilizes one main operating program and calls up several external programs (not sub-routines) which would be much too large to fit into conventional memory.

M2 often runs single parts requiring up to eight hours of unattended machining. Therefore, set-up is critical. A part can finish at the end of a day shift, then with minimal changeover, another part can be machined overnight. This scenario occurs almost daily, according to the company. Once again, the machine tool control becomes vital to this procedure. As M2 President Ron Mielbrecht reported, "The ability of the control to store so much data locally makes it easy to change the fixture plate and load the next program in fifteen minutes or less. The machine carousel

**Above left:** M2 Race Systems Programmer Rick Schneider operates the Siemens Sinumerik 840D CNC on a Fadal five-axis Machining Center.

**Above right:** CNC ported cylinder heads are produced on multi-axis machining centers with Nikken rotary tables at M2.

holds sufficient tools to do each job, so we don't need to be concerned. Our older CNC machines could hold only about six tools typically, because the movement of the fixture would contact them in the carousel."

M2 places particular emphasis on the need for five-axis simultaneous machining, because this method of cutting ports enables all the machining lines to follow the contours of the port shape. This philosophy is also critical to the optimization of airflow for increased horsepower and torque, which is the basis for any head porter's reputation.

This shop currently supplies CNC ported heads for big and small block Chevy, Ford, Chrysler and various import engines. Plus, M2 scan-and-machine services work from port designs at concept stages, for custom racing and other applications.

In commenting on the service received from his control supplier, M2 President Ron Mielbrecht observed, "They (Siemens) have been very helpful in getting the machine (Fadal 4525) up and running for us. Any assistance needed has been provided for only the cost of the service contract. It's great to know they have the desire to help us get the most out of the machine." He also



noted the control's Windows-based software was easy to use and helped keep M2's CNC up-to-speed with the computing world of today's machine tools.

M2 Race Systems was founded in 1997 and currently operates full CAD/CAM programming, CNC machining, bench/dyno testing for cylinder head and engine performance, as well as in-house welding and finishing departments. ■

M2 Racing Systems operates a full-service shop, producing big and small block cylinder heads, plus custom work for head designers, engine builders and racing teams.

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