

# Roto-Flo's Servo-Actuated CNC

## TO DEBUT AT IMTS

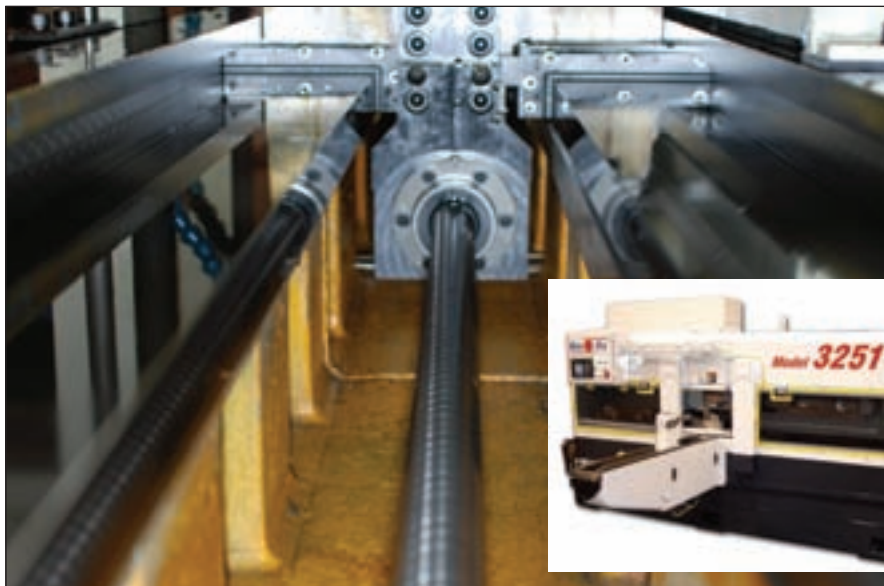
Most anyone that has been in the gear industry—or any machining and tooling oriented business, for that matter—is probably at least somewhat familiar with the Roto-Flo workhorse line of hydraulic-actuated spline and thread rolling machines. After all, they've been at it for decades.

But things are changing at the Detroit-based company. For starters, the Roto-Flo brand and company has since 2005 been owned by U.S. Group, and is operated by its subsidiary, U.S. Equipment Company. And now with that infusion of change comes another—the new 48" Model 3251-CNC—Roto-Flo's first CNC servo-actuated, horizontal spline and thread rolling machine. The machine debuts at this year's IMTS.

Paul Simon, Roto-Flo CEO, explains the addition of the servo-driven machine.

"The key motivating factor in developing the servo-actuated machine was bringing technological advancement to the spline rolling process. Servo-actuated machines provide productivity improvements, more predictable process control, easier machine setup and improved environmental considerations (no hydraulic fluids, electricity savings and reduced noise)."

The 3251-CNC is capable of producing "cold-formed splines, grooves, worms, threads and other part features with high precision," according to a company new-product release. The obvious difference between this servo-



Roto-Flo's Model 3251 48" horizontal servo CNC is the first of its kind for the company—a clear departure from its long history of hydraulic-driven spline and thread-rolling machines.

driven Model 3251-CNC and its predecessor, the hydraulic-driven Model 3251 (still available) is the latest technology in CNC controllers and closed-loop A/C servomotors. With those advances—feed rates of over 1,400 IPM, for example—part throughput is increased up to 20 percent.

The key is the servo technology, which allows for maximum-minimum speed modulation. This includes driving the tool rack, which allows for rapid traverse of the tooling to the part, slowing to a controlled entry rate to account for "part inertia control" and accelerating for optimum part quality and productivity.

In addition, says Simon, "By using servo motor technology with ballscrews to provide the variable and adjustable tool rack motion, rather than fixed hydraulic systems, tool life and part quality can also be increased because the servo drives allow the forming process to be fine-tuned."

It is this technology—not exclusive to Roto-Flo—that makes the hydraulic-driven machines of old a somewhat endangered species. Some of the well-documented drawbacks with hydraulic spline and thread rolling machines include:

- Once a part is rolled, the tailstock must fully retract before the slides return to their previous setting.

