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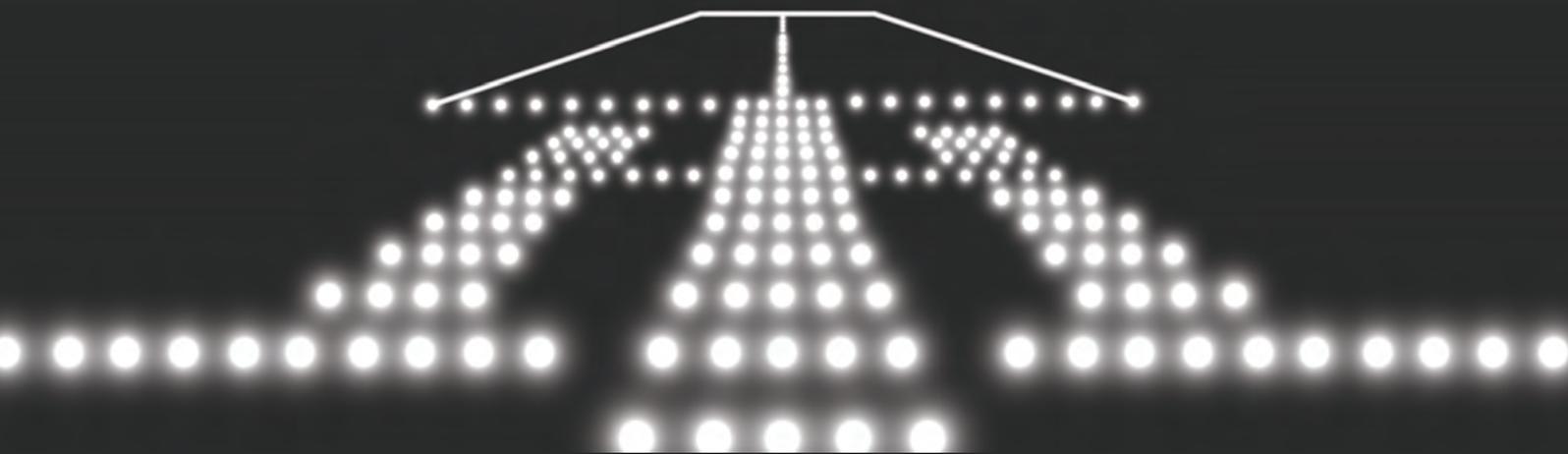


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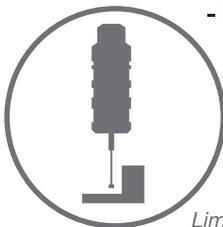
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CNC West

February/March 2017 • Volume XXXV No 3

Feature Stories

Small Manufacturers' Institute to Present Manufacturing Challenge and Exposition	20
5-Axis Machining Make Anaheim, Ca. Company a One Stop Shop <i>With the Help of Kitamura 5-Axis Machines, Shop Does More Than Ever</i>	22
Taking Continual Improvement to Heart <i>A Cypress, CA Company is Always Upgrading with Japanese Machines</i>	30
Custom High Speed Toolpaths and Probing Programs Hit Homerun <i>Ex-Seattle Mariner Pitcher Finds His Groove with Mastercam Software</i>	38
Top 10 Finance and Acquisition Trends of 2017	42
Recipe for Success <i>The New Boeing Composite Wing Center in Everett, Washington</i>	48
Top 5 Reasons Spreadsheets Are Dead Weight	54
Cad/Cam Perspective <i>What is the Best Way to Machine This Part.....</i>	56

Departments

4	Editorial	60	Industry News
8	Executive Hotline	78	New Products



Joe Puccio COO of Anaheim Precision Manufacturing which is a fully integrated solutions manufacturer servicing high tech aerospace and commercial customers.



J&F Machine in Cypress, Ca. continues to thrive with the help of Japanese machines.
- Pg.30



Ex Major league baseball player Bob Wolcott found that the toolpath functions of his CAM software, Mastercam® by CNC Software, Inc. helped speed up the process without breaking tools.
- Pg.38

Coming in April/May 2017 Software and Controls —Don't miss this issue! It will be an idea-packed focus on developments in computer controls, networking, automating plant management, the latest in CNC software, hardware and machine control technology.

Editorial: March 23, 2017

Ad Space: March 27 2017

Ad Material: April 4, 2017



VOL. XXXV NO. 3
February/March 2017

The oldest regional industrial publication serving the Western States manufacturing managers, owners and engineers from 1 employee to those larger plants of 5,000 or more. Its editorials feature numerical control applications in all size machine shops, tooling, programming, robotics and shop operations, training personnel, financing of new equipment, cutting tools and all related manufacturing requirements. Coverage extends to all of Arizona, California, Oregon, Washington, Nevada, Utah, Idaho, Colorado, New Mexico and Texas.

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Thomas F. Arnold (1927 - 2009)

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ADVERTISING SALES:

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CNC WEST (0747-3362) is published bi-monthly by ARNOLD PUBLICATIONS, INC., 16835 Algonquin St., No. 158, Huntington Beach, CA 92649. Periodical Rate postage paid at Huntington Beach, CA. and additional mailing offices. Postmaster: Send address changes to CNC WEST, P.O. Box 2029, Huntington Beach, CA, 92647. SUBSCRIPTIONS: Available without cost in U.S. only to company officials and managers of production, manufacturing engineering and purchasing agents. MUST be requested. All others may subscribe at \$10.00 per year. Single copy \$2.00. Please send paid subscription order to Circulation Manager, CNC West, P.O. Box 2029, Huntington Beach, CA 92647

Publisher's notice: We assume no responsibility for the validity of claims in connection with items appearing in CNC West Magazine. Addresses are given to facilitate further inquiry.

ISSUANCE AND CLOSING DATES: Published every other month, October, December, February, April, June and August. Issued second week of the publication month.

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The Phone is Still a Valuable Tool

As we humans become more technology advanced, in some ways we are taking a step back. It seems the art of conversation or people talking to each other is becoming a lost art. You now see kids texting each other even though they are 5 feet away from each other. Also, talking to someone over the phone has become a less and less viable option compared to email when doing business.

I am guilty of emailing someone recently when a phone call would have been so much better. The receiving end of an email can't tell tone on an email and boy did this go wrong. I am quite confident that if I picked up the phone the outcome would have been entirely different. This person does not know me or does not know that most people say I am one of the easiest going people in the industry. Persistent yes, but easy going none the less. I hope I learned my lesson and will pick up the phone next time I need to discuss something.

In a recent conversation with Matt Tierney, sales manager of DMG MORI southern California he expressed similar problems with email or texting. He feels that sometimes people can get accomplished with a 2- minute phone call what it might take an hour or back and forth texting or emailing. I am sure he is correct.

Speaking of DMG we have an excellent article in this issue from J&F Machine in Cypress, CA. and their shop which is full of DMG MORI machines. Owner Rick Varnum has had the shop in the magazine before but has really upgraded the shop since our last visit. Our cover article is on Anaheim Precision in Anaheim, CA. and how they have upgraded their shop with Kitamura 5-Axis machines to do a lot of Aerospace work. This is a big and really nice shop.

Since this is our Aerospace & Defense issue we were provided an excellent story from Boeing about their new Composite Wing Center in Everett, Washington. You will be amazed at how big this facility is. And keeping in the Pacific Northwest we have an article about how a shop in Newberg, Oregon owned by an ex Major League Baseball player

Sincerely

Shawn Arnold

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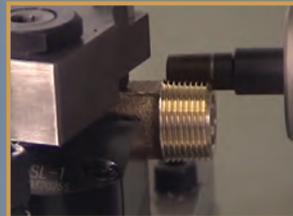
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Tesla To Make Motors and Gearboxes at Gigafactory

Tesla Motors plans to add another 550 jobs at its Nevada "Gigafactory" to produce parts for the electric vehicle maker's forthcoming Model 3 sedan.

Gov. Brian Sandoval announced the new jobs during his annual State of the State address January 17, according to the Reno Gazette-Journal.

The \$5 billion Gigafactory, located east of Sparks, Nev., was announced in 2014 with the help of \$1.3 billion in potential tax incentives from the state.

The facility was designed to build batteries for Tesla's electric vehicles, but Sandoval told lawmakers that Tesla will also make "the electric motors and gearboxes for the Model 3 at the Gigafactory."

General Atomics Wins \$56.7M Contract to Build Unmanned Aircraft for Spain

Spain wants its own unmanned Predator B aircraft and has placed a \$56.7 million order for them through its partner, the U.S. Air Force, the Pentagon announced Jan. 4.

The order to General Atomics Aeronautical Systems Inc. covers MQ-9 exportable Block 5 aircraft and associated equipment. (The same type of aircraft goes by the name Reaper when it flies for the U.S. Air Force.)

Work will be done in Poway, CA. and last through January 2019.

Faraday Future Claims Electric Car Has More Than 64,000 Reservations

Faraday Future said that 64,124 reservations were placed for its FF 91 electric SUV within 36 hours of the vehicle's unveiling at the Consumer Electronics Show in Las Vegas.

The company did not disclose what portion of those reservations included a down payment of \$5,000 and how many were placed for free. The \$5,000 reservation gives prospective buyers priority placement in line as well as chance to buy a special edition of the FF 91, which the company plans to release this spring.

The manufacturer's first production car is 1,050-horsepower, crossover-style luxury vehicle that is estimated to cost more than \$180,000 and is planned to go on sale in 2018.

Faraday Future is looking to use the unveiling of its electric vehicle to rebound from difficulties in 2016, including a cash shortage, which caused it to freeze construction on its \$1 billion Las Vegas factory, and an exodus of senior executives.

SSL To Provide Spacecraft For NASA Asteroid Exploration Mission

Silicon Valley based Space Systems Loral (SSL), a leading provider of innovative satellites and spacecraft systems, announced that it will provide a spacecraft platform for a NASA Discovery Mission to explore the metallic asteroid 16 Psyche. SSL will work for NASA's Jet Propulsion Laboratory (JPL) to support Principal Investigator Dr. Lindy Elkins-Tanton, director of Arizona State University's (ASU) School of Earth and Space Exploration, in a mission to research the 210 km diameter asteroid, which is believed to be the only place in the solar system where a metal planetary core can be studied. As the industrial partner, SSL will provide the "power-propulsion chassis," a highly capable composite structure spacecraft platform equipped with a high-power solar electric propulsion (SEP) system.

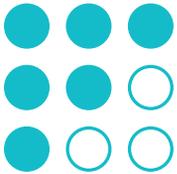
Boeing, GECAS Announce Order for 75 737 MAXs

Boeing and GE Capital Aviation Services the commercial aircraft leasing and financing arm of General Electric announced an order for 75 737 MAX 8 airplanes.

The order, booked in December, is valued at \$8.25 billion at current list prices. The follow-on order increases the GECAS firm order book for the 737 MAX to 170 airplanes, the largest of any aircraft leasing company.

To date, the 737 MAX has accumulated 3,419 orders, making it the fastest-selling airplane in Boeing history.

Continued on page 96....



Introducing a **NEW** dimension to machining complex parts.

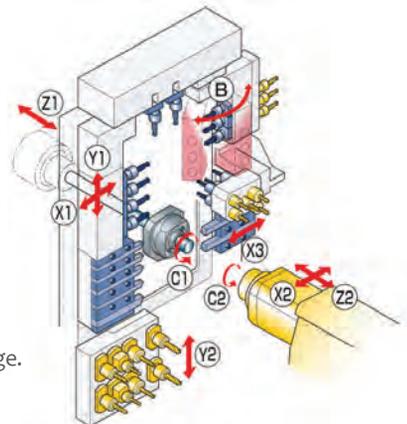
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A Axis												
Rated/max. torque [Nm]:	154/308	400/770	550/1190	710/1340	1120/2000	1610/3130	2730/5080	5000/8000	-	390/700	-	750/1500
Clamping torque [Nm]:	600	1500	2400	4000	5000	7000	7500	12000	-	2000	-	4000
Swivel angle "A" [°]:	± 110	± 110	± 110	± 110	± 110	± 95	± 135	± 115	-	± 180	-	± 190
C Axis												
Rated/max. torque [Nm]:	155/178	430/820	670/1300	780/1530	1000/1950	1950/3700	2400/4700	5000/8000	700/1000	700/1200	1800/3500	1500/3000
Clamping torque [Nm]:	700	1400	2400	4000	5000	7000	7500	15000	4000	4000	5500	6000
Swivel angle [°]:	± 360	± 360	± 360	± 360	± 360	± 360	± 360	± 360	± 180	± 360	± 180	± 360

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						Part Number	Set Price	Part Number	Set Price
Kt B206 HS06	6"	0.472	10MM	0.787	2"	KT-6200F	\$ 30.31	RKT-6200A	\$ 71.87
						KT-6400F	\$ 86.81	RKT-6400A	\$ 108.89
Kt B208 HS08	8"	0.551	12MM	0.984	2"	KT-8200F	\$ 39.68	RKT-8200A	\$ 84.48
						KT-8400F	\$ 67.48	RKT-8400A	\$ 150.00
Kt B210 HS10, N210	10"	0.630	12MM	1.181	2"	KT-10200F	\$ 44.31	RKT-10200A	\$ 124.97
						KT-10400F	\$ 72.75	RKT-10400A	\$ 201.19
Kt B12 HS12	12"	0.709	14MM	1.181	2"	KT-12200F	\$ 63.49	RKT-12200A	\$ 169.18
						KT-12300F	\$ 95.20	RKT-12300A	\$ 255.35
Kt B212 N212	12"	0.827	16MM	1.181	2"	KT-12208F	\$ 63.49	RKT-12208A	\$ 169.18
						KT-12308F	\$ 95.20	RKT-12308A	\$ 255.14

*For Pointed Soft Jaws, replace the "F" at the end of the part number with "P" & add \$3.25 per set.

