Mazak Case Study

Mazak Advanced Technology Powers Penske Racing South

Penske Racing is a legend in Indy car racing with three straight Indianapolis 500 wins, including 2003 where Marlboro Team Penske drivers Gil deFerran and Helio Castroneves finished first and second. Penske Racing is also a power in NASCAR Winston Cup racing with Miller Lite Team Penske Dodge driver Rusty Wallace and ALLTEL Team Penske Dodge driver Ryan Newman. Wallace is currently in the Top 10 in NASCAR Winston Cup points this season and Newman is the 2002 Winston Cup Rookie of the Year and the winner of the MBNA Armed Forces Family 400 at Dover International Speedway June 1, his second Winston Cup win so far this year.

Such victories are about more than points. Considering the (36) championship races throughout (19) states, sales of NASCAR-related merchandise can reach more than $1.3 billion a year. Having a winning driver can mean a million dollars in trackside sales of driver-related products at any given race, plus deliver sought-after television exposure for the team sponsors.

Part of the team building these winning race cars at Penske Racing South (Mooresville, NC) are machine tools from Mazak Corp.(Florence, KY), including the Integrex 300Y, the Vertical Center Nexus 510C, the Super Quick Turn 250-MSY, the VTC-200B, and the VTC-250/500 Vertical Machining Centers.

Building and racing high-performance race cars has changed dramatically for Penske Racing South, which returned to NASCAR Winston Cup racing full time in 1991 after a 14-year hiatus. Well known as an engineering-driven organization, Penske began working with the NASCAR project team of UK-based Mercedes-Ilmor in 1993, famous for its expertise in building Formula 1 racing engines for McLaren. Four years later, Penske Racing South purchased

Power Tech, an engine-building company in Concord, NC, that together with its purchase of Jasper Motorsports in 2000 became Penske Jasper Engines. The Penske Jasper engine currently provides the power to Rusty Wallace's #2 Dodge Intrepid, Ryan Newman's #12 ALLTEL Dodge Intrepid, and Dave Blaney's #77 Jasper Motor Sport Ford Taurus.

Even as recently as 1997, stock car racing largely involved stock parts – trying to wring the most horsepower out of the best combination of off-the-shelf parts, according to Penske Racing South president and co-owner Don Miller. But a strategy of manufacturing its own components for its own racing engines was what the company really wanted.

Parts in Hours Instead of Weeks

All NASCAR engines have certain requirements. They must be V8s, the cylinder block must be cast iron and available for sale, and the camshaft must be placed at the bottom of the engine (no overhead cams). But having the right custom camshaft, for example, can make a huge difference in performance. Variations in lift and duration due to different lobe profiles on the shaft mean engines can be custom-tailored to a given track and its unique conditions.

Obtaining a custom camshaft, though, can take between six and eight weeks for turning, machining, gun drilling, grinding, and heat treating, among other operations. With the Integex, "Now we can go out to the shop, adjust the drawings, and get one in about four hours," Miller says. "Having our own production capability allows us to look at the whole engine, and anything that's basically round we can make," he adds. "The quicker we can make iterations, the faster we advance."

Penske Racing South also takes advantage of computer-aided design (CAD) and the Mazatrol Fusion 640 MT CNC control on the Integrex 300Y for downloading 3-D solid models of engine components from Esprit, its CAD software from DP Technology (Camarillo, CA). Once the model is downloaded, the control automatically determines the most efficient tool choices and cutting conditions. The Mazatrol Fusion control accepts conversational programming as

well as EIA coding. This allows programming and editing to be optimized to any part geometry, taking advantage of the best features of each programming method. Once a program is complete, a list of required tools is generated automatically, considerably reducing machine setup time.

Another advanced technology the company uses to accelerate product development is an SLA 5000 stereolithography rapid prototyping machine from 3D Systems (Valencia, CA). The machine uses a solid-state laser and a 508mm X 508mm X 584mm build envelope to produce engine parts from resin for fit-up and other testing. “As a company, we believe we have set the bar in utilizing technology such as advanced machine tools and rapid prototyping,” Don Miller says. “The more parts you make, the more you control your own destiny.”

Working Budget More Productive

Penske Racing South also operates under a budget for making parts (“This isn’t Formula 1 after all,” Miller jokes) and Mazak machine tool technology makes Penske Racing’s dollars go much farther. Working with the NASCAR project team from Mercedes-Ilmor, Penske Racing South is able to produce camshafts in house approximately 70% less expensively than obtaining them from the outside. Coupled with the significant time advantage, Penske can test a number of different camshafts and improve engine performance while remaining within budget. “We would have never considered making our own camshafts before obtaining our Mazak equipment,” Miller says. “We’ve gone from shooting for the best combination of parts to having the best-made parts.”

“A Universal Machine”

Rick Honeycutt, who runs the Integrex 300-IIY at Penske Jasper Engines, calls it “a universal machine. There are thousands of jobs I can run on it.”

With a turning spindle and a rotary tool spindle plus a 40-tool magazine, the Integrex 300-IIY can turn, mill, drill, and machine on multiple faces, all in one setup. B-axis (spindle) positioning can take place in increments of 0.001 degree to perform contouring as well as any angled machining over the 225 degrees of swing.

The Integrex also provides speed and horsepower. The turning spindle on the Integrex 300-IIY offers a 3,500 rpm maximum and 35 Hp. The 25 Hp rotary tool spindle has a 10,000 rpm maximum speed. All of this versatility is combined with productivity enhancing options including a workpiece measuring system, X, Y, Z pitch error compensation and C-Axis pitch error calibration. It also is equipped with 1,000 PSI high pressure coolant.

With multitasking machine tools and other production equipment, Penske Racing South is now engineering and making the majority of its engine components in house. “All the engine companies will get to the same point, but those who get there first have the advantage,” Don Miller says. “We feel we’re giving our drivers the best chance to win each time they’re out there.”

With innovative products and advanced technology, Mazak stresses its engineering developments to provide customers with tangible value-added benefits and the most productive machine tools available. Application assistance and training are provided from their Southeast Technology Center, Northern Atlanta, as well as from the National Technology Center in Florence, Kentucky. For more information, contact the Mazak Corporation at (859) 342-1700 or visit the Mazak website at www.mazakusa.com.

Photo caption: Precision camshafts are made accurately and economically on an Integrex 300Y at Penske Jasper Engines.

Photo caption: Making and testing custom camshafts means Penske Racing South has more options to fine-tune engines for specific tracks and racing conditions.

Photo caption: Optimizing cutting conditions from solid models is quick and easy with the Mazatrol Fusion 640 MT.

Photo caption: Rusty Wallace's #2 Miller Lite Dodge Intrepid and Ryan Newman's #12 ALLTEL Dodge Intrepid.


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TAURUS
SIMPSON