- Part sensing during rolling is unavailable, which in turn leaves no room for error in part sizing that can result in costly tool jams and machine crashes.

- Maintenance-intensive (fluids, filters, cylinders, etc.)

- Expensive to run, and getting more so with out-of-control energy costs.

On the other hand, other welcomed attributes of servo-controlled CNCs include:

- Energy savings. Hydraulic systems run non-stop; CNC servo motors run only when needed.

- Smaller footprint. Hydraulic systems, with their fluids, filters, cylinders and other necessary parts, require a good deal of floorspace. That all goes away with servo CNCs.

- No hydraulics = maintenance savings (see above).

- Greener. None of the above mentioned hydraulic fluids, oils, etc. to worry about or recycle. Servo motors also run cooler, which leads to savings

continued

on air conditioning.

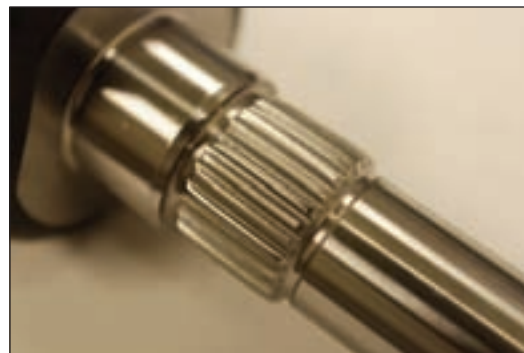
- Quieter. AC-servo motors reduce noise by 50 percent over continuous-running hydraulic motors.

- Faster setup. The CNC control positions the racks, so an operator no longer needs to adjust stops and switches.

- Enhanced part precision. Unlike

hydraulic spline rolling, servo-driven CNCs can re-roll with ease and as needed to fine-tune a specific part feature.

The Model 3251-CNC is the first out of the gate for Roto-Flo, but, says Simon, "New models are under continuing development," including a 36" version.



And for users of hydraulic-driven machines, don't despair. Roto-Flo still makes them and intends to continue doing so. In fact, Simon adds, they still represent a big chunk of the company's business.

"We have customers that still desire hydraulic-actuated machines, and we will continue to provide that model. These customers tend to be customers in developing countries that do not have the expertise in CNC technology and domestic companies with a shortage of CNC expertise in their maintenance departments."



Nothing new there, unfortunately, regarding skilled workers here at home. Which makes the fact that both the hydraulic- and motor-driven versions are easily Fanuc-automated a very good thing indeed.

See the Roto-Flo Model 3251-CNC at IMTS in **Booth 7511**.