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- Ideal for castings and scaly material
- Black oxide for long life
- 2 steps (1 step also available)



Chuck Model	Chuck Dia	Part Number	Price Per Set
B-206, HS06	6"	KT-60HJ2	\$328.76
B-208, HS08	8"	KT-80HJ2	\$388.96
B-210, HS10	10"	KT-100HJ2	\$463.06
B-12, HCH12	12"	KT-120HJ2	\$500.09
B-212, HS12	12"	KT-128HJ2	\$500.09

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Chuck Make/Model	Size	Part Number	Price EA
B206, N206	6"	ED-MJSK6LA	\$783.75
B208, N208, HS08	8"	ED-MJSK8LA	\$783.75
B210, N210	10"	ED-MJSK10LA	\$783.75
HS10	10"	ED-MJSK10HA	\$783.75

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1/4	3/4	1/4	2-1/2	YG-EMUGMF68905	\$ 18.12
3/8	7/8	3/8	2-1/2	YG-EMUGMF68907	\$ 29.85
1/2	1	1/2	3	YG-EMUGMF68909	\$ 45.87
5/8	1-1/4	5/8	3-1/2	YG-EMUGMF68911	\$ 92.61
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Small Manufacturers' Institute To Present Manufacturing Challenge and Exposition



Last years Grand Prize Winner, CSU, Northridge Cloudponics- Bongbing Li (left), Hyunjin Kim, Navjeevan Sandhu (center), Rodrigo Soltero, Michael Mora (right)

On Saturday, April 22 there will be a Manufacturing Challenge and Exposition in Santa Fe Springs. It is sponsored by the Small Manufacturers' Institute and hosted by the NTMA Training Centers, Santa Fe Springs, CA

The contest has three divisions:

- 1) Community Colleges, Two Year Technical Schools and public or private schools providing instruction at the associate degree/certificate level.
- 2) Universities, Senior Colleges and public or private schools offering programs at or beyond the baccalaureate level.
- 3) High School division is separate from the Community College and University divisions and has its own contest guidelines document.

The Manufacturing Challenge and Exposition is a creative contest where the students choose their own project and then design, manufacture and document the projects for display and evaluation. These projects may be student club projects, class projects, senior projects or funded projects.

Any type of engineering principle, concept, or process utilizing any kind of material may be applied in designing the product and manufacturing system. Any conventional or automated manufacturing process, including those utilizing computers, programmable controllers, robotics, vi-

sion systems, material handling systems, or any other manufacturing process may be used individually or in any combination.

PRIZES INCLUDE:

- 1) A \$1,000 Grand Prize will be awarded to the overall "best of show" project selected by the contest's judging teams from the contest's two divisions.
- 2) A \$500 cash prize will be awarded for first place, \$300 for second place and \$200 for third place in each of the contest's divisions.
- 3) A \$500 cash prize will be presented to the student winning the prestigious William B. Johnson "Leadership in Manufacturing" award.

TRAVEL FUNDS:

Teams traveling a distance of over 100 miles one way will be eligible for travel/motel funds. This could be as high as \$1,000/team, depending on the distance traveled and the number of team members.

For more information access www.manufacturingchallenge.org found on Yahoo.com for full details of the Manufacturing Challenge and Exposition.



The following photos are of the Grand Prize, University First Place, Community College First Place, High School First Place and the William B. Johnson Manufacturing Leadership in Manufacturing Challenge and Exposition winners:

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ANAHEIM PRECISION MANUFACTURING



Joe Puccio COO of Anaheim Precision Manufacturing

Article & Photos by Sean Buur

VERTICAL INTEGRATION AND 5 AXIS MACHINING MAKE APM A ONE STOP SHOP

Anthony Puccio founded Anaheim Precision Manufacturing 35 years ago as a sheet metal and fabrication shop. Today, they are a fully integrated solutions manufacturer servicing high tech aerospace and commercial customers.

“My dad started the company and I started working here when I was around 7,” half jokingly explains Joe Puccio COO of Anaheim Precision Manufacturing (APM.) “I remember the first time I drove the forklift I was seven. After school or on school holidays I would be in the shop following my dad around just eating up as much as I could. I loved the machines and equipment as a kid, and I still love them now as COO.” Joe ran the machines as soon as he was allowed to. As a young man his passion was machining, and he had a knack for it. Joe went off to college, but returned to APM right after graduation. “I came back from school and went to work in our sales department”, tells Joe. “I moved into operations and worked my way through the system. I even wrote our MRP software because none of the off the shelf systems could handle all the things we do. That “can do” way of thinking is how we’ve grown the business over the years.”

APM is a fully integrated manufacturing company, and they do it all. Their business cards read Anaheim Precision Manufacturing, but they also own Online Graphics and Finishing down the street and D Mills Grinding and Machining in Riverside, CA. In total they have six manufacturing locations with the corporate headquarters located in Orange, Ca. They do final assembly in the main building and have a single CNC used for fill-in work. Their sheet metal, machining and aerospace manufacturing center is just a couple buildings down from HQ and the paint facility is only a few blocks away. “We’ve become vertically integrated over the years,” explains Joe. “Adding more and more capabilities to the company that we at one time outsourced. The more processes we can control, the better an impact we have on our lead time, cost and ability to meet the customer’s demands.” Online Graphics was their first acquisition back in 2001. “We negotiated a deal to buy the company with the stipulation that the owner stayed on so the tribal knowledge wasn’t lost.” They did the same kind of deal with D Mills Grinding. “Tribal knowledge is a valuable commodity in our business due to the specialized nature of what we do. Keeping that knowledge going and taking steps to make sure it is passed



Top - APM has many parts in the rotor and transmission assemblies of Sikorsky helicopters. This housing was a hog out from a titanium block.

Below left - Tanker fueling component that has a few different features welded together before APM does the final anodizing.

Below right - A lot of what APM does is pilot controls. They work with the pilots on a specific need and design for that. Here we have adjustable cyclic control mounts. They pretty much wanted a tilt steering wheel that could fit a large man or a small female pilot. They wanted a quick way to put it in place and fly off the deck. You squeeze the handle, put it where you want and let it go. They are now in their 6th version for different helicopters. The one on the right is an early prototype.



Above left - A helicopter rotor component machined out of titanium.

Above right - The G650 pedestal structure is (center console between pilot and co-pilot) a complex combination of sheet metal assemblies and machined parts all done inhouse at APM.

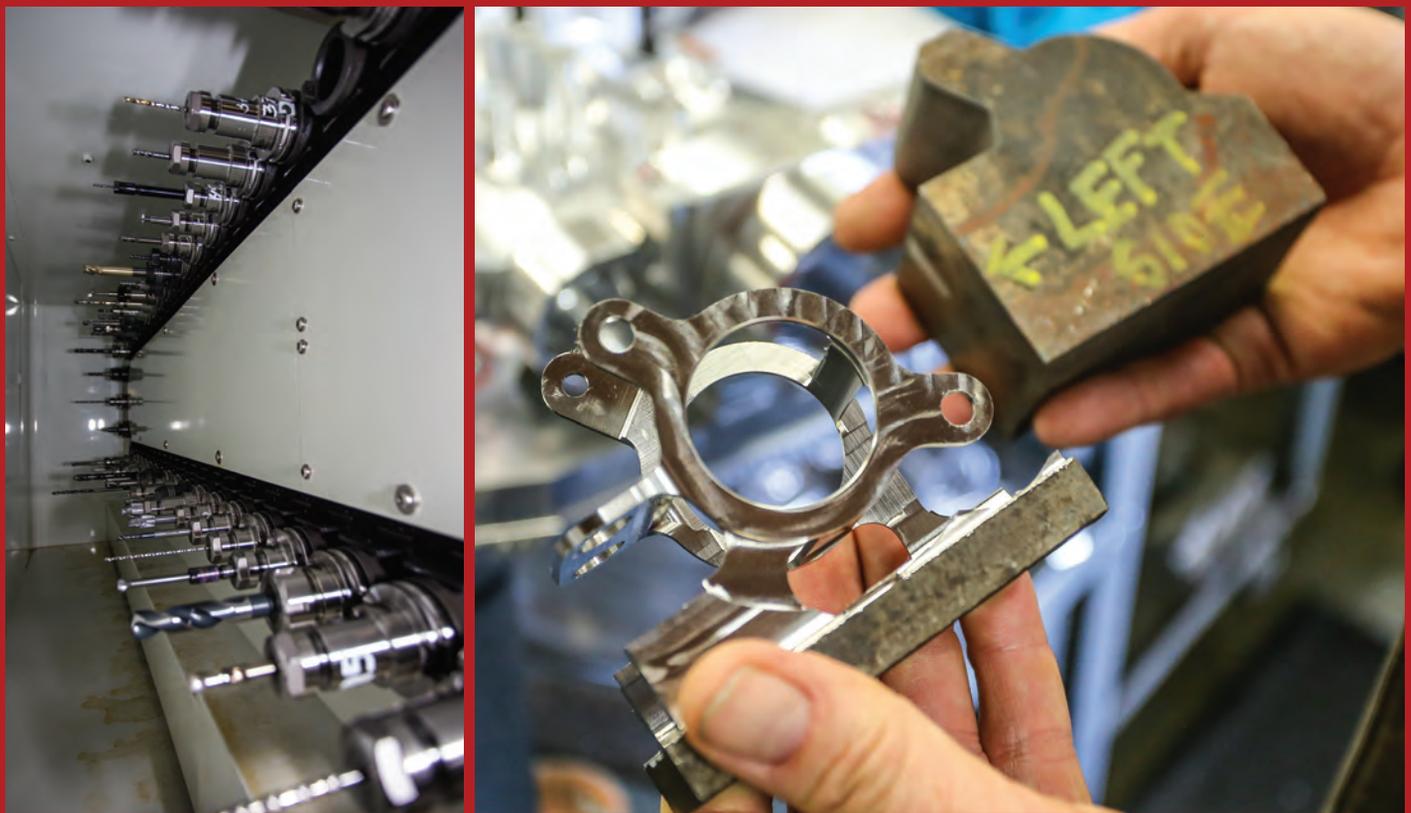


Fidel Solas runs the Kitamura 5 axis machining centers during the day shift. He was one of the original two operators trained on the new machines.

on is something we've worked hard to achieve." All 3 companies have a solid Quality System in place and are AS9100C and ISO 9001:2008 Certified and On Line Graphics is also NADCAP Certified.

"Manufacturing solutions" is the umbrella company Joe has in place to realize his vision for APM. "I see manufacturing solutions as us taking in a job via anything from a napkin sketch, to a full blown design. We take that design all the way through the development, prototype, qual-test documentation and completion and deliver a final product to the customer. Being a one stop shop is what we have been offering for quite some time." A growing portion of APM's business is design, development and manufacturing of their own products based on customer specs, but they also have a strong build to print division. "We do everything from major components for the transmission and rotor systems on Sikorsky helicopters down to small brackets for landing gear, and interior components like seat tables and seat trays." Because of their full service sheet metal fabrication, full service machining, full service turning and grinding, plus full service painting, powder coating, overlays and membranes you will find APM's parts everywhere on the aircraft. Customers range from military and non-military aerospace to non-military aerospace and commercial. "We are proud to partner with such amazing companies as: Sikorsky, Boeing, Raytheon, Parker, Honeywell, Hewlett Packard and AT&T."

APM eased their way into aerospace machining thanks in part to their existing sheet metal customers. "We had sheet metal aerospace jobs like pedestals for the G400 and G450," details Joe. "Really complicated assemblies that required us to outsource machine work. We ended up buying a couple Fadal machines to bring the machine work in house." Today company-wide they have two dozen CNC machining centers split between the six manufacturing facilities and had more than 5000-part change overs last year. "5000 times our machines went from one part to another," explains Joe. "So our focus over the last few years has been on ways to minimize setup times." APM has gone to zero point clamping, added 5 axis machining, and standardized their tool sets, all of these efforts focus on a reduction in setup times. "Setups are an arduous process that take a long time. Some take only an hour while others kill an entire day, but four hours is about average for complex change overs. Besides investing in machines and tooling to help the processes it has been about changing the company wide culture of how we go about attacking a job. We are aiming and succeeding at seeing that number closer to 15 minutes average across all 5000 part change overs." The addition of four 5-axis machining centers has been a big step forward for APM, allowing them to manufacture a part in a single op that was two, three or even four set-ups on a 3-axis machine.



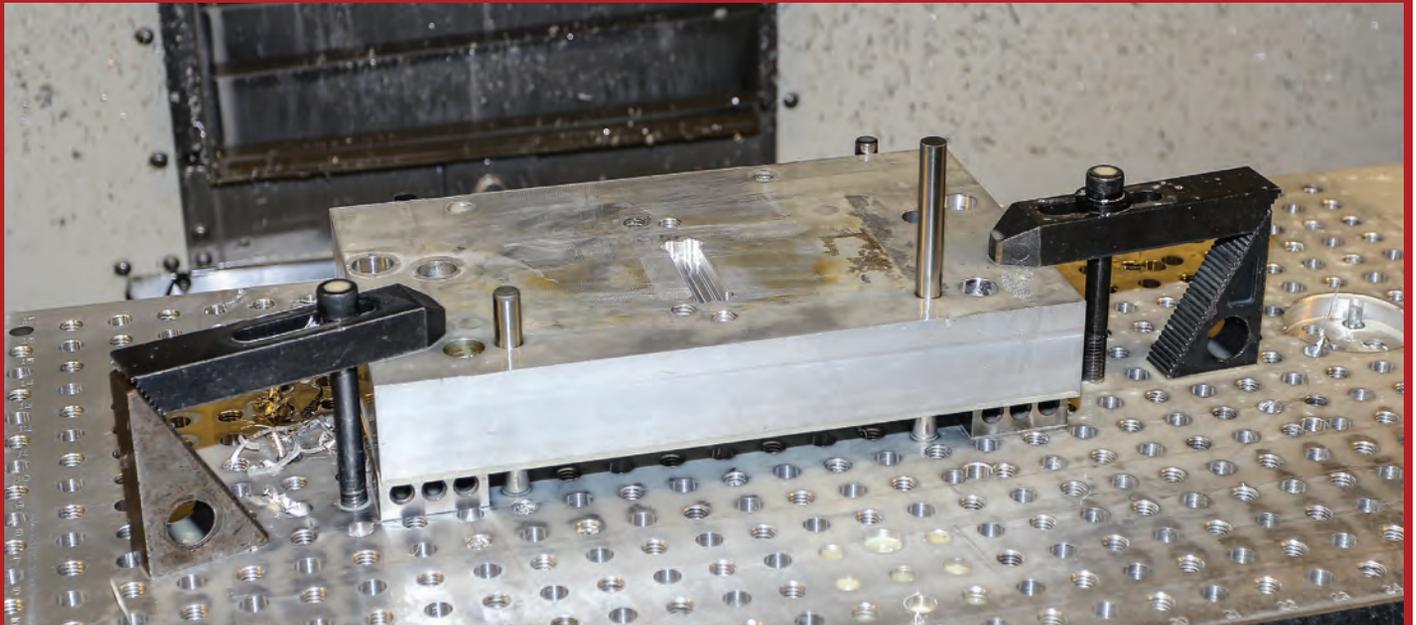
Left - Tooling carousels of 60 and 100 tools were a selling point of the Kitamuras.
Right - The 5 axis machines can take a raw chunk of metal and do in one op what might have taken 2 or 3 ops on a 3 axis machine.

