

Shop's Diversity Rides on Waterjet Cutting

What do a 260-mph (418-kph) Ford Mustang funny car, a 48" (1.2-m) manhole lid, a kitchen countertop and a 56' (17-m) semitrailer have in common? They all center around Brian Hough's shop, West Coast Steel Fabricators (Eugene, OR), and benefit from versatile affordable waterjet cutting technology.

Brian Hough's business extends beyond the West Coast Steel Fabricators job shop and into three other divisions—OTI, Olympus Trailers, and Cascade Truck Body & Trailer Sales. OTI manufactures equipment for wastewater treatment facilities; Olympus Trailers builds large motorsports and utility trailers; and Cascade Truck Body & Trailer Sales up-fits trucks for service and heavy-duty industrial use.

And about that Ford Mustang funny car, Brian also runs his own NHRA Top Alcohol Funny Car racing team, Brian Hough Racing. He's also the team's championship driver.

West Coast Steel Fabricators began operation in 1979 and does custom fabrication work that includes conveyors, bins, hoppers, tanks, trusses, ductwork, and silos, among others. In essence, listing what products the versatile 50-person shop has not created would be easier. Besides his regular customers, Hough shares the shop's fabricating expertise and capabilities with all his other divisions, including the Top Alcohol Funny Car racing team.

A few years ago, Hough looked to expand and diversify his business in the face of the new economic reality. He wanted to expand his custom steel product offerings and elevate component quality to higher levels. That is when he incorporated his first abrasive waterjet cutting machine into his shop.

With abrasive waterjet technology, Hough now handles a wider range of production runs, including fast prototype development. He is able to quickly turn around highly accurate

parts without the hassle of tool changes or complex fixturing. Plus, compared with his other production equipment, abrasive waterjet cutting generates much smoother surface finishes, which in many instances eliminates the need for secondary machining.

"I had long been interested in waterjet cutting, so when I was ready, I contacted OMAX Corp. The company appealed to me because it is nearby in Kent, WA, and is a close-knit, family-oriented, US-based company," said Hough. "Once I decided on a machine, OMAX had it here within three days, and that same day, I was up and running."



Brian Hough's Top Alcohol Funny Car hits speeds approaching 260 mph (418 kph) while covering the quarter mile in 5.6 seconds. All of Hough's businesses have benefited from the precision cutting and quality finish provided by the OMAX Maxiem 1530 JetCutting Center.

Hough's machine is a Maxiem 1530 JetCutting Center. First introduced in 2009, the Maxiem line has proven its ability to meet customer demands for cost-efficient, versatile waterjet cutting technology. More than 20 different sizes currently comprise the Maxiem line, and each model incorporates OMAX's proven direct drive pump technology and Intelli-MAX software suite. Hough's 1530 model employs an X-Y cutting travel of 10' 2" x 5' 2" (3 x 1.6 m)

CELEBRATING
95
1919 - 2014

**An
Employee Owned
Company**

M.A. FORD
High Performance Cutting Tools

sales@maford.com • www.maford.com

Shop Solutions

“Where the Maxiem 1530 really shines is in producing parts that are beautifully finished right off the machine. We have eliminated up to two hours of finishing time from most parts, as well as gained back the manhours usually spent deburring and cleaning parts,” said Hough.

The shop recently added the OMAX Collision Sensing Terrain Follower accessory to its 1530. The accessory has especially been an asset at OTI, Hough’s anaerobic digestion equipment division, which contends with uneven part surfaces on a daily basis. Prior to adding it, the shop’s operators continuously experienced instances where the machine’s cutting head would encounter an uneven surface height and automatically shut the machine off.



Adding the Collision Sensing Terrain Follower accessory to the Maxiem 1530 has allowed OTI to waterjet cut uneven part surfaces for its anaerobic digestion process equipment without unplanned machine stoppages.