## For more information:

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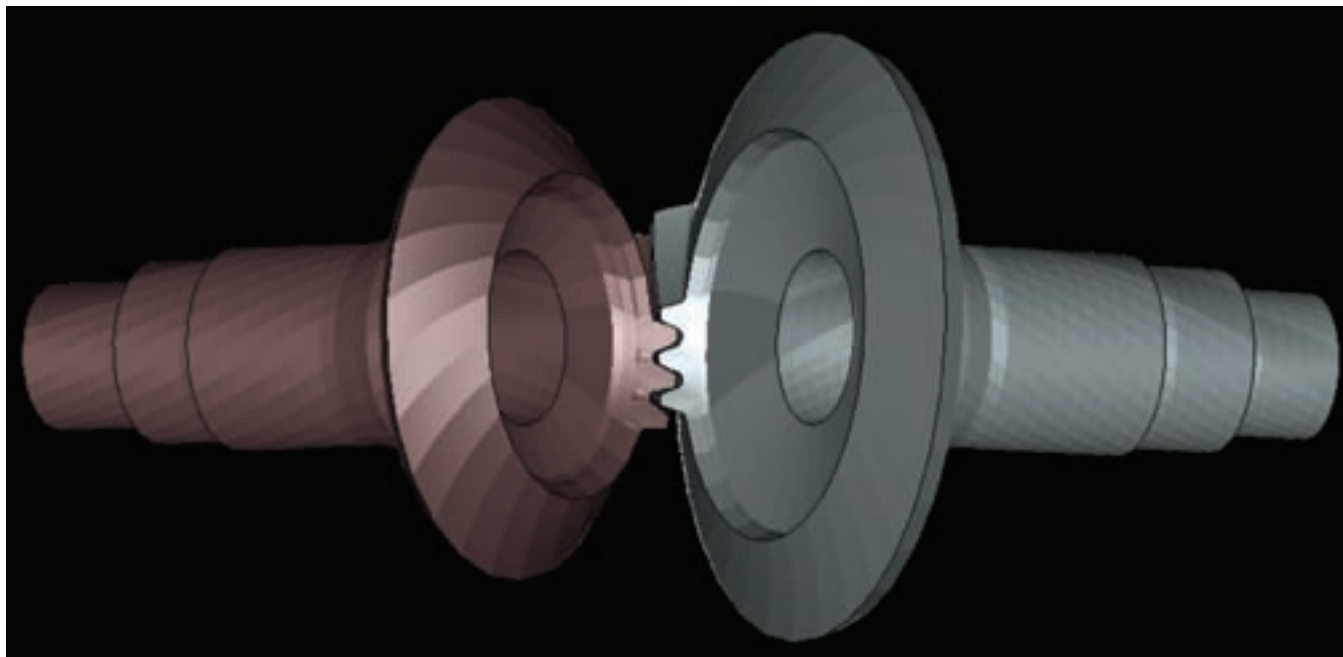


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## GPSys Critical to Spiral Bevel Gear Life

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CAD model of a spiral-bevel gear set.

Impact Technologies delivered a software module that combines tooth contact analysis, stress analysis and fracture mechanics evaluation for spiral-bevel gears to the U.S. Navy in 2006. *GPSys* was originally developed to examine helicopter gearing.

"The ability to predict remaining useful life of spiral-bevel gearing, based on assumed initial flaws and specified mission profiles was the initial motivation behind creating *GPSys*,"

says Jeff Steele, manager of software and services at Impact. "For the stress analysis portion, traditional formulas in truck or automotive applications assume that the gear is very rigid and make the assumption that the flexibility is in the teeth and that the gear itself is rigid. In helicopters, this is not the case."

The software integrates advanced physics-based failure modeling, system vibration features, inspection and operational data and run-to-run testing to enable failure prediction on critical drive train components. According to the website, it automates the process for model generation, stress analysis and 3D fracture mechanics of spiral-bevel gears. The prognostic approach incorporates a probabilistic fusion process which can update damage models for component-specific damage states and remaining useful life predictions.

The developed technology and analytical approach can be applied

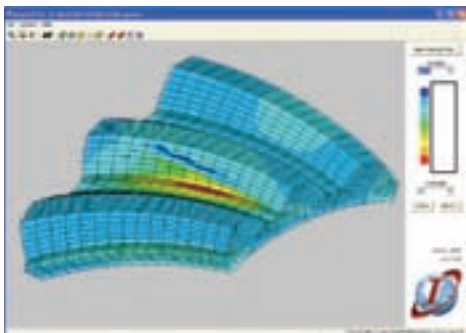
to other systems. Because of this, Impact is now considering commercial versions of the software suite for other applications.

*GPSys* pulls together a number of software packages including *Gleason T900*, *ANSYS* and *Franc3D* and acts as the director for data communication between the modules.

"The initial work on the prognostic side was done nine or ten years ago, then the first modeling on failure progression started in 2002/2003," says Joel Berg, senior project engineer at Impact. "The Phase II program was initiated in 2004, looking at integrated software systems before it was delivered to the Navy in 2006."

Damage tolerant design and prognostics are the key aspects of the program, and the reason both Berg and Steele believe the software can be marketed effectively.