APM is primarily a Haas shop. They have machines big and small including two Haas 5-axis machining centers. They like that tooling is the interchangeable, programming is congruent and the platform is all the same. Recently they purchased two Kitamura Mytrunnion-4G 5-Axis machining centers from Machinery Sales and introduced a completely different element in the mix. "It was not an easy decision to add machines that differed from what we knew," explains Joe. "We needed different capabilities for jobs we already had and for future growth. The Haas machines are nice machines, but with some of our more critical items we needed something more robust. It is no reflection on them. We will continue to buy their machines and run the hell out of them, but we are making a part right now on the Kitamura that has 400 features with tolerances within 5 tenths across all the features. It has to be perfect and it has to be fast. Everything is getting tighter with regards to delivery and tolerance levels. Higher quality requirements and customer expectations are impacting us. We are working a lot with exotic hard materials such as titanium and the Kitamuras I feel offer a better platform to match that demand. For me, the Kitamuras represent the next level of manufacturing for APM."

Machinery Sales had two new Kitamura Mytrunnion-4G 5-Axis machining centers available and APM needed such capabilities for a job they already had won. "Peter Clayfield presented us with 2 fantastic machines with an attractive deal and we jumped on it," tells Joe. They ordered both machining centers at the same time but staggered delivery to give them a little time to learn the new systems. The programming is different, the code is different, the post is different and the trunnion tables are opposite to what they we are used to. APM dedicat-

ed two guys to the initial training, one from day shift and one from night shift. Later those two would cross train the remaining staff as needed. "Kitamura has been great with the training," praises Joe. "They are vested in the success of the machine and that is very important to us." Joe learned a long time ago the value of service and support and both Machinery Sales and Kitamura have exceeded his expectations so far. "Support has been incredible. We crashed the machines when we first got them and they were quick to help find a solution and get us back up and running. I think the parts we are manufacturing even impresses the Kitamura guys with the number of features and the precision we achieve."

The pair of Mytrunnion-4G 5-Axis machining centers came to APM as brand new works of art. The second machine has been up and running for the last six months and given Joe and his team plenty of time to appreciate some of the advanced options and nuances. The Kitamura machining centers are identical with the exception of tooling capacity. One machine came with a 60-tool carousel and the second boasts a 100-tool capacity. "The first two jobs we put on the Kitamuras used every tool available," details Joe. "Prior to the Kitamuras our largest tool capacity was 42 tools. Having 100 tools is a big deal and allows for a lot of added flexibility. On our 42 tool machines we would stage tools and load new ones in as needed, adding unnecessary interaction with the operator." Each Kitamura has 40mm high speed 15,000 RPM spindles and impressive computing power. "With more and faster memory these machines just eat up the code and never miss a beat," explains Joe. "All our posts have high speed machine capabilities and now we are able to capitalize on it. The finish right off the machine is flawless and the



Top left - Anaheim Precision started out as a sheet metal and fabrication shop. They still do extensive sheet metal work as part of their one stop shop customer service plan.

Top right - APM has machines ranging from simple to complex 5 axis machining centers.

Bottom - APM process improvements include zero point clamping systems and fully customizable mounting solutions.

repeatability is mind blowing. I'm really impressed." APM's day shift operator Fidel Solas also adds how he likes having a large work envelope with easy door access and 24 inches of travel in X and Y and nearly 20" in Z.

With turn-key manufacturing solutions for their customers, Joe is convinced that Anaheim Precision Manufacturing is in a position to double their sales in 2017. "We have a nice combination of machines, employees and a great base of LTA work," details Joe. "With 118 people on staff spread between the different locations it is a manageable number. One quarter of our current business is sustainable programs and that number is growing.

We have our designs, and our products on programs that are ramping up production. APM products are on everything from the new presidential helicopter to the 787. These demands will continue to grow as will the LTA programs for the A350, 777 and 737." Joe's goal is to have every spindle turning 24/7 and they are well on their way to making that happen. "Quality and customer service have always driven our success," concludes Joe. "My dad instilled that in me early on and every day APM works with that in mind."

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J & F MACHINE



Article & Photos by Sean Buur

Left to right – Rick Varnum, VP –Operations; Erasmo Estrada, Lead Mill; Swahili Idol; Micheline Varnum, President

TAKING CONTINUAL IMPROVEMENT TO HEART

Rick Varnum is in his 40th year at J& F Machine and like his father before him he is a machinist above all else. He started cleaning the floors as the shop's "hey boy," ran all the machines through high school, and in what seems like the blink of an eye became chief of the tribe. The J & F tribe is 24 strong with two shifts of metal working warriors spread between 11 CNC milling and turning centers in 11,000sq.ft.

"My father Francis started this business back in 1976," tells Rick Varnum, Vice-President and Operations chief of J & F Machine. "When we started out we were different, both in the parts we made and how we made them." J & F began as a combination shop, making tooling and small production runs.

They specialized in high precision one and two off commercial projects. "We used to do a lot for the local canning and bottling industry," continues Rick. "We would make components for these giant machines that looked and ran like Swiss watches. They ran very fast and were very precise. They were on par with the precision needed now in our aerospace work, but without the necessary paper trail." Tribal knowledge was a big part of how they did business in the early days. They would run a job and use what they learned on the next project. There were no production meetings, Rick was the chief and the tribe came to him for answers.

J & F's quality policy is to never stop improving, be it through new machines like the new DMG MORI machines he

Rick's love of Japanese machines carries over to his turning department. J & F purchased a second Mori Seiki SL403 turning center. It is a rigid, robust and accurate (Japanese built) machine. Its large turret can accommodate up to 2 ½" ID tools and has a two speed transmission. It has a small footprint for a big lathe.

has, advanced software, employee training or changing the company's overall philosophy. Six years ago J & F was making great parts, but they saw a need to shift from being a personality driven business to a process driven one. "Small events led us to a point in our lives that we needed to make a change," explains Rick. "We were always AS compliant, but industry pressure forced our hand to actually get certified. We went to a job fair and the first question everyone asked was are you AS9100 certified. We were compliant, but we see now that it isn't the same thing. We do great work, complex parts, but not having that certification took us out of play." Like many companies, Rick thought the certification was going to be more of a problem than a solution, but now a few years down the road they are seeing the payoff.

Rick is a machinist first and a businessman second, but fortunately his wife Micheline has a background in finance with Fortune 500 companies. "When Micheline re-joined the company she joined in a big way," describes Rick. "She is largely responsible for the growth and direction we are headed as a company." Micheline started out as the "girl Friday" driving for the company when she was in high school before going away to college. Rick claims she came back because she couldn't get him out of her mind, but the fact is he is fortunate to have her as a driving force at J & F. "I like things to be planned and organized," tells Micheline. "Part of our program is contingency and succession oriented. You need the confidence that things will progress and be done right in your absence." Customers wanted to see that J & F were all set to cover them with a contingency plan. "GE can't stop making jet engines because someone way down the supply chain died and the shop can't function without them," details Rick. "We have processes in place now to keep that from being an issue and it is business as usual if I am here or not." Rick jokes that if someone would have told him getting AS certified would have got him more vacation time he would have done it long before they did.

Once they started taking continual improvement to heart things started to fall in





The NH5000 with six pallets was a big investment for J & F. They have a personal relationship with each part and don't often run lights out, but the pallets allow them to have multiple jobs and multiple setups ready to go. It has a 200 capacity tool changer and like all of the machines is made in Japan. Rick likes that it is robust and no issues with the heat treated Inconel castings they machine on a regular basis.



place. “The hardest thing for us was finding a starting point,” describes Rick. “I look to resources like CNC West to see what other shops are doing. I really appreciate the people willing to share in the articles.” “We decided to change the culture from the top down, but we needed some help and needed ideas,” adds Micheline. “So I qualified for the Goldman Sachs 10,000 Small Businesses program and we contracted with CMTC (California Manufacturing Technology Consulting), a non-profit to help us with training.” CMTC organized trainings ranging from leadership and management to 5S and AS9100 reviews. What many companies do not know is that there is state and local funds available to subsidize the majority of the consulting and training cost. Rick and Micheline found working with CMTC to be a great experience and an under used resource. “It took a while for me to get used to the idea that the guys were sitting in a training and not out running the machines,” confesses Rick. “We included everyone in the programs right down to the person sweeping the floors. Everyone felt part of something bigger and appreciated that we as a company were investing time and money into them.” Having an outside company come in with an expert in each field made a huge difference on how the information was received. “It was no longer the boss telling them what to do, but an expert suggesting change,” continued Rick. “We were able to grow and learn as a unified group.”

Part of J & F's continual improvement plan is having the shop filled with high quality machining centers. For a long time Rick has been a fan of Japanese built machines. The shop is strewn with Japanese milling and turning centers. “Most of our machines are DMG MORI or Kitamura Japanese built machines, and I am tremendously happy with them” tells Rick. Rick has purchased 6 new machines in the last five years including a NH5000 horizontal with 6 pallets, two DMG MORI

NVX5100 vertical machining centers and a DMG MORI SL403 lathe. “DMG MORI hires smart and qualified people to represent their brand,” tells Rick. “They went direct last year and Matt Tierney who is the southern California sales manager is our salesman and does a great job for us. When customers visit and see a shop full of nice equipment like we have they know we mean business and can deliver what we promised.”

A good portion of J & F's aerospace work consists of ultra complex parts manufactured out of heat-treated Inconel castings. “Inconel is a super alloy used in jet engines and high temp applications,” explains Rick. “It isn't the easiest to machine and wreaks havoc on tooling because of its hardness. DMG MORI delivers a robust platform and they have no problems holding the tight tolerances we need.” Rick has machines on the floor that are 6 or 7 years old that still hold “like new” tolerances. The latest machines to come on line are a pair of DMG MORI NVX5100 vertical machining centers and Rick has been impressed by their output. “The Direct drive rotary table on our two NVX5100s provides high speed and high precision in a compact machine without giving up rigidity,” details Rick. “The newest controls are pretty awesome too. Besides doing all the standard control features they are touch screen and you can pull up all the planning, blueprints, and images related to the job you are running.” Operators take photos of the setups and call them up when they need it. Rick is a proponent of switching his guys around to keep them sharp and the photo system is a real value to maintain setup efficiency and still give the operators the opportunity to run new parts and different machines. “I'd be remiss in my duties as a shop owner if I didn't mention the service, or lack of service really I get with my Japanese machines. They very rarely break down. We lose maybe one day every two years and that is it. You may pay more for a quality



Alejandro Marez is the shop's latest hire. He comes from the NTMA training program and the J & F team are very pleased with his abilities and how quickly he fit in the shop atmosphere. He is running one of their two new DMG Mori NVX5100 vertical machining centers with a direct drive rotary table and touch screen control center.



Top – Neil Schneiderhan is head of Engineering and Programming. He utilizes Surfcam, Solidworks, and ESPRIT for CNC programming and design.

Below - Even the tool room has been given an upgrade. Operators log their tools with the job number right from the shop floor. Multiple workstations are located in the shop area to give easy access to those who need it.



Top – John McDaniel, QC Inspector uses the CMM to inspect a part for the US Navy. J & F is AS9100 certified and take quality to heart.

Below - Part of the continual improvement was to upgrade shop management software and policies. The monitor on the shop floor is updated multiple times a day to keep employees in the loop on the status of each job running and upcoming jobs to be run.



made machine like a DMG MORI, but you get it back in precision and reliability and I feel the ROI comes quickly.”

Over the years, J&F have shown a real commitment to their employees and it shows. More than half the workforce has been with the company for more than five years. “A quarter of our staff has been with J & F for 20 plus years,” tells Micheline. “All of our machinists are true machinists, not just button pushers. We appreciate their suggestions and ability to trouble shoot. We make sure to get them as much training as we can and try and do a good job in the hiring process.” J & F was having an issue with under qualified applicants showing up for job openings before turning to NTMA for a solution. “We’ve been an NTMA member for 25 years and our last hire Alejandro is a star employee. The NTMA gives them the base level to start the job and if they have the ability and aptitude they really shine.”

Rick jokes that the crack of the whip over the downcast shoulder used to be the motivation tool needed in this industry but admits that times have changed and they get better re-

sponse out of positive reinforcement and continued education. J & F have quarterly 5S award lunches and recognize employee achievements, but one of the more unique items of business is their “Swahili idol.” The idol is given as bragging rights to the employee who has gone above and beyond. It stems from the joke they have in the shop when there is a breakdown in communication that Rick must have been speaking Swahili. The recipient gets the idol at his workstation; there is a gift and a short presentation ceremony. “The idol gives individual recognition in the tribe,” concludes Rick. “We sit with the idol around the campfire, eat raw meat and discuss how we are going to run the next job. There is a lot of pride in manufacturing here. We have parts with millions of miles on them because they have been around the earth hundreds of times. I like that, our employees like that and our customers like that.”