“Initially, we didn’t realize the need for the Terrain Follower. Fortunately, OMAX designs its accessories to retrofit onto any machine already in the field, so adding it was fast and easy. Now if our plate stock has a bit of a wave to it, the machine just follows along seamlessly and without any issues,” said Hough. “No special programming is necessary. It just works when we need it to.”

Prior to waterjet, Hough’s businesses had relied on high definition plasma cutting. And while that process still accounts for a large amount of his daily operations, it is unable to compete with the Maxiem waterjet in terms of accuracy, especially when cutting the shop’s mild steel, stainless steel, and aluminum.

“With our high-def plasma we can get speed but not accuracy. Parts come off the machine and must be polished,

the edges cleaned up and a reamer run through the holes. These operations add up to an extra hour and a half of time tacked on to every part," said Hough. "With the waterjet, we can do the same amount of parts as with plasma, but when

the waterjet parts are done, they are done and have much higher quality finishes. So much so that we now have internal guidelines stating certain parts can only be produced using the waterjet machine, specifically those parts that will be cus-

tomer facing. We want to show off these parts. It gives equipment a high-tech feel. Parts are cut perfectly and look beautiful every time," said Hough.

In addition to OTI, the precision of waterjet cutting really shines for the Olympus Trailers division of Hough's businesses. These high-end trailers are built for demanding markets such as the motorsports industry, and customers expect tight tolerances and elegant finishes on every part.

The trailers feature extensive aluminum constructions, including all-aluminum framed cabinets with stainless steel countertops in work areas and heavy-duty aluminum doors throughout. The company's semi-trailers can measure up to 56' (17 m) in length and feature lounges with DuPont Corian countertops, drop-down LCD satellite TVs, full size refrigerators, and even custom marble floors.

For his racing team, Hough uses the Maxiém 1530 to help reduce the weight of his funny car, cutting precision parts such as motor mounts and brackets to his exacting specifications. NHRA drag racing is all about extreme straight-line speed. Often a team's only path to gaining a few hundredths of a second in the quarter mile is in reducing the weight of its car. Teams like Brian Hough Racing look to gain every possible advantage, and Hough uses his waterjet machine for this purpose every chance he gets.

"When it comes to making parts for the car, the great thing about having the waterjet machine is how quickly I can go from idea to prototype. I can sketch out an idea and quickly turn that into action

HOW FAST DID THAT PIPE GET THREADED?

Instead of taking the time to shim, clamp, rotate and repeat, you can now start threading pipes in seconds rather than minutes.

Because the **BIG BORE BB-FZA** from SMW Autoblok is simplifying the challenge of clamping premium pipes and couplings now and forever.

With three centering jaws and three compensating jaws, even irregular pipes can be clamped on-center in well under a minute. Its extended jaw stroke of 1.5" is perfect for machining couplings and premium pipe threading applications in high volumes.

After all, you've invested enough in your machine. Why chuck the time you could be using it on lost productivity?



www.SMWautoblok.com
847.215.0591





Gleaming stainless steel and aluminum are waterjet cut for the interiors of high-end semitrailers Olympus Trailers manufactures for the racing industry.

on the machine,” said Hough. “We can turn around a new bracket to try on the car in rapid fashion. And if that doesn’t work, we go back to the drawing board and come up with

something new. The Maxiem allows us to do a lot of experimenting in a very short amount of time.”

In the shop, Hough’s employees frequently experiment with new applications for the waterjet machine, working to accomplish even more with the equipment. They are now able to cut practically any type of material, from rubber to UHMW to aluminum to stainless steel and carbon fiber. “We are now even cutting the wood for our skids with the Maxiem waterjet,” said Hough. “All our equipment ships out on wood skids, which require cutting prior to shipping. Thanks to one of our experiments, we recently switched to making those cuts with the waterjet. As a result, we took a job that previously ran between 7 and 10 hours and reduced it to only three hours. And because we complete the job so quickly, we have time to also cut our company logo into the pallets, which we had never done before.”

Now that abrasive waterjet cutting is fully integrated into all of his businesses, Hough can’t envision succeeding without

ABB Robotics. From small parts to the largest. Automated metal fab made easy.