"We've developed some of these



Calculated stress contours in a spiral-bevel pinion.

things for the military over the years on other components such as bearings and parts of gas turbines,” Steele says. “The unique thing here is that we’re applying the outside framework to these high-performance gear drives. The *GPSys* has the ability to combine design parameters with assumed flaws and mission profiles to determine the likelihood of a catastrophic failure.”

Berg says *GPSys* ties in with the new generation of military aircraft and control systems and onboard health monitoring systems where the military is looking at how to operate the equipment safely and when to operate certain profiles.

“They have the ability to predict remaining life and how they should properly operate an aircraft to get to a safe landing condition,” Berg says. “With this software, pilots can plan out a safe return flight instead of losing an aircraft. That’s kind of the birth of prognostics and how it is permeating through the design of these next generation aircraft.”

Steele says the most important aspect of this technology is the safety of the pilots.

“They want a smart system onboard to tell the pilot to punch out, land immediately or continue the mission.”

While this is prevalent in aerospace applications, Berg says the software offers plenty of flexibility and some of the tools such as the fracture analysis

software do not have to be tied to gears if you have a model and load conditions.

“There are basically two systems at work here. One is an analysis tool and the other is a design tool, and both can be applied to several applications,” Berg says.

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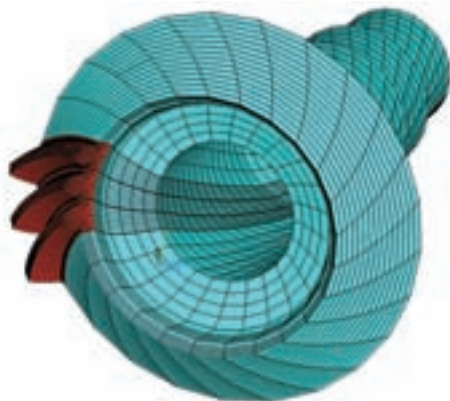
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3D finite element model of a spiral bevel pinion.



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The V-tec helical end mills and drills have a broader application range. Non-ferrous application materials include composites, aluminum alloys, copper alloys, metal matrix composites, ceramics, graphites, carbides, friction materials, green ceramics and magnesium. Helical geometry reduces tool forces and helps improve chip removal. They exhibit less heat buildup and adhesion.

Star-SU is exhibiting at IMTS 2008 in booth **F-2238**.

#### For more information:

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The ConSep Plus is for stand-alone machine tools and cell or FMS configurations. It handles any type of chip and can function with as many as 12 coolant tanks. An optional high-pressure coolant package includes a media-free filtering module with 10-15 micron level filtering.

The MagSep Plus handles cast iron chips and fines, and it can also be fitted with a high-pressure coolant package. Both units change belt speed to reduce coolant loss from the chip carryout by sensing the machine tool load. They are programmed to monitor the volume temperature, concentration, acidity and

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removal rates are three times faster than traditional insert-clamping systems.

Valenite incorporated three of its carbide grades and top-form geometries. The VForce can be used on a range of materials, especially cast iron, the company notes. Indexing time is minimized by releasing the insert quickly, which is enabled by one screw. There are 12 cutting edges created from a hexagonal shape.

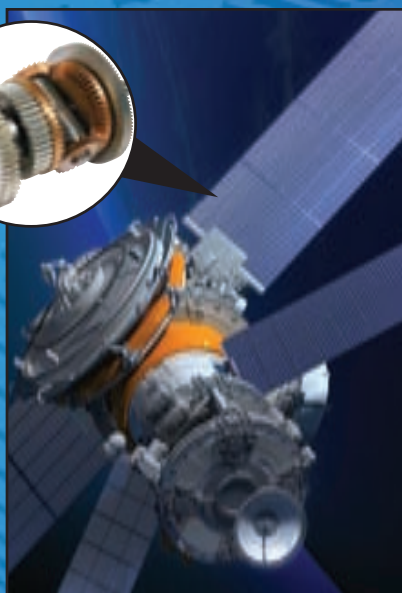
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The VForces insert cavity and locking screw are aligned and angled relative to each other, so they apply force in two directions while the screw tightens. A wedge-like condition is created by a process where the insert is pushed against pocket-side walls and pulled down to the bottom of the pocket, effectively securing the lock screw and retaining the insert.

