

## news and notes

### Mowing With Water

by Peggy  
Chalmers

Students at Purdue University in West Lafayette, Ind., have edged water hydraulics closer to practical vehicle application by converting an industrial riding lawn mower to water-powered steering, transmission, and cutting reels. The project, directed by professor Gary Krutz, cut its way across university lawns following replacement of the unit's oil hydraulic systems.

The cool performance of the 16-horsepower, front-wheel-drive Jacobsen industrial mower came as a pleasant surprise to the developers. The unit's reservoir temperatures never exceeded 33°C, well below the 50°C limit at which vaporization could affect liquid levels.



*This industrial mower has been refitted with water hydraulics. The next test will use chrome-plated steel or plastic in place of aluminum.*

Water was filtered to eliminate minerals and impurities that could cause buildup and corrosion, and deionized to remove electrical charges that also could cause corrosion. Nevertheless, the water interacted with the aluminum cylinders and left dime-size pieces of aluminum oxide floating in the reservoir. Future models will switch to either chrome-plated steel or plastic.

To control speed, the students had to settle for a fixed-displacement pump and pressure-compensated flow control valves.

"The application demands a variable-displacement piston pump," Krutz said, "but the only existing water-based

versions are manufacturers' prototypes and, unfortunately, we couldn't convince any manufacturer to part with one."

Krutz believes that water hydraulic systems could be successfully developed for many off-road applications. Water inherently offers a higher operating efficiency than oil; it is 30 times less viscous than oil, making it easier to pump and, therefore, results in lower pressure losses.

Equipment for the mower project was donated by Danfoss Nessie, Fairfield Manufacturing, Indianapolis Valve and Fitting, Parker Hannifin, and Swagelok Co.

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## **New Toy in Dearborn**

by Harry Hutchinson

Ford has taken delivery of a modified Focus with a diesel engine that burns natural gas. The car is the brainchild of Westport Innovations Inc. of Vancouver, British Columbia, which develops technology for diesel truck engines that run on natural gas.

Ford, according to a spokeswoman, is supporting Westport's research with the Focus. The protocar has been handed over to Ford for road tests in Dearborn, Mich., after a cross-country drive. Ford executives will get to drive it around town, the spokeswoman said.

A crew from Westport drove the car down the West Coast from Vancouver to Los Angeles, where they entered the Focus in the 2001 Michelin Challenge Bibendum competition for low-emissions vehicles. It took gold medals, or grades of A, in slalom, or handling, and in noise. It got a silver medal, or a B, for efficiency. Then the crew made for Michigan.

The trip came to more than 3,800 miles, or 6,200 km. This month, the car is moving to northeast London, to Ford's Dunton Engineering Centre.

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## **Heads Up**

by Paul Sharke

Auto manufacturers test their products according to U.S. Federal Motor Vehicle Safety Standard 201 to evaluate how well a pillar, visor, or headliner softens a head blow in a crash. To help carmakers, MTS Systems Corp. of Eden Prairie, Minn., builds a free motion headform

impact system for launching a standardized head shape at various spots around a car's interior. The head flies at 15 mph toward the strike point.



*Another faceless mug awaits its short flight off the end of a velocity generator.*

According to safety systems project manager Paul Nave, the company's latest tester incorporates two advances. One is the ability to work with a vehicular coordinate system when defining the location of a target. The other is an extended operating range.

Manufacturers can designate the coordinates of target points in CAD, Nave said, then transfer those points to the head smasher. A coordinate measuring machine on the tester orients it to a car body datum.

With seven degrees of freedom and a column that can sweep through 60 degrees, the machine has enough range to perform just about any head impact test for both occupants and pedestrians. The tester facilitates solo operation and allows several impact tests to run during a given shift, Nave said.

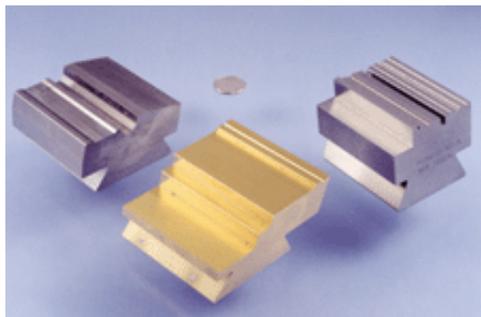
## **Keeping an Edge Longer**

by Michael Valenti

A Michigan manufacturer of stainless steel hexagonal valves has tripled its tool life and cut machine downtime by a third, by using tools made of a specialty alloy that approximates the wear resistance of carbide at less cost than carbide tools.