From entry level systems for smaller parts to the most intricate, highly engineered systems for heavy, large frame welding, ABB has the ideal robotic system for the full range of welding, cutting and metal fabrication applications. With industry leading software innovations that reduce programming complexity, ABB robots and modular systems can easily handle small batch runs of highly diverse parts. The ABB family of robots includes a selection of integrated dressing models that deliver 15% shorter cycle times, lower operational costs and greater flexibility. www.abb.com/robotics

Power and productivity
for a better world™ **ABB**

See us at **FABTECH Booth #N-1436**

the technology. "It is something that I look back on now and wonder how we were able to do it all along without a waterjet," Hough said. "The capability was something that we should have always had in the shop. We will definitely continue to

move forward, and we are absolutely considering another machine, most likely with a larger table size. Our current machine is already used much of the workday, and as we market our machine's capabilities to clients in the area, it has become

obvious that we will eventually see the demand for running two machines.

When that time comes, I will certainly call OMAX." **ME**

For more information from OMAX Corp., go to www.omax.com, or phone 253-872-2300.

Faucet Parts Gush from Multistation Center

A manufacturing engineer's open mind, common sense and eclectic background in business have transformed the way parts are machined at the Guadalajara, Mexico, plant of plumbing fixture leader URREA Group. Charged with re-inventing a process that relied on discrete machining centers to cut brass faucet components at rates of 10 parts an hour, Project Director Juan Ramon Delfin Madariaga studied technology from around the world before settling on an entirely different concept—the ICON 6-250 from Hydromat Inc. (St. Louis).

The ICON 6-250 is a single, multiple-station machining center with four CNC spindle modules, which has taken on all the production for five part numbers, while using only 60% of its capacity. The machine's ability to produce the same parts at rates up to 350 plus per hour, with higher quality and process capability, is at the heart of URREA's strategy to re-shore parts made in Asia and expand the company's already substantial market coverage to the entire globe.

URREA Group is a diversified, family-owned Mexican company focused on three key markets: bath environments,



YOUR PRECISION. YOUR PRODUCTIVITY. YOUR PROFITABILITY.
YOUR OMAX.

From advanced technology and intuitive software to highly responsive service and forward-thinking support, OMAX empowers you to surpass your competition and grow your business. You can rely on OMAX waterjet technology for all your part processing needs, whether it's manufacturing small or large components from stainless steel, titanium, advanced composites or glass.

OMAX brings the highest level of accuracy, speed, simplicity and versatility to your operations because we understand that at the end of the day, it's your success that matters.

AT THE CENTER IS YOU.
SHAPING THE FUTURE OF WATERJETS



WWW.MAXIEMWATERJETS.COM

Made in the USA



VISIT US AT
FABTECH
BOOTH
#S1067



WWW.OMAX.COM

See us at **FABTECH Booth #S1067**

Helping manufacturers produce results.

A Right-From-The-Start™ ERP success story.

"The busier we got, the more we needed a powerful ERP system up and running. Out here, there's no time for down time."

Andy Bubulka,
Manufacturing Plant Manager
H-J Enterprises, St. Louis, MO



"That's why we went with Global Shop Solutions. They were in, they were out, and we were seeing major new efficiencies—right from the start. What a tremendous difference their ERP system, and their people, made in accelerating our workflow, lowering overall costs, and setting the stage for unconstrained growth. Very powerful. Only regret is that we didn't go with them years ago."

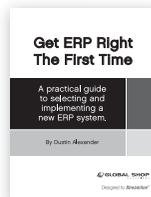
For a **FREE** copy of "Get ERP Right The First Time™" call 1-800-364-5958 or visit www.GlobalShopSolutions.com.

Come see us at
Booth #S1927



Nov. 18–21, 2013

Designed to **Streamline™**



GLOBAL SHOP
SOLUTIONS
©2013, Global Shop Solutions, Inc.

