

# more than Spinning Their Wheels

By Joel Cassola

## OPPORTUNITY KNOCKS FOR STUDENTS OF VINCENNES UNIVERSITY'S ADVANCED MANUFACTURING PROGRAM.

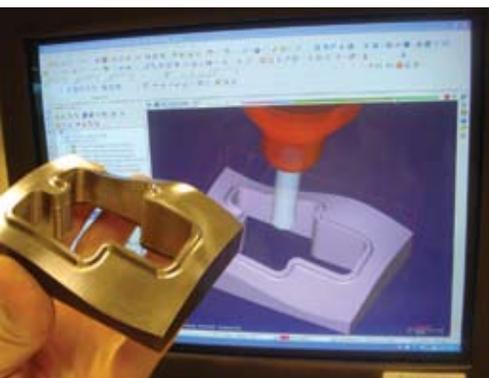
Last fall, when Mastercam, the leading manufacturer of computer-aided manufacturing (CAM) software, announced the winners of its IOF (Innovators of the Future) contest, first, second and third prizes went to students in the advanced manufacturing program of Vincennes University's Machine Trades Technology Department.

The contest called for students to design a unique hot rod wheel and make it to quarter scale using CNC (computer numerical control) manufacturing equipment. Submissions were judged by Boyd Coddington, host of the Discovery Channel's *American Hot Rod* TV program. In addition to receiving \$1,000 in prize money and a trip to California, contest winner Zac Frame will get to see his winning design scaled up and manufactured in Coddington's Los Angeles shop as a new addition to the hot rodder's wheel line.

Although this is all very exciting, there is still better news for the Vincennes University (VU) students. Each of this year's nine advanced manufacturing program graduates (all contest participants) has received three or more job offers from high-tech manufacturing shops. Many of these were from some of the most prestigious names in automotive, aerospace and medical device manufacturing. They not only have job offers on the table, but also the opportunity to choose among attractive options.

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### Advanced Manufacturing Advantage

“I certainly wouldn’t call it unfair, but I think my advanced manufacturing students made such a strong showing in the IOF contest because they have the opportunity to be enrolled in a third-year program focused on advanced CAD/CAM and CNC,” says Associate Professor Doug Bowman, lead instructor for the advanced manufacturing program. “Prior to enrolling, each student must complete an intensive two-year associate degree program in either tool and die or injection mold tooling.

“In the two-year program, students construct complex projects that include progressive dies and injection molds with side action. By the time I get them, they have all of this, plus three CNC classes already under their belts. This solid background is what makes the difference. I think some other schools should think about offering a third-year program in advanced manufacturing for those students who really want to make a career of advanced CAD/CAM and CNC. Industry today has a great need for this type of graduate.”

Bowman integrated the contest into the curriculum, and he plans to do it every year. In fact, he is very excited and confident about this year’s entry, which he describes as a very complex part that he was preparing to submit to the

competition in a few weeks.

Under Bowman’s direction, students utilized the CNC programming lab in the technology center to design and program their wheels with Mastercam for last year’s contest. They machined the wheels in the CNC lab—a Haas Technical Education Center (HTEC). The center is equipped with 13 state-of-the-art Haas machining and turning centers acquired with a substantial grant from their manufacturer and one from the Lilly TechWorks Partnership Fund. Students spend about half their time on a Mastercam seat, programming the CNC equipment, and half in what Bowman calls “the dream lab” running their programs.

The university has 30 Mastercam seats. About 22 of these are in the CNC programming lab, and the others can be accessed from any node on the campus network—the library, for instance.

### Training for the Real World

By the time the students graduate from the advanced manufacturing program, they will have logged in 800 additional hours of two-, three-, four- and five-axis programming using Mastercam X and manufacturing with the Haas CNC machines. Many of the projects are designed to make use of the latest in high-speed machining (HSM) and multi-axis machining in collaboration with companies specializing in die making, mold making, aerospace, medical devices and motorsports.

Approximately one-third of the projects are actual “live” prototype work for manufacturers such as Toyota Motor Company. Toyota, as an industry partner, contributes funding for materials for the advanced manufacturing option.

Some of the projects undertaken during the 2005-2006 academic year include:

**Tundra Tooling.** “Toyota makes their Tundra trucks about a half





hour down the road,” says Bowman, “and one of the engineers approached us about doing a job they would normally do with their tool and die makers, but they don’t like to pull them off repairing dies to do odd jobs. They wanted special tooling to spin on the lug nuts of the 2007 Tundra because they are going from a 21 mm lug to a 22 mm. So we put a couple students on the job and reverse engineered the 21 mm lug up to 22 mm. The tools were shipped to Japan for testing and will reappear on the manufacturing line in the U.S.”

**Four- and Five-Axis Parts.** Bowman had the students design a “widget” using all of the Mastercam program’s four-axis capabilities. Students also created and manufactured a contoured turbo compressor rotor using five-axis CNC machining.

**Military Parts.** The program was pleased to accommodate a request from a nearby military facility to design and make a dozen housings for surveillance equipment, and these are now being used overseas. Students also got involved in making mil-spec mounting hardware for missile launchers that travel on Humvees, which are currently being used in Iraq.