The parts manufacturer originally used dovetail form tools fashioned from T15 steel to make the small valves, which are turned in screw machines. T15 is a high carbon/tungsten/cobalt/vanadium alloy that offers both abrasion resistance and hardness. However, every eight hours, the form tools became worn, so that the company had to stop its screw machine and grind off 0.04 inch to sharpen them.

The part maker decided to increase productivity by extending the intervals between tool sharpening, and approached Nichols Precision Tool Inc. of Madison Heights, Mich., for a solution. Nichols is a manufacturer of high-speed steel and carbide cutting tools for screw machines and CNC machines.



*Form tools made of Maxamet alloy have three times the tool life, and incur two-thirds the downtime, of the steel tools used previously.*

Company president Dave Nichols ruled out tungsten carbide tools, whose relative brittleness might cause them to crack in this interrupted cut application. Instead, he suggested making the form tools from the Micro-Melt Maxamet alloy developed by Carpenter Specialty Alloys of Wyomissing, Pa.

Maxamet is composed of 2.15 percent carbon, 4.75 percent chromium, 6 percent vanadium, 13 percent tungsten, and 10 percent cobalt, with the balance being iron. This composition and the manufacturing process used by Carpenter to make bars or plates of the alloy give properties that lie between those of conventional high-speed tool steels like T15 and cemented tungsten carbide.

For example, the high carbide volume provides the alloy with wear resistance, while balancing the chemical composition when making the alloy enables the finished product to possess good toughness at high levels of hardness.

After the Maxamet forming tools were installed at the Michigan machine shop, workers were able to run their forming machine for 12 hours between resharpenings that only required 0.02 inch to be ground off the tools. The combination of longer machining runs and savings in stock removed from the tools added up to a 300 percent increase in tool life.

Nichols believes further improvements are possible using Maxamet. The precision toolmaker will coat future Maxamet form tools with titanium nitride and titanium carbonitride, hoping to double or even triple tooling life.

## Addressing the Ball

by John DeGaspari

No one really knows just how many millions of golf balls are lost each year on the world's courses, but it's sufficient to keep manufacturers busy rolling out replacements. At the Fairhaven, Mass., packaging facility of Acushnet Co., which produces Titleist golf balls, high summer humidity occasionally threatened productivity as the balls were placed in foil-backed cardboard boxes.

The 50,000-square-foot plant, with a 33-foot-high ceiling, was air-conditioned, but had no additional humidity control. Sometimes humidity created problems in folding the packaging materials.



*Acushnet installed a dehumidification system to keep its golf ball packaging line running properly.*

The packaging equipment could malfunction at humidity levels above 65 percent, said Acushnet's

facilities manager, Charles Sands. "The cardboard portion of the packaging can absorb moisture, which results in minuscule but critical expansion in the cardboard," Sands said. "When that happens, the bends won't occur where they should in the folding process. And sometimes the foil is stretched so far that it can tear."

The result might be an unacceptable package or, worse, an equipment jam if more than one cardboard sheet was picked up by the rollers.

To improve the humidity control in the plant, Sands

decided to install a desiccant dehumidification system, supplied by the DH division of Munters Corp. in Selma, Texas. The system passes moist air through a 60-inch desiccant wheel that rotates at eight to 12 cycles an hour. The dried air is delivered to the plant via a processing fan, while the moisture is collected and released into a heated reactivation section.

The unit is contained in an 800- cubic-foot cabinet atop the packaging plant. If the plant calls for dehumidification, the system takes supplemental air from the outside, dehumidifies it, and delivers it into the plant. "The system literally sucks the moisture out of the make-up air before it's delivered to the plant," Sands said. "It may reduce the moisture in the air from, say, 100 percent to 10 percent. And when the air is added to the in-plant atmosphere, the resulting humidity level may be 50 percent in the building."

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## Computer as Eye Doctor

by Jean Thilmany

In space, you can't just run to the doctor.

As NASA tests methods for keeping astronauts in orbit for longer and longer periods of time, it has to make sure that they can stay healthy while up there. It also has to provide a means of diagnosing illnesses and malaise, and of screening for common health problems.