Shop Solutions

hydraulic components, and locksmith tools and solutions. Its plumbing brands include URREA, Stanza, Orion, and Dica. The company's business campus in Guadalajara occupies more than 248,900 m² and continues to grow.

Madariaga was tasked in 2011 with redesigning the machining processes for multiple faucet parts. "We were using three high-quality horizontal machining centers to cut the parts, fixtured two-up, and we were producing about 10 per hour," he said. "The company needed a process that would allow us to start at lower volume, and increase gradually. We also wanted to reduce the piece cost, and be able to change over quickly, because over time we hope to transition to a high-volume, just-in-time manufacturing operation, to the extent that's possible in our business.

"My policy is to break from the old ways and rules, and use rational thinking to find a new path," said Madariaga. "The obvious and standard solutions are not the best for everyone. For example, one of the German machines we considered needed a day to change the process. We were focused on the best European machines, not the US, but the best solutions are not always in the obvious places."

The presentation on the ICON machine from the local Hydromat contact came at just the right time, according to Madariaga. "Hydromat assured us the ICON 6-250 machine could easily handle our parts and would surprise us. We visited St. Louis in September, saw the ICON machine in action and evaluated the process strategies Hydromat had developed for our parts."

The ICON 6-250 is capable of having both horizontal and vertical working spindles at the same position. It enables



A World of Improvement

Is your weld shop having problems pulling its own weight? They need Bluco's modular fixturing system for welding. Find out for yourself what proper tooling can do to improve the quality of your weldments and your productivity. We can make it happen! Try us.

Call for a free catalog (800-535-0135)
Visit our website (www.Bluco.com)

Welding fixture for agriculture hitch frame

A World of Fixtures for... Pipes Train Cars Frames

Games Pipes Cranes Trucks Job Shops Excavators Tractors Sheetmetal Defense Gates Cons

FABTECH
Booth N2411

BLUCO Corporation
3500 Thayer Court Aurora, IL 60504
www.Bluco.com 800-535-0135

some unusual processing strategies, so it caught the attention of an outside-the-box thinker like Madariaga. The ICON 6-250 machine can handle parts up to 250-mm cube and is designed for medium to high-volume, flexible part production. The single machine incorporates eight individually controlled three-axis spindle modules, four horizontal and four vertical, with a full fourth-axis interpolation indexer at each of the four machining positions.

Spindles are arranged in pairs of one horizontal and one vertical at the four machining positions, which are on the perimeter of the six position pallet-transfer. The four machining positions are equipped with CNC B-axis indexers capable of ± 4 arc-sec accuracy, while the two nonmachining stations are fixed position, one to be used for part loading and the other used for gaging, assembly, part ID marking, etc.

Both nonmachining stations can also be used simply for part loading. A cycle for the pallet-transfer takes just 4.5 seconds, with each pallet handling up to 91 kg standard. The pallet system uses zero-point clamping to securely and accurately clamp the 300-mm base pallet to the indexer.



Project Director Juan Ramon Delfin Madariaga studied technology from around the world before settling on an entirely different concept—the ICON 6-250 from Hydro-mat—to machine brass faucet components for leading plumbing fixture manufacturer, URREA Group.

Each HSK A63 spindle has its own 12-position disk-style toolchanger unit, with each tool change done in a rapid 3.5 seconds. A fully equipped ICON with eight machining units has a total inventory of up to 96 tools. The disk allows direct toolchange without a cam box or toolchange arm, eliminating frequent maintenance issues.

The machine can put up to eight spindles into the cut at one time, performing five-sided machining on four different parts at one time, all in a single clamping. Flexibility is enhanced with Fanuc standard programming, standard or special tooling, and fixturing typical of any horizontal/vertical machining center. The machine is completely self-contained with coolant system, hydraulics, PLC and CNC electrical systems—the equivalent of eight CNC machining centers in a footprint of just 54 m².