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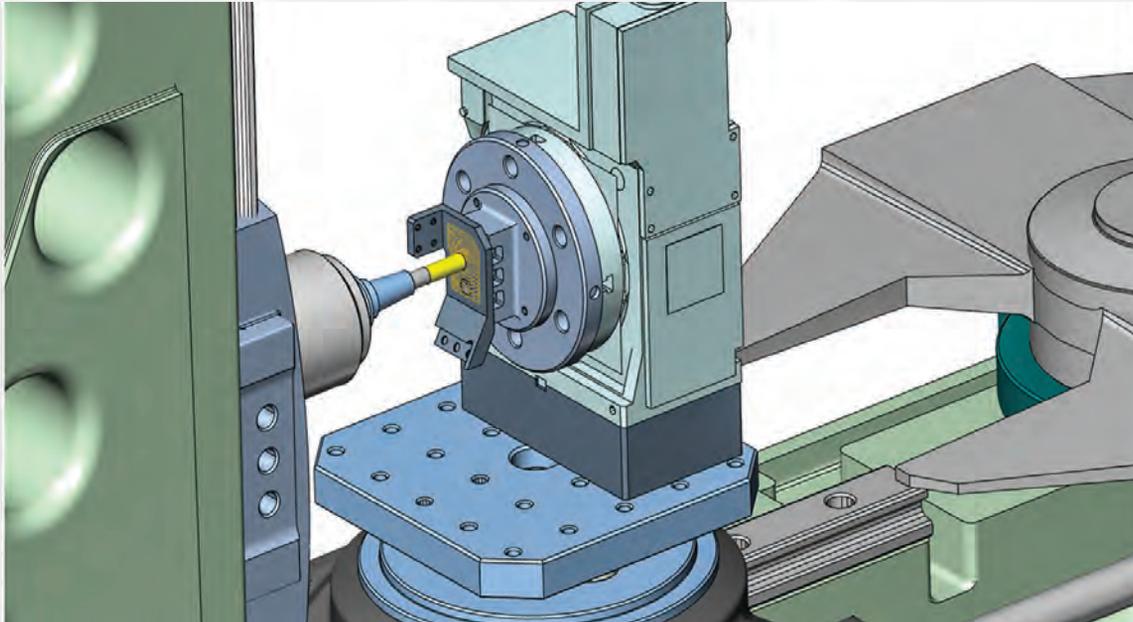


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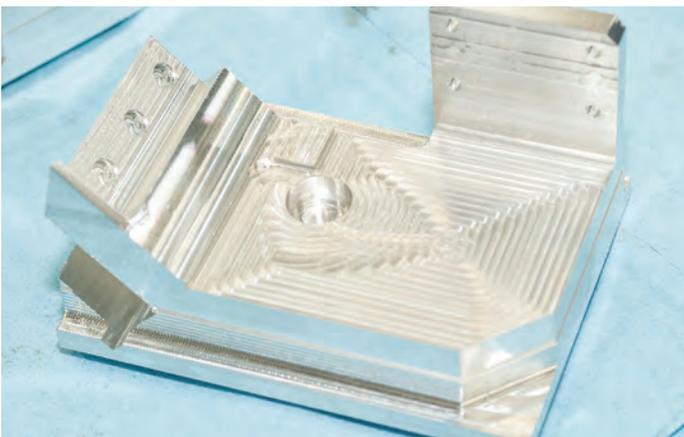
Supplied by Lynn Gorman Communications LLC

Bob Wolcott is familiar with competition. A member of the 1995 “Refuse to Lose” Seattle Mariners baseball team, the retired major league pitcher (he also pitched for the Arizona Diamondbacks and the Boston Red Sox) went on to study mechanical engineering at Oregon State after a shoulder injury forced him to hang up his glove for good. He then started his own design, analysis, and fabrication company and set out to find customers who needed high-precision parts in low-volume quantities. Wolcott Design Services (Newberg, OR) has made it a practice to continually analyze their work processes in order to ensure they are fulfilling the customer’s needs while still remaining profitable. When it looked like they were weaker in the profitability de-

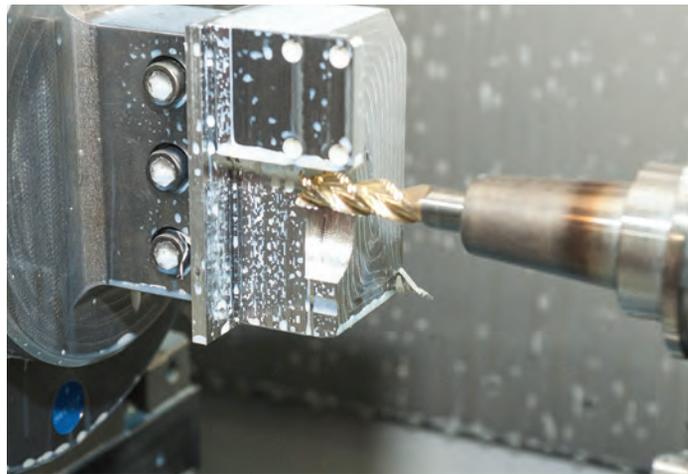
partment, Bob and his team decided to try to push their three Makino horizontal milling machines as hard as they could, to see if they could improve productivity—and profits. Here is how they did it.

MAKING THE PROGRAM HIS OWN

Wolcott Design Services is a four-man shop that specializes in design and manufacturing of prototypes, molds, and other high-precision parts such as orthopedic tools for the medical industry, as well as racing components. The molds range in size from about the size of a shoebox to the size of a thumbnail. Job sizes range from 10 to 1000 on average. After one particular small-run project involving a part machined



The ability to use the tool’s entire flute length makes the wear more consistent and increases the useful life of the tool. Wolcott has used Dynamic toolpaths to reduce production cycle times up to 70% by eliminating load spikes which typically limit a tool’s metal removal rate for a given machining operation.



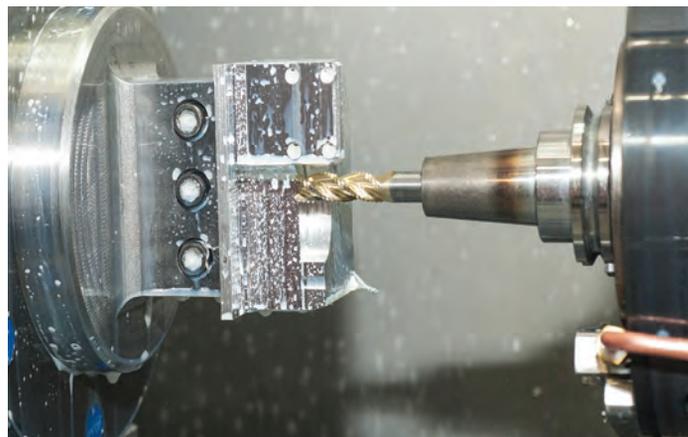
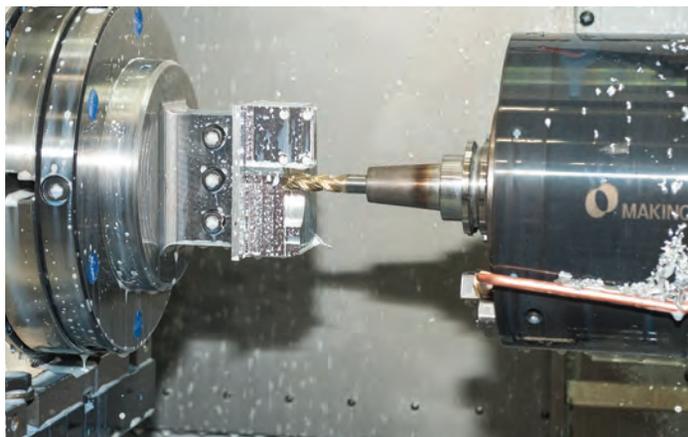
Wolcott customizes the programs to achieve the speeds and feeds he desired which often involved pushing the machines as far as they could go. He described the speeds as “staggering”.

from heat-treated steel, Wolcott realized that he broke numerous tools while trying to run the machines faster to save time, causing him to not only lose time, but also money. “There were parts where you’d remove 90 percent of the material with a big end mill and the last 10 percent would have to be done with a tiny end mill,” said Wolcott of the more intricate designs. The routine post-production analysis led Wolcott to explore the toolpath functions of his CAM software, Mastercam® by CNC Software, Inc. in an effort to speed up the process without breaking tools.

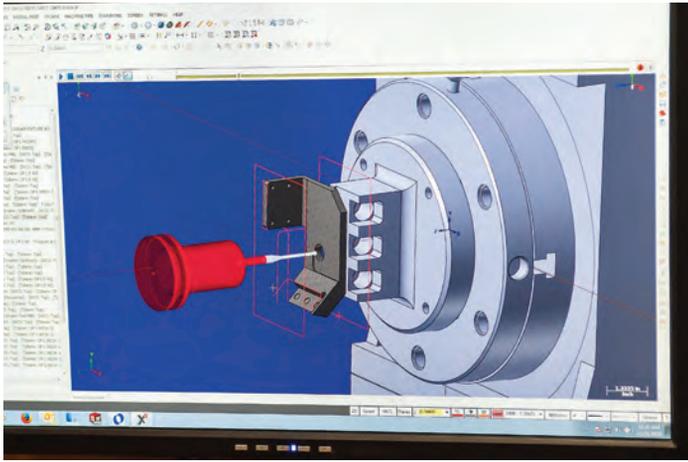
Wolcott realized that he could program custom toolpaths using Dynamic Motion strategies that machined the parts wicked fast, removing materials at high rates of speed using the entire length of the tool, minimizing air cutting, and allowing intricate designs to be cut. “With the toolpaths, you can do all of the removal work with the big tool and then create a stock model that’s driven off that, then use that stock model to drive the next tool at 100 percent efficiency instead of machining a lot of air,” said Wolcott. He was able to machine waterlines, scallops, and other specific geometries using one toolpath because the proprietary intelligent algorithms in the software were able to detect material conditions, adjusting the tool position so that it remained in constant contact with the material. As for the machining speed, Wolcott adjusted the programs to achieve the speeds he desired, which often involved pushing the machines

as fast as they could go. “I was able to configure the software and integrate it to the machine at such a high level. We can go into the machine definitions and tweak the parameters so that the software is outputting the code exactly how the machine likes it,” said Wolcott. He utilized Mastercam features such as miscellaneous integers as switches to control processes at the program level on an operation by operation basis. Examples of this are tool break detection routines and whether the machine is set to roughing, standard, or finishing mode. He also utilized custom drill cycles to allow programming specific probing routines designed for 5-axis operations. These allow for probing and setting dynamic fixture offsets or tool center point control Fanuc parameters on the fly. “The degree of custom configurability seems endless,” said Wolcott.

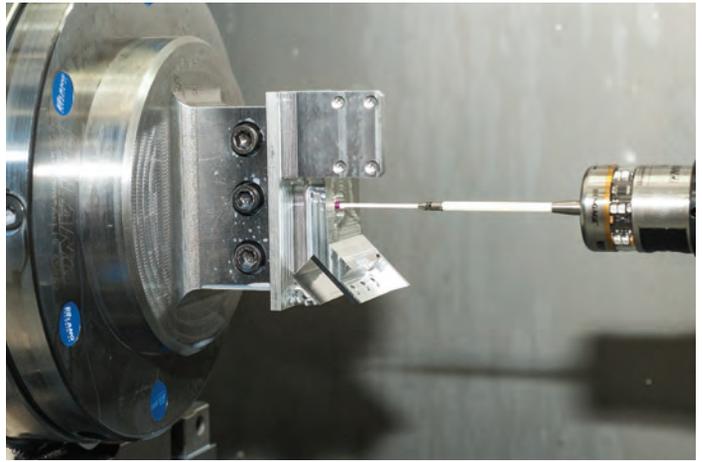
Wolcott also took the time and effort to customize his Tool Library accurately so that each tool has one specific tool number which consists of the tool, tool holder, and stick up combination regardless of which machine it is running on. Additionally, Wolcott streamlined the mold programming process using stock models. This allows for importing the new CAD file and simply reselecting new geometry for a few operations which takes around 90 seconds for the roughing toolpaths. Once toolpath regeneration is complete, the roughing, rest roughing, and second rest roughing are done and the mold is ready for finishing toolpaths.



Wolcott has been able to integrate his routines into the CAM platform and customize it in such a way that he can push his machines to their full potential.



The NH5000 with six pallets was a big investment for J & F. They have a personal relationship with each part and don't often run lights out, but the pallets allow them to have multiple jobs and multiple setups ready to go. It has a 200 capacity tool changer and like a



FASTER MATERIAL REMOVAL WITH GREATER ACCURACY

The Dynamic high speed toolpaths have allowed Wolcott to reduce the cycle time on certain production parts from 80 minutes to 24 minutes by running the cutting tools at a constant load. “The speed at which we could run without breaking tools was just staggering. I had no idea it would be so fast,” he said. He expected the tools to break much sooner in the cycle, considering how fast they were running with steel at Rockwell 50C. “With aluminum, we are limited by how fast the machines can physically move, and sometimes I’m afraid they are going to shake themselves apart.” Makino’s tool life monitoring function allows the machine to move on to the next tool when the original becomes worn down, allowing for very stable processes.

The Dynamic toolpaths’ ability to efficiently remove material allows more flexibility when machining intricate geometries. Using one large piece of steel is often easier than breaking it up and machining multiple pieces that bolt together. “I’d rather make one part and hog out the material than making multiple parts and bolting them together,” said Wolcott. “When we are designing and making molds, the projected cycle time impacts how we go about designing the tool. We’ll produce a mold with fewer parts and better overall accuracy as a result because we’re not worried about material removal and how long it’s going to take.” The ultimate goal, according to Wolcott, is to have accuracy limited by the machine, not the production process itself.