A five-minute vision test that uses a laptop computer and a touch-sensitive screen could be used both on Earth and in space to help diagnose the onset of eye disease and even certain types of brain tumors, according to Wolfgang Fink, a physicist and senior member of the technical staff at NASA's Jet Propulsion Laboratory in Pasadena, Calif.

Fink, who is also a visiting research assistant professor of ophthalmology at the University of Southern California in Los Angeles, developed the three-dimensional, computer-based Threshold Amsler Grid Test as part of his postdoctoral research while at the California Institute of Technology in Pasadena, with his colleague Alfredo Sadun, a professor of ophthalmology at USC.

"As NASA moves forward to establish a permanent

presence in space, this may be considered a breakthrough step for the creation of an autonomous, onboard physician," Fink said. "It's a noninvasive, quick, and easy process that gives astronauts and physicians on the ground an almost instant auto diagnosis."

To take the test, a person sits with one eye covered in front of a computer screen divided into a grid. The subject stares at a central spot on the touch-sensitive screen and then outlines with a finger the missing areas of the grid. The computer records, processes, and displays a 3-D image of the subject's visual field. The test for each eye takes about four or five minutes, Fink said.

"This type of technology will be useful for long-term space missions, where early detection and advance monitoring will be key to the health of astronauts," he said.

The tool has been undergoing testing in clinical trials that began last year at the Doheny Eye Institute of the Keck School of Medicine at USC. Trial results show that the screening test helps detect a variety of eye conditions, such as glaucoma and macular degeneration, two causes of blindness. Early detection of these conditions is crucial to prevent further loss of sight, Fink said.

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**Briefly  
Noted**

**Federal-Mogul Corp.** of Southfield, Mich., and **Teikoku Piston Ring Co. Ltd.** formed a joint venture for the manufacture of high-performance steel piston rings. The joint venture company will be called United Piston Rings Inc. and will manufacture at Federal-Mogul's current Manitowoc, Wis., facility. Federal-Mogul and Teikoku will together invest approximately \$10 million in United Piston Rings Inc. over the next year.

An automatic steering system from **Deere & Co.** of Moline, Ill., will spell farmers who tire of guiding their tractors along seemingly endless furrows. Using satellite-based positioning, the system will require a farmer to turn the tractor only at the end of a row or around obstacles.

**Pratt & Whitney** of East Hartford, Conn., demonstrated a 22 percent improvement in fuel use on a Boeing 707-

300 after fitting it with JT8D turbofans. P&W is aiming to upgrade 1960s-era TF33 and JT3D-7 engines currently powering 707 aircraft in AWACS and other military surveillance missions.

**DukeSolutions** of Charlotte, N.C., will design, install, and finance energy-saving measures at Fort Jackson, **the U.S. Army** post in Columbia, S.C. DukeSolutions will install geothermal heat pumps, perform lighting and chiller plant control upgrades, and install demand-limiting controls designed to improve reliability while saving energy. The total value of the contract is approximately \$44 million.

**Delphi Automotive Systems Corp.** of Troy, Mich., is planning a big push into aftermarket sales in India, directly addressing car owners looking for replacements.

**Foster Wheeler Ltd.**'s U.K. subsidiary, Foster Wheeler Energy Ltd., has been awarded a front-end engineering and design contract for an estimated \$800 million gas-to-liquids, or GTL, project, based in Ras Laffan Industrial City, Qatar. The GTL facilities will provide fuel, naphtha, and liquefied petroleum gas for domestic consumption. The contract was awarded by a **Sasol** and **Qatar Petroleum** joint venture.

Paris-based **Alstom** will supply Fluor Daniel with two 7.7-megawatt Tempest gas turbine generating sets to be installed at the IRP Pharmaceuticals plant in Canovanas, Puerto Rico. The turbines, worth \$6 million, are scheduled for delivery in Puerto Rico from Alstom's Houston manufacturing facility in February and March next year. Alstom also provided the electrical and pumping equipment for an irrigation station that was recently commissioned to supply water from Daule-Peripa to Severino, Ecuador. Equipment included electrically powered pumps with flow rated at 1,920 cubic meters per second, cranes, telephone systems, and a 33-km-long 138-kV transmission line.



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