For URREA's first part numbers, two brass faucet spouts, Hydromat developed a four-position tombstone-like fixture with hydraulic clamping and interchangeable form jaws. The form of the upper jaw provides the locating point for the part, so it is protected during loading from chips/contaminants. With this process concept, four parts are completed on every table index, with 20 parts in the workzone at all times. Operations on the parts include drilling, thread milling, tapping, counterboring, face milling, and chamfering. Each of the four machining stations performs different operations, further enhancing the machine's output rate.

Quick-Turn Black Oxide



TRU TEMP® 30 minute process.

Smart option for in-house black oxide on iron and steel components. Nothing like it. Safe, simple, 30 minute TRU TEMP® process operates at 200°F and contains no pollutants. Non-dimensional finish is RoHS and Mil spec compliant.

Ideal choice for Job Shops or OEM manufacturers whose customers need quick delivery of high quality finished components at low cost.

Comprehensive Factory training and on going tech support to keep you finishing in the black. Call us today: 952-937-7931.

Buy online today.

www.birchwoodtechnologies.com

BIRCHWOOD®
TECHNOLOGIES

PRECISION Hydraulic Clamping



Experience
the **BEST**
Customer
Service
in the
industry
&
the **BEST**
Product
availability!



Request our
latest **CATALOG**
with **NEW** products!



The Productivity Devices Company

CALL TODAY:
800-992-0236
sales@vektek.com
www.vektek.com

Shop Solutions

Hydromat developed two different processing approaches for URREA's first two part numbers. The difference involved part load/unload from one station or two. In one case with load/unload at a single station, the machine completes four parts on every table index with a cycle time 60 seconds, or about 15 seconds per part. When loading/unloading from two stations the machine completes eight parts on every table index in 91 seconds, or just under 12 seconds per part. The potential output of the machine proved so aggressive that URREA initially set the machine up for loading from only one station.



*Glazing faucet spouts are machined on the **ICON 6-250** and then handled by robots and polished in the manufacturing cell.*

Installed in March 2012, the machine today handles five different part numbers, all of which can be machined in the same fixture, but with different form jaws. Changeovers on the machine—currently about five per week—take about an hour to 90 minutes.

“When the machine was first delivered, the first two things I noticed were its heavy construction and the precision of the machining technology,” said Luis Manuel Galan Vicente, project manager. “It has proven exceptionally accurate.

“The machine has been a strong performer, and we are gradually adding part numbers to exploit its potential,” said Vicente. “The throughput per square meter makes it the top production asset on our factory floor. It’s like a factory within our factory. This machine, and probably more like it, will play a key role in the expansion of our worldwide market coverage and re-shoring work to North America.” **ME**

For more information from Hydromat Inc., go to www.hydromat.com, or phone 314-432-4644.

Continued on page 101

UPGRADE NOW



Before the competition does! Upgrade to the proven performance of a Unist MQL system and...

UPGRADE YOUR PART QUALITY
Excellent finished cut quality

UPGRADE YOUR SCRAP VALUE
MQL produces dry chips

UPGRADE YOUR TOOL LIFE
Longer tool life with MQL

UPGRADE YOUR WALLET
MQL saves you money



Learn more: unist.com/upgrade

See us at **FABTECH Booth #S4515**

Continued from page 56

Flexible Solution for Global Automotive Supplier

Modatek Systems, a subsidiary of the Austrian-Canadian company Magna International, manufactures parts all over the world for the automotive industry. The Magna Group is a major diversified global automotive supplier with 315 production sites and 90 engineering and research and development centers in almost 30 countries.

Management of the Canadian branch of Magna International embarked on a search for a suitable systems supplier for production lines for machining trailing arms for SUV platforms. What they found was a standardized yet flexible solution from Licon mt (Laupheim, Germany). Licon mt supplied four twin-spindle LiFLEX II 1078 machining centers to Modatek Systems that offered process flexibility and the ability to accommodate any product variations that came from the final customer, General Motors.

The process-oriented approach and support provided by Licon mt were essential to the success of the project. Previously, Modatek Systems had executed very few machining projects of this kind and welcomed the machining know-how offered by Licon mt and the confidence that "Made in Germany" brought with it. The first of four twin-spindle machining centers, the LiFLEX II 1078 4U model was shipped to Canada six weeks ahead of the officially agreed upon delivery date.