INTEGRATED PROBING SOLUTIONS

Custom probing routines that were written by Wolcott himself are integrated by modifying the post processor and custom drill parameters. Their efficiency is evident when heat-related problems arise due to machining parts with tight tolerances or in multi-axis operations. Custom probing routines were developed to find the location of the machine’s rotating axes and adjust the parameters to compensate for the shifts. They are further customized per job. Other routines probe a tooling ball, perform the roughing, re-probe the same tooling ball, reset the parameters, perform semi-finishing, and then re-probe the tooling ball again, reset the parameters, and perform the final finishing. It’s all part of Wolcott’s custom features written into custom drill cycles and posted by the post processor. “They are

huge time savers,” he said. “They just make it a lot more efficient and it’s all integrated into the program so once it’s done and set, you don’t have to worry about how many edits you make after you post the program. It’s all as seamless and bulletproof as a tapping drill cycle.”

INTEGRATING ROUTINE FOR COMPETITIVE RESULTS

Like watching films of the last game, Wolcott studies every program when a new order comes in to evaluate how newer technologies might help speed up the manufacturing process. By taking full control of his manufacturing processes, from bidding to delivery of the final product, Wolcott has been able to integrate his routine into the CAM platform and customize it in such a way that he can push his machines to their fullest potential, tightening the level of integration between the software and the machine. His willingness to explore the full capabilities of his capital investments has resulted in time and material savings, which he has passed on to his customers with more competitive pricing and faster delivery.



Bob Wolcott specializes in manufacturing small molds with complex geometries. The molds range in size from about the size of a shoebox to the size of a thumbnail. Here he measures a bracket that is about the same size as one of those molds.

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Equipment Leasing and Finance Association Announces Top 10 Equipment Acquisition Trends for 2017

The Equipment Leasing and Finance Association (ELFA) which represents the \$1 trillion equipment finance sector, in early January revealed its Top 10 Equipment Acquisition Trends for 2017. Given U.S. businesses, nonprofits and government agencies will spend over \$1.5 trillion in capital goods or fixed business investment (including software) this year, financing a majority of those assets, these trends impact a significant portion of the U.S. economy. Businesses will find positive momentum for equipment investment as the changing economic and regulatory environment contributes to improved business conditions.

ELFA President and CEO Ralph Petta said, “Equipment acquisition continues to drive the supply chains across all U.S. manufacturing and service sectors. Equipment leasing and financing provide the source of funding for a majority of U.S. businesses to acquire the productive assets they need to operate and grow. We are pleased to provide the Top 10 equipment acquisition trends each year.”

ELFA distilled recent research data, including the Equipment Leasing & Finance Foundation’s 2017 Equipment Leasing & Finance U.S. Economic Outlook, industry participants’ expertise, and member input from ELFA meetings and conferences in compiling the trends.

ELFA forecasts the following Top 10 Equipment Acquisition Trends for 2017:

1. Look for capital spending to pick up in 2017 after the previous year’s negative equipment and software investment growth. After overall negative growth in 2016, equipment and software investment is on track to improve in 2017. Renewed enthusiasm by business owners to make capital investments will be driven by solid employment rates, rising incomes and higher business confidence.

2. Expect growth of financed equipment acquisitions to outpace growth in total equipment investment. Growth in equipment and software investment this year will be exceeded by growth in equipment financing as the propensity to finance has increased. A reduced rate of cash outlays, a greater percentage of firms financing—nearly 8 in 10 businesses—and an increase in the rate of lease financing, along with market data indicating that the equipment leasing and finance industry is emerging from a period of slow growth, all point to higher investment in 2017.

3. More business-friendly federal policy will bolster business investment and economic growth. Businesses will be further induced to make capital investments with promised action from the new Trump Administration and Congress for infrastructure spending, tax relief and reduced regulatory burdens and other constraints. These fiscal and regulatory policies will contribute to moderately strong growth for the U.S. economy, and somewhat higher growth for equipment and software investment in 2017. However, a tempering influence to this growth scenario is the potential curtailing or elimination of interest deductibility as part of congressional efforts to reform the tax code.

4. Changes in trade policy will risk headwinds for

equipment exports. Businesses will also be following developments from the Trump Administration for a less-friendly trade environment. The potential for exiting the Trans-Pacific Partnership (TPP), renegotiating or withdrawing from the North American Free Trade Agreement (NAFTA), and striking a sterner stance with China could spur retaliation from trading partners.

5. The oil industry drag on the U.S. economy will cease. The oil price freefall that sent oilfield and mining investment plunging has steadied.

6. Many key equipment verticals will benefit from positive momentum. Changes in market and economic conditions will be good news for a number of previously underperforming equipment verticals this year. Stabilizing oil prices will positively impact oilfield, mining, railroad, materials handling and industrial equipment. Look for increased construction equipment investment.

7. Businesses will need to keep abreast of interest rate increases. A non-issue since the Great Recession, expect additional rate increases this year after the December 2016 hike. Businesses will need to assess and plan for financing options accordingly as the Fed acts to keep inflation in check.

8. Innovations in the equipment finance industry will increase flexibility and convenience for customers. End-users seeking value-added benefits for ease of access and process improvements will find them when financing equipment this year. The availability of “fintech” as an alternative method of financing, managed solution transactions to realize the benefits of aligning costs with business demands and avoid obligations of ownership, and e-chattel for efficient paperless transactions are just a few of the growing trends to watch.

9. Lease accounting changes won’t deter financed equipment acquisitions. Changes approved by the Financial Accounting Standards Board (FASB) in 2016 to bring leases on-balance sheet weren’t as burdensome as many had anticipated, and the primary reasons to lease remain intact under the new rules.

10. Businesses will watch for potential “wild cards” when considering equipment acquisition decisions. Despite many favorable factors for equipment spending this year, U.S. businesses will be keeping an eye on developments on numerous fronts. The impacts of geopolitical shifts such as the U.K.’s Brexit move and the prominence of the National Front in France and other groups that are contrary to the existing liberal, free-market international order could be disruptive financially, politically and even militarily. Also, the new Administration’s promised infrastructure spending will depend on the size, design and level of political support of budget-conscious Republicans to pass. Finally, unknown and long-term economic implications of terrorism to loom.

The Equipment Leasing and Finance Association (ELFA) is the trade association that represents companies in the \$1 trillion equipment finance sector, which includes financial services companies and manufacturers engaged in financing capital goods.



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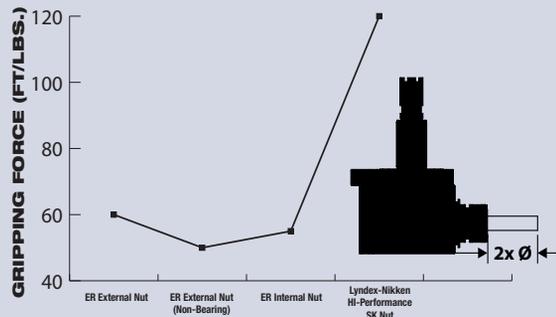
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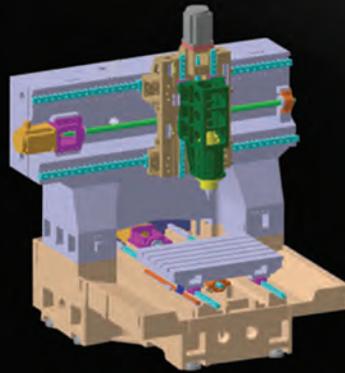
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Photo: Two contract employees survey the massive new autoclave at the Composite Wing Center in Everett, Wash., prior to the building's grand opening. BOB FERGUSON | BOEING

**“Originally published in Boeing
Frontiers magazine”**



Composite wings of 777X will be baked in one of world's biggest autoclaves

By Dan Raley

Photos by Bob Ferguson

The new Composite Wing Center in Everett, Wash., is so vast it could accommodate multiple jetliner production lines, similar to what takes place next door in Boeing's main widebody factory. Yet this sprawling facility will put all of its energy into fabricating carbon-fiber wings for the coming 777X.

At 1.3 million square feet (120,800 square meters), the enormity of it—with the longest unsupported ceiling beams found anywhere and one of the world's largest autoclaves, per Boeing—left an indelible impression on employees at its spring grand opening. Among them was Mohssen Mohaghegh, who has spent much of his three-decade Boeing career assessing wing strength and durability.

As he sat under the 27-acre (11-hectare) roof, surveying the 1.1-million-pound (500,000-kilogram) autoclave before him, the stress engineer from nearby Mukilteo came to the following conclusion.

"I look at this building, and these surroundings," Mohaghegh said, "and I see the factory of the future."

That will entail creating and curing eight separate wing parts for the 777X, which will have a wingspan of 235 feet (71 meters), the longest of any commercial or military airplane produced by Boeing.

Fitting these pieces into the Composite Wing Center's dark blue, cylindrical autoclave won't be a problem—it can hold more than 200,000 midsized pizzas stacked atop one another, or 21 pickup trucks, according to Boeing calculations.

"The recipe, for what you have to bake it at and for how long, is a family secret," Tiffany Lundberg, Composite Wing Center building integration manager, said playfully.

Actually it's no secret that the operating temperature in the autoclave will be about 350 degrees Fahrenheit (175 Celsius), topping out at 450 F (230 C), per Boeing.

The autoclave is one of about two dozen of various sizes managed by Boeing Fabrication and Boeing Defense, Space & Security in Missouri, South Carolina, Utah and Washing-



Photo: A spar-lamination machine will be used to make 777X wings out of carbon-fiber material in Everett. BOB FERGUSON | BOEING

Photo: The machine will lay carbon fiber on a form, which will then be baked inside an autoclave, creating parts for a 777X wing at the Composite Wing Center. BOB FERGUSON

ton in the U.S.; multiple sites in Australia; and Manitoba, Canada. They essentially are industrial ovens that use high pressure and heat to bake composite materials into hardened airplane parts.

"It's like baking a cake," said Kenneth Buchanan, experimental test mechanic.

The Composite Wing Center autoclave fills up 91,000 cubic feet (2,575 cubic meters) of space, but it's not Boeing's biggest. By volume, the largest autoclave is the newest one at Boeing's North Charleston, S.C., factory, which fills 97,500 cubic feet (2,760 cubic meters) and went into operation last month to support rate increases on the 787 Dreamliner program and to manufacture the longer aft-body fuselage section of the 787-10.

The Everett and North Charleston autoclaves have different interior configurations because of the shapes and sizes of the parts that will be heated and cooled inside each of them. Everett cures a wing panel, spars and stringers; North Charleston a fuselage. The Composite Wing Center autoclave requires a higher floor, enabling the use of heating and cooling coils beneath it; North Charleston places its coils at the rear of the autoclave, notably lowering its interior working space.

At some point, the Composite Wing Center will have three autoclaves side by side, churning out composite wings, as production of the 777X increases.

"This is just the start of what's to come," Mohaghegh noted.

The Composite Wing Center, big enough to hold 25 football fields, is divided in two—the autoclave area on one side and spar-lamination machines on the other, with four levels of office space supplying a buffer. One area supports the other.

Spar-lamination machines roll back and forth on parallel sections of track in a "clean room," or a debris- and dust-free work area. Tugs repeatedly sweep the floor as construction continues inside the wing center. Two spar lamination and two skin lamination machines have been installed, as well as a stringer machine. At each machine, technicians lay down carbon-fiber material on a metal form. The machine stops and starts, moving vertically over the form below it.

Attached to the lower half of the machine, a robotic capsule equipped with a camera slides horizontally, inspecting the work during the ongoing testing. An entire composite wing, composed of upper and lower wing skins with stringers and front and rear spars, can be built in a day, according to Boeing technicians.

"The machine is very cool; it moves like we never imagined," said Arica Epps, a spar technician. "It's like going from a toy truck to the real thing."

Parts will be transferred from the spar-lamination machine to the autoclave by automated guided vehicles. Three are needed to transport a spar, which is the main structural piece of the wing.

The Everett autoclave is lined on the inside with stainless steel panels and temperature probes. It has a huge

blue end cap that slides into place on rollers using overhead tracks. It is heated with natural gas burners, cooled with water and pressurized with nitrogen.

Unlike other Boeing autoclaves, this one has just a front entry, with parts moving in and out rather than through it. Large blower fans block off the rear section.

At Boeing Fabrication Advanced Developmental Composites in Tukwila, Wash., Tiffany Ferguson is a composite layout team leader for a group that creates 777X wing prototypes, models for the wings that will be reproduced at the new facility. She welcomed a chance to catch a glimpse of the Composite Wing Center to size up the entire process.

"It's nice to see where the handoff is and where the parts are going to go," Ferguson said. "It's going to be cool to see how this takes off and be part of it."

Carl Withers moved from Advanced Developmental Composites to become a Composite Wing Center operations manager. He said his team feels empowered by the building and the idea of working on something new. The autoclave alone proved eye-opening.

"Just the size is unbelievable," he said.

Aluminum wings for current 777 models are built in Everett's main factory. Composite wings for the 787 Dreamliner are put together in Japan and shipped to Everett and North Charleston for assembly-line installation. The Composite Wing Center will streamline the process and lower costs, according to Boeing.

Employees say this latest addition to the Boeing landscape, centered on that huge autoclave with others to come, represents a new era of manufacturing innovation.

"Composite is the wing of the future," Buchanan said. "This will keep us competitive."

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TOP 5 REASONS SPREADSHEETS ARE DEAD WEIGHT

Reasons why spreadsheets on shop floors are outdated and killing productivity.

Greg Mercurio, Shop Floor Automations



Spreadsheets are still pretty prevalent on shop floors, and it's understandable. It's a long standing part of manufacturing operations, as well as in many offices in the manufacturing industry.

However, sticking to this enduring method could be costing your productivity. Here are five reasons why your shop floor should make the change from spreadsheets to a real-time, graphical job scheduler:

Reason One: No ROI for time spent on spreadsheets. You are spending time manually noting information on a spreadsheet plus doing related administrative work, such as filing and searching for work order data info. If you have an operation with more than a couple of machines and more than a handful of employees, this is time wasted. You could instead have software with real-time insight from your production schedule that shows capacity usage and keeps jobs running on time.