**Pre-Production Tooling Models.** Another job for Toyota had students making exact-size replicas of tooling used in making the new Tundra truck, so that production engineers in Japan could evaluate clearances.

“Some of these were quite complex,” said Bowman. “Our students imported 3-D solid models into Mastercam and then created tool paths so that the models could be cut in Delrin plastic.”

**High-Speed Machining and Surfacing.** Bowman created an



exercise based on the manufacture of free-form die sections used in the stamping of body panels made on an automotive production line. This exercise requires the students to use high-speed machining and surfacing on parts made of hardened tool steel. This is also the very kind of experience that would get favorable notice in Warsaw, Indiana, home of several of the world’s most advanced surgical implant manufacturers. At least one of Bowman’s graduates has accepted an offer as a programmer at Zimmer Corp., a global leader in orthopedic products.

In return for machining several prototypes for AFCO racing shocks, VU was invited to a special two-hour seminar on shock design given by AFCO’s lead engineer. AFCO also helped out by supplying technical assistance with the design and construction of VU’s shocks for the Mastercam IOF contest this year.

“We could not have done it without them,” says Bowman.

### Hitting the Road

Students in the program are no strangers to the real world of manufacturing. Each worked as an intern during the summer at a local shop, another course requirement. Even so, Bowman did his best to broaden their experience base by taking them on six field trips to visit 18 different manufacturing operations during the course of the academic year. In addition to the field trips to manufacturers, Bowman’s students attend trade shows



Vincennes University created these shocks for the Mastercam Innovator of the Future contest. They are designed to be 1/4 scale monster truck shocks.



such as the Society of Manufacturing Engineer's (SME's) Manufacturing for Performance in Indianapolis, and International Manufacturing Technology Show (IMTS) in Chicago. According to Bowman, VU students actually worked in the Haas Automation booth for three days operating the CNC machines.

Many of the students have had job interviews after visiting these companies. More importantly, the field trips help open the students' eyes to the many different types of opportunities available to those with CNC programming and machining skills.

For example, on one overnight trip, the students attended a Swiss turning seminar, visited a medical prosthetics manufacturer, toured an aerospace manufacturing plant and finished with a visit to a race shop in Indianapolis where they do machining on Indy cars. Bowman says automotive racing has really embraced CNC. In this area, there are hundreds of shops that work with Indy car teams, drag racing teams, sprints, NASCAR—every type of motor sports.

"There are so many opportunities open to these students," he says. So where will they go?

### Hot Commodities

The advanced manufacturing program at Vincennes is now in its second year. It was instituted after conducting a survey of Indiana manufacturers, who unanimously agreed that there was a crying need for technical school graduates with advanced CAD/CAM and CNC skills.

Such a good job was done in enlisting the aid of industrial partners to develop its technical center, CNC capabilities and curriculum, that Vincennes University was awarded the 2005 Indiana Career and Technical Education Award for Excellence. Partners include Haas Automation, Inc., Mastercam, Kennametal, Niagara Cutter, Inc., Sandvik Coromant, LMT-Fette, SGS Tool Company, REGO-FIX, Charmilles, EROWA and others.

The program can accommodate up to 16 students a year. How-

ever, the demand for even a modest level of CNC skill is so great that some associate degree students planning to do the advanced training take jobs instead.

"The ideal number of students is 13, because that is the number of Haas CNC machines that we have," Bowman says.

"It is difficult to walk into a manufacturer or a tool and die/mold shop in Indiana and not bump into a graduate of Vincennes University's machine trades technology program," notes Bowman. "VU has been supplying the majority of the entry-level toolmakers in Indiana for 40 years. But we need to get the word out about the third-year advanced manufacturing program, so that young people will know that training is available for the new wave of jobs that require skills in the latest CAD/CAM and CNC technology."

Haas Automation recognized the value of the advanced manufacturing program at Vincennes University by offering a position in their "Top Gun" machine shop apprentice program to all nine of last year's graduates. Bowman notes that three of the graduates are now working with Haas in California and are doing quite well. Because the VU graduates had come from a three-year program rather than the usual two-year program, the company actually created the new classification of master apprentice for them.

In the manufacturing industry, the opportunities are definitely there, and Bowman believes many of his students will choose to stay in Indiana. Companies from the state were visiting regularly in the weeks just before graduation—an aerospace company, a turbo-charger manufacturer, a medical device manufacturer and an automaker, to name a few.

An advanced manufacturing degree from Vincennes University is simply a hot commodity in a sellers' market. ■

### Explore More

For more information about the university and its partners in the advanced manufacturing program, here are some Web sites to explore.

Haas Automation, Inc.  
[www.haascnc.com](http://www.haascnc.com)

Lilly Endowment  
[www.lillyendowment.org](http://www.lillyendowment.org)

Mastercam  
[www.mastercam.com](http://www.mastercam.com)  
[www.mastercamiiof.com](http://www.mastercamiiof.com)

The Society for Manufacturing Engineers  
[www.sme.org](http://www.sme.org)

Toyota Motor Company  
[www.toyota.com](http://www.toyota.com)

Vincennes University  
[www.vinu.edu](http://www.vinu.edu)