Modatek Systems approached Licon mt with a description of the parts to be processed. "The process had to be very dynamic from the start because the manufacture of the machines and the start-up of processes needed to be completed within a relatively short timeframe," said Dorde Zmijanac, project manager for Licon mt in Germany. "Through web conference calls as well as personal meetings, we were able to quickly and accurately coordinate, determine, and approve order-specific details such as individual concepts for fixtures as well as the customer's loading system. Our experience enables us to be flexible in responding to individual customer requirements throughout the project process. At the end of the day, this all contributed toward the successful launch of the project and also strengthened the market position of our North American subsidiary."

Factors such as productivity, process reliability flexibility, durability and longevity, ease of maintenance and servicing, reusability and reconfiguration were the primary considerations for designing the process. "Cost per part is always at the heart of



Licon mt supplied four twin-spindle LiFLEX II 1078 machining centers to Magna International's Canadian subsidiary Modatek Systems that offered process flexibility and the ability to accommodate any product variations that came from the final customer, General Motors.

all investment decisions made by our customers," said Winfried Benz, managing director of Licon mt. "This is the major investment driver which we have to confront in our market environ-

Indexable Angle Heads

TITESPOT® Angle Heads and KeyCutters are **driven by your high pressure coolant system, not spindle rotation**. Now, your spindle can index for **multi-position machining with one head**.

- ▼ Machine in bores down to 1" in diameter
- ▼ Tool change without stop block
- ▼ Speeds to 13,500 rpm
- ▼ Lathe versions available



**Call for
FREE
Trial Offer**

ELTOOL

Eltool Corp Toll Free 877-435-8665 www.eltool.com

LASER CALIBRATION SYSTEMS

U. S. Innovation, Made in the USA

***Trusted by the global machine tool industry
for more than 25 years***

Patented LDDM (Laser Doppler), single aperture is compact, lightweight, easier to use, and more cost effective than traditional interferometer laser systems



Features:

- > ASME and ISO machine calibration
- > Innovative 3D laser-vector volumetric compensation
- > Automatic data collection and file generation
- > Dynamic contour and spindle error motion measurement

Applications:
CNC Machine Tools, large area Water and Laser cutting machines, 5-axis Gantry type machines, and CMMs



Optodyne, Inc.

1180 Mahalo Place, Rancho Dominguez, California 90220 USA
Tel: (800) 766-3920 – (310) 635-7481
info@optodyne.com – www.optodyne.com

Shop Solutions

ment. In addition, every customer wants a flexible production facility that is not tied to the current order and can be used again for future orders. We then collaborated to configure the appropriate machining center with our LiFLEX modular system. Our goal is to continually optimize the process of machining complex workpieces to minimize costs for scrap as well as additional quality controls."

"All key modules such as the machining units, spindles and rotary units of Licon mt's machine are developed and manufactured in-house," said Benz. "This not only guarantees availability and quality, but also continually develops the capability of all Licon mt employees to meet our customer's requirements. For our customers, this operating philosophy is an assurance of exceptional service quality and provides Licon mt distinct advantages over other machine builders."

A vendor of Modatek Systems had already produced these parts, but in an A-B load configuration, meaning the part had to be removed from one fixture, reoriented and reclamped for completion of machining. The heavy weight of the parts, 21 lb (9.5 kg), made refixturing these parts' clampings prohibitive because these were to be manually loaded. The Licon mt solution allowed for complete machining of the part in one fixture. The fact that the A axis tilted, tipping the parts into the fixture made loading/unloading easy. Licon mt's five-axis solution allowed for machining a set of parts per spindle so that two pairs of parts were completed every cycle. The result is that there is less material in queue. Traditionally, after a machining run of left-hand parts, they would sit in inventory until the right-hand parts were machined to complete the pair.