Reason Two: Data entry errors require revisiting. Have you ever needed, or has an employee ever needed overtime approved to fix errors with spreadsheets? This is more time, resources and money spent fixing human errors. Instead, there is software that will help with data entry – for example, no duplication errors from entering work times. You will also have day-to-day planning data based on real-time capacity versus guesswork based on previous spreadsheets.

Reason Three: Control-F isn't the answer. If you are looking for specific info in a spreadsheet, it is likely you need to remember data from a certain tab, or you go

tab to tab and press good old "Control-F" to find the info you think you are looking for by keyword. You especially can't use Control-F if you print all the spreadsheets and file them away, while never saving the digital copies (perhaps due to lack of storage space on an old computer). Instead, particular software programs can help access work orders and look at job statuses immediately without spending more time sifting through information.

Reason Four: You dread growth because it means more paperwork. A spreadsheet is not going to be able to adjust by itself when you get new jobs in, or when a job is canceled. A spreadsheet also isn't going to tell you when there are issues with a machine causing a bottleneck. It's especially a bad situation if you get a last minute rush order in from a big client and you feel like you have to turn it down because you don't want to spend the time figuring out how to re-organize jobs. Job tracking, planning and scheduling combined into one simple interface will help your production run more efficiently and to meet, or surpass, promised due dates.

Reason Five: Machinists are not office clerks. There is a sizable skills gap in manufacturing that will be filled slowly over the next few years, and asking a qualified machinist to spend time helping with redundant paperwork that automated software could be doing for you is not in your best interest. They want to be able to get their hands dirty, create and contribute to a \$2 Trillion Dollar, Made in America industry. Asking them to struggle with spreadsheets is an unfair thing to ask when their rare talents can be used elsewhere. User-friendly software only requires a few button pushes for operators to provide immediate feedback on current job statuses.

The bottom line here is that job scheduling software is crucial for knowing if deliveries will be on time. It takes current jobs, along with machine capacity, and provides the ability to see where your jobs are plus when they are going to be completed. Unexpected downtime on machines will be accounted for and re-scheduling that is based on new machine capacity can occur.

With a reliable, real-time scheduling system in place, you'll be better equipped to update valued customers on delivery dates and identify late jobs before they happen so you have time to prepare or fix it. Displays of pre-order and estimated costs, as well as actual costs incurred during manufacturing, are shown as they occur, which is of added value.

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CAD/CAM Perspective

By: Tim Paul

CAM Application Engineer with Autodesk Inc.

Tim.Paul@Autodesk.com

Instagram: OneEarTim

What is the best way to machine this part?

I recently posted this question on Instagram, "What is the best way to machine this part? The next morning, I was happy to see that most of the 30 replies were more questions than answers. It was definitely a loaded question. I decided this would be a great test for the upcoming Nor-Cal Machinist Geek Meetup, and hoped for some good discussions.

The Test: Use different tooling and tool path strategies to machine a part. Run the tools in the middle of the recommended cutting parameters. Compare the different results.

Key data to collect:

- How do different tooling combinations and strategies affect cycle time?
- How does Adaptive Clearing compare to traditional step over, step down pocketing?

Details:

Part: 1018 Steel 4.75 x 5.625 x .75

Features:

- 8 Windows with .210 internal corner radii
- 1 Center window 2.125 Diameter
- External wall thickness .150
- Internal wall thickness .125

Roughing tool options:

- 1/2 SwiftCarb Ramp Mill XT05005CS005TCOM
- 3/8 SwiftCarb Ramp Mill XT03755BU003T60M
- 3/8 SwiftCarb 5 Flute R/F SD03755BU003R60M
- 1.125 Mitsubishi MVX Indexable Drill

Finishing tool options:

- 3/8 SwiftCarb 5 Flute R/F SD03755BU003R60M
- 3/8 SwiftCarb 5 Flute Finish XM03755CS003R60M
- 3/8 SwiftCarb 7 Flute Finish XM03757CS003R60M

Roughing/Finishing strategy options:

- 1.125 Drill, 3/8 XT Rough, 3/8 7Flute XM Finish
- 1/2 XT Rough, 3/8 SD Rest Machine and Finish
- 3/8 XT Rough, 3/8 7Flute XM Finish
- 3/8 5FI SD Rough and Finish with traditional step over, step down pocket.

Test Data:

Roughing/Finishing strategy options:

Note: All Cycle times also include separate face and chamfer ops

- 1.125 Drill, 3/8 XT Rough, 3/8 7Flute XM Finish
 - Cycle time: 10:40 min/sec
- 1/2 XT Rough, 3/8 SD Rest Machine and Finish
 - Cycle time: 11:34 min/sec
- 3/8 XT Rough, 3/8 7Flute XM Finish
 - Cycle time: 10:20 min/sec
- 3/8 5FI SD Rough and Finish with traditional step over, step down pocket.
 - Cycle time: 1:10:43 hr/min/sec

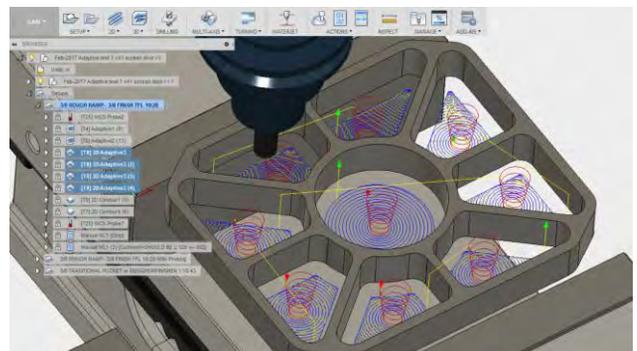


Figure 1: Adaptive roughing (constant engagement)

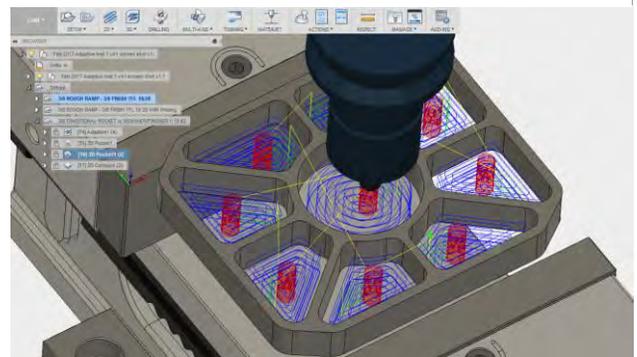


Figure 2: Traditional step over step down roughing

The Meetup:

We had a great group of Machinists at our Meetup with experience ranging from High School students to old timers. When I asked the question, "What is the best way to machine this part?" I expected a variety of replies much like what I had from the Instagram group and that is what I got. Questions like, "What machine is it on?", "What tools do you have?", "Can we order tools?", "How many parts do you have to make?". I would add more questions like, "What work holding is available?", "What tool holding is available?", "What surface finish and tolerances are required?".

I think the best question is, "What is the priority?". My years in the racing industry leads me to the question, "How do I win the race?" In this case I look at the whole job as the race. You have to get all the details right to win a race and in machining you have to get all the details right to make a profit and make happy customers. I don't care so much about getting the fastest lap (Cycle time), I care about getting the whole job done the most efficient way possible from receiving the order to shipping the parts.

If you have one part to make there is a good chance the entire job could be done fastest with one tool if you already have it set up and have good reliable cutting parameters. If the job has a higher volume it may be worth testing different tools and cutting parameters.

Most of our group was surprised by the strategy that had the fastest cycle time. The 3/8 SwiftCarb XT Ramp Mill to rough and 3/8 SwiftCarb 7 Flute XM Finisher to finish won the race. Interestingly enough, this strategy also took the least amount of time to program and had the lowest tooling cost.

The only surprise with the loosing traditional step over, step down strategy was how badly it lost the race. I wouldn't have guessed it would have been almost 7 times slower.



As I was machining the part for the traditional step down, step over test, I was struck with a powerful realization. There is a whole generation of machinists that will look at traditional step down, step over roughing the way I look at old machines that were once run by a Pelton water wheel and a leather belt.

I was happy that our group had the time and interest to have a deep dive into the geekier aspects of tool paths like Adaptive Clearing (Constant Engagement Roughing), radial chip thinning, tapered helical entry etc. I encourage everyone to continue learning and sharing knowledge for it is the only way our Machinist Geek Community will stay healthy and thrive.

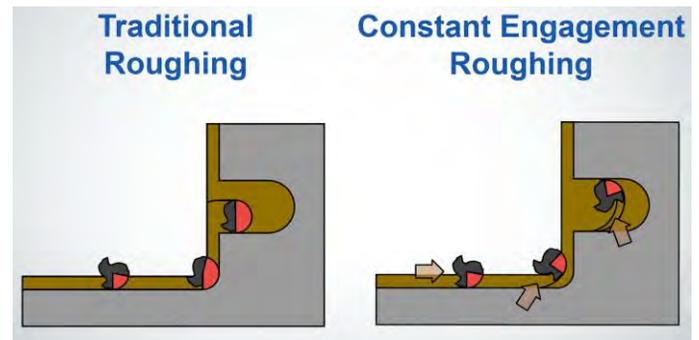


Figure 3: Traditional Step Over, Step Down Vs. Adaptive Clearing



Lasers Could Give Space Research its “Broadband” Moment

Thought your Internet speeds were slow? Try being a space scientist for a day.

The vast distances involved will throttle data rates to a trickle. You're lucky if a spacecraft can send more than a few megabits per second (Mbps) -- a pittance even by dial-up standards.

But we might be on the cusp of a change. Just as going from dial-up to broadband revolutionized the Internet and made high-resolution photos and streaming video a given, NASA may be ready to undergo a similar “broadband” moment in coming years.

The key to that data revolution will be lasers. For almost 60 years, the standard way to “talk” to spacecraft has been with radio waves, which are ideal for long distances. But optical communications, in which data is beamed over laser light, can increase that rate by as much as 10 to 100 times.

High data rates will allow researchers to gather science faster, study sudden events like dust storms or spacecraft landings, and even send video from the surface of other planets. The pinpoint precision of laser communications is also well suited to the goals of NASA mission planners, who are looking to send spacecraft farther out into the solar system.

“Laser technology is ideal for boosting downlink communications from deep space,” said Abi Biswas, the supervisor of the Optical Communications Systems group at NASA's Jet Propulsion Laboratory, Pasadena, California. “It will eventually allow for applications like giving each astronaut his or her own video feed, or sending back higher-resolution, data-rich images faster.”

Science at the speed of light

Both radio and lasers travel at the speed of light, but lasers travel in a higher-frequency bandwidth. That allows them to carry more information than radio waves, which is crucial when you're collecting massive amounts of data and have narrow windows of time to send it back to Earth.

A good example is NASA's Mars Reconnaissance Orbiter, which sends science data at a blazing maximum of 6 Mbps. Biswas estimated that if the orbiter used laser comms technology with a mass and power usage comparable to its current radio system, it could probably increase the maximum data rate to 250 Mbps.

That might still sound stunningly slow to Internet users. But on Earth, data is sent over far shorter distances and through infrastructure that doesn't exist yet in space, so it travels even faster.

Increasing data rates would allow scientists to spend more of their time on analysis than on spacecraft operations.

“It's perfect when things are happening fast and you want a dense data set,” said Dave Pieri, a JPL research sci-

entist and volcanologist. Pieri has led past research on how laser comms could be used to study volcanic eruptions and wildfires in near real-time. “If you have a volcano exploding in front of you, you want to assess its activity level and propensity to keep erupting. The sooner you get and process that data, the better.”

That same technology could apply to erupting cryovolcanoes on icy moons around other planets. Pieri noted that compared to radio transmission of events like these, “laser comms would up the ante by an order of magnitude.”

Clouding the future of lasers

That's not to say the technology is perfect for every scenario. Lasers are subject to more interference from clouds and other atmospheric conditions than radio waves; pointing and timing are also challenges.

Lasers also require ground infrastructure that doesn't yet exist. NASA's Deep Space Network, a system of antenna arrays located across the globe, is based entirely on radio technology. Ground stations would have to be developed that could receive lasers in locations where skies are reliably clear.

Radio technology won't be going away. It works in rain or shine, and will continue to be effective for low-data uses like providing commands to spacecraft.