### For more information:

Valenite LLC  
1675 East Whitcomb  
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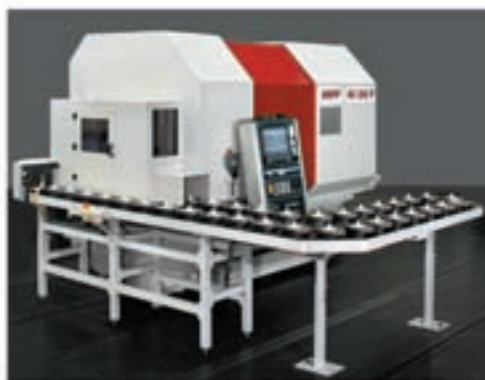
1,102 pounds. The Ecoline machines are designed to offer a low price tag for quality machining.

The DMC 55 H ECO is one of 27 machines DMG is exhibiting at IMTS in booth A-8501. Other DMG machine tools being displayed are ultrasonic

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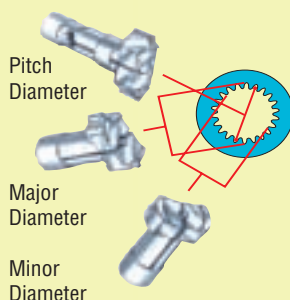
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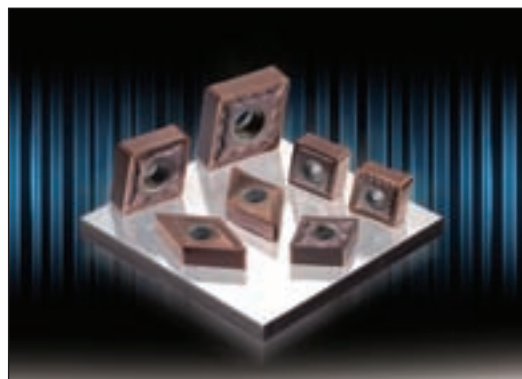
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edging and contouring. The tool resists axial forces and has four cutting edges. The insert pockets have threaded coolant holes, so high-pressure coolant is applied directly to the cutting edge, reducing chip build-up.

Both tools can be seen at IMTS in Sandvik Coromant's booth, F-2000.

## For more information:

Sandvik Coromant Company  
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The new Bison VWDIR gearmotors range from 1/30 to 1/2 hp, with output torques from 12–800 in-lbs. DC models include 12V and 90V permanent magnet motors as well as a 115V universal motor. AC models are available with 115V and 230V inputs in permanent split capacitor, split phase, shaded pole and universal motor design.

“Over the past 24 months, we were approached by a growing number of customers requiring shorter lead times for these types of gearmotors, and we have responded by tooling up this complete VWDIR line that is now in full production in our St. Charles, Illinois facility,” says John Morehead, vice president of strategic planning and marketing at Bison.

“OEMs benefit by being able to design in a gearmotor solution that is just right and not overkill for their particular application. With increasing emphasis today on reduced cost designs it is important to be able to choose an appropriate gearmotor that is not burdened with rugged design features that may not be necessary,” Morehead says.

## For more information:

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Milacron's HFP line of fluids features foam arrest control technology (FACT) to minimize the amount of foam produced, which improves lubricity for high volume and high fluid pressure applications. The fluids provide rancidity control, and they

are compatible with most conventional waste treatment methods, according to the company's press release. The HFP line with FACT includes six fluids to accommodate different applications.

Milacron is exhibiting at IMTS in booth **B-7527**.

## For more information:

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3000 Disney Street  
Cincinnati, OH 45209  
Phone: (888) 246-2665  
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