PITMAN, NEW JERSEY



Incredible 495,166 sq. ft. manufacturing facility on 76.14 acres

- Fully air conditioned by 7 chillers with plate and frame heat exchangers
- Masonry over steel frame and insulated metal panel over steel frame
- Reinforced concrete floor
- Ceiling heights up to 24' clear
- Three positive pressure clean rooms
- Primary 34.5 KV electrical service
- High pressure air system featuring six air compressors
- Vacuum air system featuring multiple vacuum pumps
- Three positive pressure clean rooms:
 - 38,106 sq. ft. – Class 10,000
 - 2,875 sq. ft. – Class 1,000
 - 3,100 sq. ft. – Class 10,000
- Energy efficient T5 lighting with high efficient fixtures and motion sensors
- Conveniently located off Exit 53A from NJ Route 55 with easy access to the NJ Turnpike, I-295, I-95 and South Jersey and Philadelphia Ports

*For complete details contact
Marc Policarpo or Bob Corr:*



BINSWANGER

215-448-6000

MPOLICARPO@BINSWANGER.COM

RCORR@BINSWANGER.COM

www.binswanger.com/pitman



Clean Room

The main advantage of five-axis, five-sided machining was that product changes or additions by the end user pose very little problem to implement. The ability to machine at any compound angle or on five of the six sides of a part simplifies process changes to meet product design revisions. During ramp up, for example, there are multiple design changes which were able to be implemented within the parameters of fixture design.

Modatek Systems also benefited from Licon mt's capability to design and manufacture fixtures. The complex workpiece geometry challenged Licon mt's engineers to integrate all necessary functions in the fixtures while taking into account space requirements, stability, and internal oil lines. All lines for hydraulic supply are incorporated in the main body via long oil channels. As a result, the chip build-up that occurs with clamping jigs that have external piping is largely prevented, increasing the efficiency of the overall system.

The alignment of raw components in the fixture is accomplished via a mandrel inserted into the work spindle from the tool magazine, centering the part before clamping.



Licon mt's fixture design for machining complex workpieces integrated all necessary functions in the fixtures, which in the machining position are suspended in an inverted position from the fifth axis trunnion for minimum quantity lubrication (MQL) machining.

Final clamping under high pressure is only carried out once the alignment has been completed. This procedure ensures that machined holes and surfaces are always optimally positioned in relation to the raw cast bore and that they meet the precision requirements of the final workpiece.

The fixtures in the machining position are suspended in an inverted position from the fifth axis trunnion for minimum quantity lubrication (MQL) machining. Licon mt recommended MQL machining because of its ecological and economic benefits for the customer. "Through minimum quantity lubrication, we are not only working towards a cleaner environment around the machines, but are also saving the money previously spent on acquiring and disposing of cooling lubricants," said Chris Peters, Modatek Systems manufacturing engineer.

Following installation of the machines and the start-up of processes Modatek Systems, employees were given intensive instruction and training in both Germany and Canada with the aim of enhancing daily operations in the processing of these workpieces. The necessary procedures for machine maintenance for quality and process assurance were also communicated in these training sessions. **ME**

For more information from Licon mt, go to www.licon.com or phone 734-879-2201.

New Coolant- Thru!

End Mill Holders

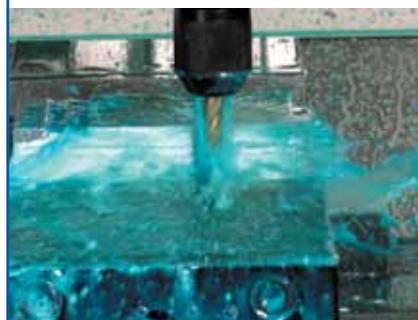
*Three internal channels
deliver coolant where
you need it!*



- Flush Chips
- Increase Tool Life



- CAT 40 and CAT 50
- Standard And Extended Length



Fitz-Rite Products, Inc.
1122 Naughton, Troy, MI 48063
Phone: 800.835.2643
Fax: 248.528.1581
www.fitzrite.com