Next steps

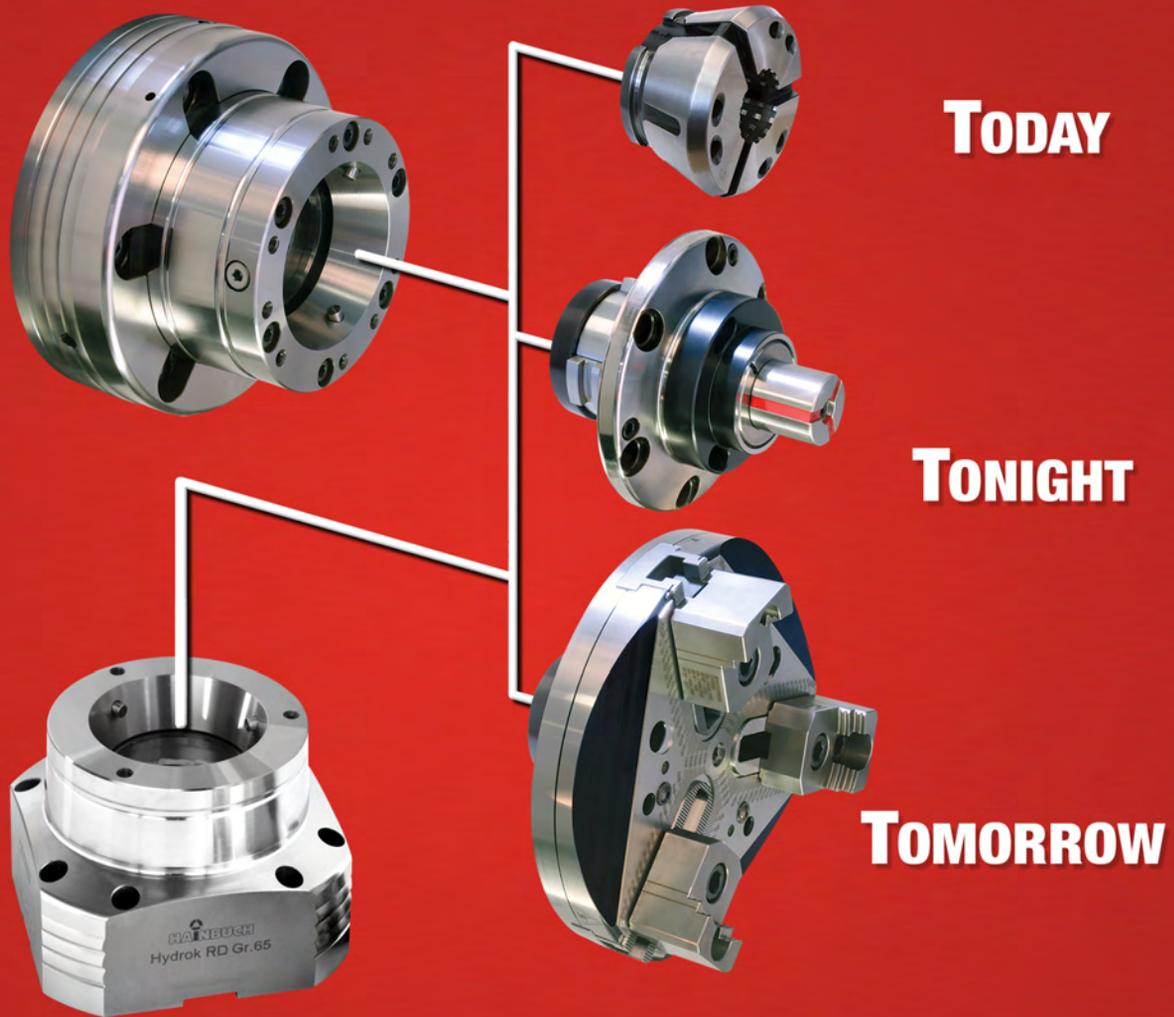
Two upcoming NASA missions will help engineers understand the technical challenges involved in conducting laser communications in space. What they'll learn will advance lasers toward becoming a common form of space communication in the future.

The Laser Communications Relay Demonstration (LCRD), led by NASA's Goddard Space Flight Center in Greenbelt, Maryland, is due to launch in 2019. LCRD will demonstrate the relay of data using laser and radio frequency technology. It will beam laser signals almost 25,000 miles (40,000 kilometers) from a ground station in California to a satellite in geostationary orbit, then relay that signal to another ground station. JPL is developing one of the ground stations at Table Mountain in southern California. Testing laser communications in geostationary orbit, as LCRD will do, has practical applications for data transfer on Earth.

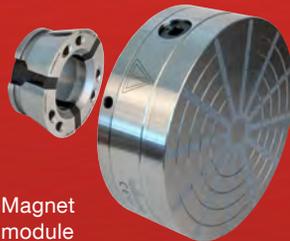
Deep Space Optical Communications (DSOC), led by JPL, is scheduled to launch in 2023 as part of an upcoming NASA Discovery mission. That mission, Psyche, will fly to a metallic asteroid, testing laser comms from a much greater distance than LCRD.

The Psyche mission has been planned to carry the DSOC laser device onboard the spacecraft. Effectively, the DSOC mission will try to hit a bullseye using a deep space laser -- and because of the planet's rotation, it will hit a moving target, as well.

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New Gosiger West Headquarters Provides Expanded Product, Training & Customer Support Services

Manufacturing technology provider Gosiger, Inc. has moved its West Coast headquarters from Fullerton, CA to a new location in Cypress, CA effective January 9, 2017. The new facility is approximately twice the size of the previous space to better serve customers with an expanded showroom, training area and replacement parts inventory.

According to Brad Gecowets, Gosiger's executive director for west coast operations, "With our growing service and support staff along with increasing customer demands for demonstrations, applications assistance and equipment training, we simply outgrew our former facility. At the same time, we wanted a more accessible location and one that enables us to better serve our customers today and into the future."

Located in the former Sandvik Coromant building at 6400 Gateway Drive, Cypress CA 90630, the new 17,500 square foot Gosiger facility includes a 4 times larger product showroom to accommodate more and bigger equipment. The training space is also 4 times larger to provide more customer education classes and special events. Another plus is an expanded spare parts inventory utilizing an automatic retrieval system for faster customer deliveries.



Ganesh Machinery Expands With Announcement Of New President

Ganesh Machinery announced that they have hired Method Machine Tool's sales executive, Robert Serano, as their new president, effective January 16, 2017. The appointment follows the recent promotion of former president Harvinder Singh to CEO of Ganesh Machinery. The organizational change allows Robert to advance and guide Ganesh's overall growth strategies.

"As Ganesh expands, our team continues to evolve. Robert's vast experience in the machine tool industry brings a different perspective needed for an expansion of this size. His experience building dealer networks in such a niche industry is impressive and we're excited to see him in action. We're thrilled to have him on board and have him lead our growth efforts." –Harvinder Singh, CEO, Ganesh Machinery

Robert has over 27 years of experience working in the OEM machine tool industry with a proven track record of success. He's worked for several major manufacturing players such as Method's Machine Tools where he implemented a sales growth strategy that brought the marketing and sales goals to fruition. He led his team in developing tactics to spread company's presence throughout the West Coast to increase brand awareness. In addition,

he has managed key customer relationships, built and executed growth plans, assembled dealer networks, implemented manufacturing training programs, increased revenue and more.

Gilman Precision Adds To Business Development Team

Gilman Precision, manufacturer of customized linear and rotary motion systems, recently added Craig Grady to its sales force team as a Business Development Specialist.

Grady will manage western U.S. territories as well as work with Weimer Bearing on regions within Wisconsin to accomplish business growth goals.

Through a variety of methods he will facilitate the connection between engineers and customers, creating smooth communication and intentional, service-minded relationships with existing and prospective clients

Lyndex-Nikken Partners With MachiningCloud

Machining Cloud and Lyndex-Nikken have jointly announced their partnership to provide Lyndex-Nikken cutting tool product data on the Cloud.

Lyndex-Nikken is a manufacturer of toolholders, rotary tables, right angle heads, live and static tools. Machining-Cloud is a product data provider for cutting tools, CNC machines and workholding.

MachiningCloud represents a new channel through which Lyndex-Nikken will be able to provide its customers with the digital product data needed to run to day's data-driven shop. This partnership will help to simplify the process of finding the right cutting tools for customers for their manufacturing jobs, as they will have direct access to current and complete tooling

Industry News

data without the hassle of searching through printed catalogs and multiple websites to find ideal tooling.

Tongtai and You Ji Machines from Absolute Machine Tools Win 2017 Taiwan Excellence Awards

The Tongtai iTD 2000 YBC CNC turning center and the You Ji VHL-1200ATC series of vertical turning lathes have received prestigious 2017 Taiwan Excellence Awards. Absolute Machine Tools, Lorain, Ohio, is the sole North American importer and distributor of Tongtai and You Ji machine tools.

An international panel of judges chooses winners based on consistent high scores in four criteria: R&D, design, quality, and marketing.

The judges recognized Tongtai's iTD 2000 YBC CNC turning center, debuted by Absolute Machine Tools at IMTS 2016, for its combination of new technologies and efficient machining processes.

Among the innovative features of the iTD 2000 YBC is its 75° slant bed design that allows chips to flow directly into the chip conveyor and also provides easy access to the spindles and turret. The machine's 45mm roller-type ways permit high rapid traverse rates, and high-torque 20 hp main spindle and 10 hp subspindle motors.

Also honored was the You Ji VHL-1200ATC series of vertical turning lathes. You Ji developed the VHL series to facilitate machining of workpieces with challenging shapes, such as those common in the aerospace industry. In addition to a vertical ram, each VHL machine also has a horizontal ram, simplifying access to difficult-to-reach machining areas. In many cases the horizontal RAM eliminates the need to move large parts from machine to machine.

CMTC® Adds Personnel to Support NextFlex

California Manufacturing Technology Consulting – affiliated with the National Institute of Standards and

Technology (NIST) and California's Manufacturing Extension Partnership (MEP) Center announced that William "Bill" Metzger has joined the organization in the role of Flexible Hybrid

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Electronics (FHE) Practice Leader.

In this role Bill will be responsible for building small manufacturer participation in key technologies and opportunities available through CMTC's partnership with NextFlex – the Manufacturing USA Institute for Flexible Hybrid Electronics. NextFlex is a public-private consortium of companies, academic institutions, nonprofits and the federal government with a mission to advance US manufacturing of flexible hybrid electronics.

FHE are lightweight, low-cost, flexible, comfortable, stretchable, highly efficient smart products with a vast potential in the commercial, consumer and defense related environments. FHE brings electronics “out-of-the-box” and places them virtually anywhere directly onto a variety of surfaces including the human body, enabling

an entirely new breed of defense and commercial applications we haven't imagined.

Mr. Metzger has over 30 years of senior management leadership and technical experience in the aerospace, medical device and semiconductor industrial areas, focusing on product development, operations and consulting.

Best Carbide Cutting Tools, LLC has Joined Global Carbide Specialist, Ceratizit Group.

Through this partnership, Best Carbide will have access to Ceratizit technologies and expertise that will help the company to improve its manufacturing process, technical capabilities,

and quality of tooling – with the goal of ultimately adding greater value for our customers.

For the first time in its 37-year history, Best Carbide becomes part of a global cutting tool organization.

Best Carbide Cutting Tools, LLC will continue to operate as it has in the past and honor all existing customer and vendor relationships moving forward, but now with full support from the Ceratizit Group.

Best Carbide Cutting Tools, LLC, a U.S. manufacturing company, has been providing carbide cutting tool solutions since 1980. At the start of 2016, Best Carbide relocated to a 46,000 square-foot state-of-the-art facility located in Rancho Dominguez, California. Best Carbide operates one of the largest collections of Swiss-made CNC grinding machines in the country, specializing

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New Walter-Comara Venture Provides Smart Manufacturing, Industry 4.0 Solutions

Walter has joined with long-standing software partner Comara to create a new company under joint leadership. “This is a key step in our drive to provide our customers in North America and around the world with Smart Manufacturing, Industry 4.0 solutions,” notes Mirko Merlo, president of Walter AG.

Walter, now with the majority stake in the new company, is continuing to pursue its evolution from a tool manufacturer to a provider of comprehensive production solutions. Comara, meanwhile, has been working closely with Walter since 2012 on connectivity and Smart Manufacturing issues, building on its strengths in collecting, evaluating and using real-time data to connect machines. Together with Walter, the company also develops software solutions for connecting all devices in the production environment: From machines and tools through to logistics and databases.

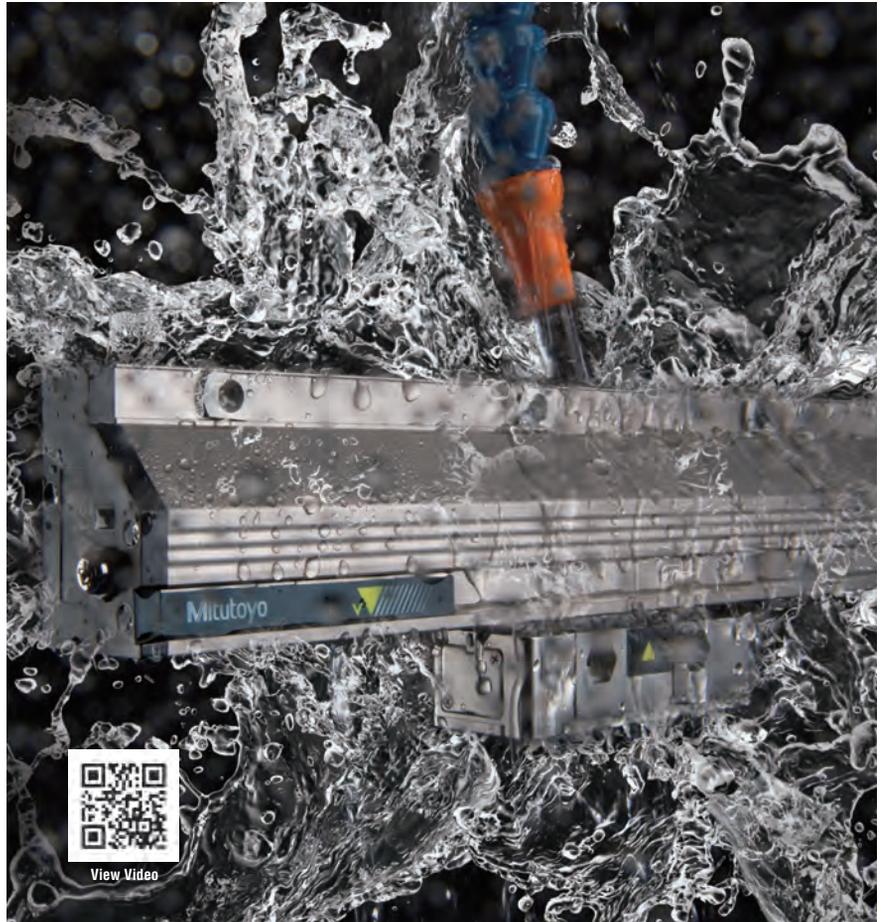
The synergies made possible by the new Walter-Comara collaboration will enable Walter to digitize and to connect tools with greater precision and sophistication and optimize them using real-time data. Combined with the existing Walter Tool•ID system allows the user to transfer tool data from the pre-setting device to the machine tool and to evaluate the parameters that are run on the machine.

And Comara, with its “appCom,” offers machine manufacturers and industrial companies their own platform for individual “apps” – special software modules geared to the production environment.

Team Penske and Nikon Metrology Announce Technical Alliance

Team Penske announced that it has formed a technical alliance with

Nikon Metrology, a market leader in metrology instrumentation and technological innovation. The announcement expands upon an already existing relationship between the two companies.



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Under the terms of the new multi-year agreement, Brighton, Michigan-based Nikon Metrology will help enhance Team Penske's manufacturing process of its racecars competing in NASCAR, working closely with the organization's fabrication department. Team Penske will also rely on Nikon Metrology's superior optical instrumentation and resources to support its overall technical processes at its headquarters in Mooresville, N.C.

"Team Penske is continuously looking for opportunities to further develop the processes involved in building fast, consistent and reliable race cars," said Tim Cindric, Team Penske president. "By expanding our partnership with Nikon Metrology, we now have an industry leader that is committed to taking the quality of our race cars to another level."

After working closely with Penske Technology Group in the past, Nikon Metrology is looking forward to the new challenge of partnering with the winning Team Penske racing program, which celebrated its 50th anniversary season in 2016.

"Manufacturing better, faster, and with optimum usage of resources is the demand of manufacturers today, and the Team Penske racing program demands running at the cutting edge of technology," says Robert Martin, vice president of sales (Americas) at Nikon Metrology. "Better matters, and we're inspired to continually prove it together with Team Penske through applying state-of-the-art metrology solutions and the expertise of our people."

Emuge Introduces Tool Reconditioning In U.S. Facility

Emuge Corp. has introduced tool grinding and reconditioning services based out of the company's North American headquarters in West Boylston, MA, USA. A clean, new state-of-the-art manufacturing facility at Emuge Corp. is now equipped with the latest technology high precision CNC grinding machines and inspection equipment, providing tool reconditioning for U.S. and Canadian customers for Emuge taps, drills and end mills, in addition to other brands of carbide drills and end mills.

"Reconditioning Emuge tools by Emuge makes sense," said Bob Hellinger, president of Emuge Corp. "Emuge has the knowledge and manufacturing expertise to refurbish an Emuge tool to its original condition and specification, providing maximum performance levels, predictable operation and longer life than any other method, all at a modest investment for the utmost value."

Emuge reconditioning services offer complete inspection and evaluation of all tools received. Reconditioning



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services include complete regrinding to the original geometry of Emuge taps, drills and end mills, as well as other brands of drills and end mills. Reconditioning services also include corner radius, Weldon flats and other modifications to standard end mills, and PVD coatings through a state-of-the-art coating system.

Cincinnati Incorporated Appoints New Western Regional Sales Engineer

Cincinnati Incorporated has named Kristina Frontino regional sales engineer for northern California, Nevada, Utah, and southern Idaho. Frontino brings five-plus years of project management experience and holds a Bachelor of Science degree in Civil Engineering from the University of Nevada, Reno.

Frontino is stepping into the territory long-held by Mike Malatesta, who, after 30 years with CI, is retiring. "Cincinnati's legacy is based on exceeding customer expectations by providing innovative, durable, and high performance machine tools with exceptional service," said Frontino. "CI's complete line of press brakes, shears and lasers will be represented in my region, along with the high level of service that CI customers have come to expect."



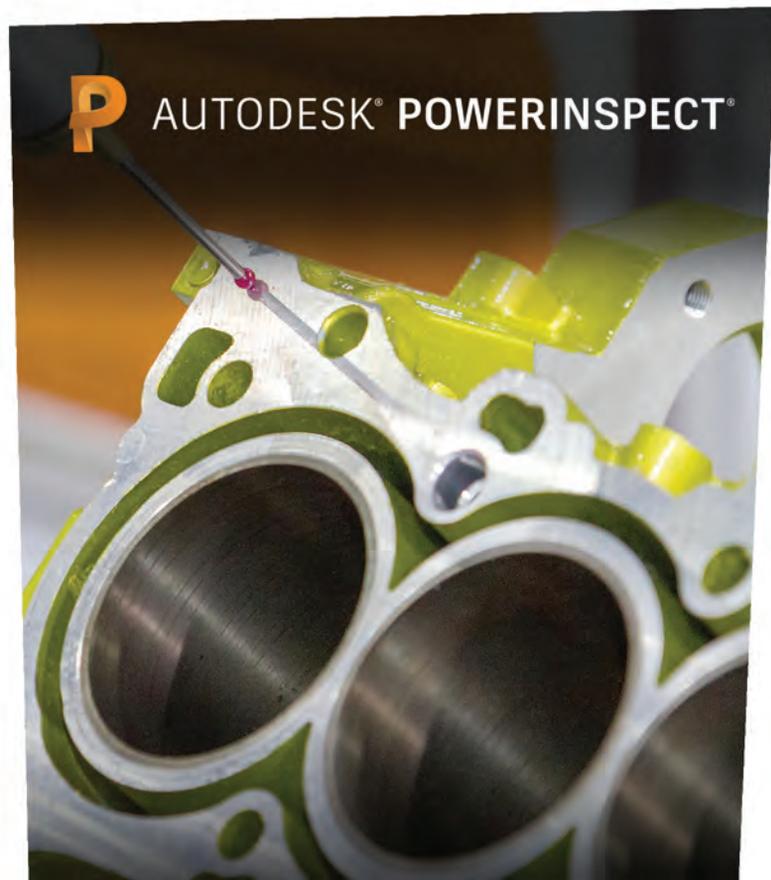
"Our sales strategy in the U.S. is to establish direct sales and application support in the appropriate locations," said John Previs, national sales manager, Cincinnati Incorporated. "This is a well-established region, and Kristina will continue to strengthen and grow the relationships in this market."

GF Machining Solutions Names New Head of Business Development

GF Machining Solutions has named

Karl Kleppek as its director of business development. He brings with him more than 25 years of sales, business development and marketing experience that will help continue the sales, service

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and support of the company's milling, EDM, micro-machining, additive, laser texturing and automation and tooling solutions.

In his new role, Kleppek is responsible for the development and leadership of marketing strategies that will further strengthen existing customer relationships, as well as develop new opportunities in the aerospace, energy, automotive, medical, ICT, oil/gas and other industries. He will also oversee efforts to ensure that GF Machining Solutions' customers and distributors have the guidance, technology and training they need to succeed.

Prior to joining GF Machining



Solutions, Kleppek served as director of sales and strategic business development for Fanuc America Corporation. His career also includes multiple sales management positions at Siemens Energy and Automation along with a machine tool sales engineering position at Advanced Machinery Sales. Kleppek earned a Bachelor's degree from the University of Wisconsin.

OMAX Receives 2016 Tibbetts Award for Micro Abrasive Waterjet Technology

On January 10, OMAX® Corporation was one of 37 companies to receive the prestigious Tibbetts Award at the White House. The Tibbetts Award is given to small businesses and individuals by the US Small Business Administration (SBA) in recognition for



Seen in the photo from left to right: SBA Administrator Maria Contreras-Sweet, Peter Liu, SBA Associate Administrator for Investment and Innovation Mark Walsh

innovative research and development of transferrable technology. OMAX received the award for its outstanding technological innovation in the area of micro abrasive waterjet technology, culminating in the MicroMAX® JetMachining® Center.

Dr. Peter Liu, Sr. Scientist at OMAX and creator of the MicroMAX abrasive waterjet, was at the ceremony

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in Washington D.C. to receive the award for the company. "Receiving the 2016 Tibbets Award is truly an honor," said Mr. Liu. "The MicroMAX, commercialized based on mAWJ technology, was named a Finalist of the 2016 R&D 100 Awards. At OMAX, we strive to produce high-precision, easy-to-use waterjet machining systems, and research and development is a critical component to achieving that objective. It's great to be recognized for our R&D work at such a high level."

CGTech Joins CCAM, Commonwealth Center for Advanced Manufacturing

The Commonwealth Center for Advanced Manufacturing (CCAM), an applied research center providing solutions in adaptive automation, surface engineering, and additive manufacturing, announced that CGTech will join as its newest Affiliate member. CGTech, the developer of VERICUT software application, will participate in CCAM research and provide extremely valuable verification/optimization capabilities to complement CCAM's current machining capabilities.

"CGTech's VERICUT software supports applications utilized by many of our members. It will help our research team simulate CNC machining to detect potential inefficiencies or conflicts prior to the machining process", stated Ron Volpicella, research manager at CCAM.

"With many customers and partners already part of CCAM, it was a natural fit to join the research center," said Jon Prun, president of CGTech. "We look forward to working with the other CCAM members to help deliver improved efficiency to industry."

The CCAM industry and government consortium now numbers 30 members, including Aerojet Rocket-

dyne, Airbus, Alcoa, Chromalloy, Kyocera SGS Precision Tools, Newport News Shipbuilding, Oerlikon Metco, Rolls-Royce, Sandvik Coromant, Siemens, Blaser Swisslube, Canon

Virginia Inc., EOS, GF Machining Solutions, Hermle Machine Co., Mitutoyo, Paradigm Precision, RTI International Metals, Inc., Buehler, Cool Clean Technologies, Hexagon

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AB, Mechdyne, National Instruments, Spatial Integrated Systems (SIS), and the NASA Langley Research Center.

The five Academic Members include: Old Dominion University, University of Virginia, Virginia Commonwealth University, Virginia State University, and Virginia Tech.

CCAM is based at a 62,000 square foot facility that provides solutions in the areas of adaptive automation, surface engineering, and additive manufacturing. Leveraging the combined strengths and capabilities from CCAM and the network of university, industry, and government partners, CCAM bridges the gap between research and commercialization, accelerating new developments to market.

Q-Mark Manufacturing Inc. Announces 25th Anniversary

Rancho Santa Margarita, CA – Q-Mark, a leading North American manufacturer of probe styli, is celebrating an important milestone reaching their 25th year in business. Among the industries they serve are aerospace, biomedical, defense, technology, and transportation. While this is a cause for celebration for any company, owner and CEO Mark Osterstock is especially proud to share the credit with his staff and family.

Osterstock had entrepreneurialism in his blood. He worked alongside his father at age 13 sweeping the machine shop after school. “My dad was

a hard worker,” he remembers. “He was a fantastic role model for how to run a business and manage the many challenges that come with the responsibility.”

As is often the case, it has not been a straight line to stability and recognition as a premier supplier of a precision measurement tool so many industries demand. “We’ve gone through several deep economic crisis since our launch in 1993,” Osterstock notes with a head shake. “I just kept focused on what our customers needed, even if there were fewer of them for a time.”

Being very involved in the manufacturing industry in California, Osterstock has been in leadership roles in the Los Angeles chapter of the National Tooling & Machining Association,

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recently serving as board president. “I’m certain that part of how our company has prospered throughout the years has been by teaming with other knowledgeable professionals I meet through NTMA.”

Allied Machine Announces Purchase of Superior, Inc.

Allied Machine & Engineering, a leading manufacturer of holmaking and finishing tooling systems, announces it has purchased Superior, Inc of Xenia, Ohio USA.

Superior built its reputation as a manufacturer of innovative, special solid carbide and PCD tipped rotary cutting tools such as end mills, reamers, drills, and step tools. They are widely recognized as experts in developing customized solutions in specialty tooling.

“By acquiring Superior, Allied has added a wealth of over 50 years of experience in special tool manufacturing. Their highly-skilled associates operate CNC equipment and utilize sophisticated quality control systems to ensure the highest standards of quality” said Bill Stokey president/CEO of Allied Machine & Engineering. “Their product expertise will provide tremendous opportunities for the growth of Allied products.”

Customer sales and support will continue to be provided by both Allied and Superior, reflecting the strong relationships established by both companies.

Mazak to Host Special San Francisco Event

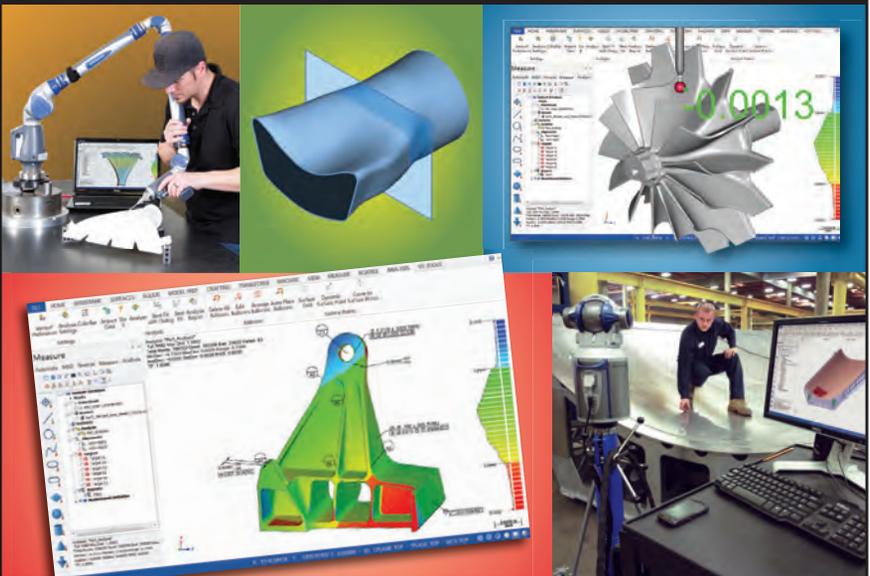
Mazak will host a special Discover More with Mazak™ Technology and Learning event at its San Francisco facility in Milpitas, California, March 15 – 16 from 10:00 a.m. to 4:00 p.m. The event will center on the particular needs of Silicon Valley shops as well as those of the local area manufacturing

community in general.

At the event, Mazak will showcase both machine tool and support technology solutions that will allow those shops to overcome their specific manufacturing challenges. Many of

which stem from the ever tightening delivery times for short-run, high-precision complex parts that require multiple cutting operations and high-speed machining in automated cells to continuously boost output.

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Discover More with Mazak San Francisco attendees will experience the high-speed machining capability of Mazak's HCN-4000 Horizontal Machining Center; the DONE IN ONE® production benefits of its INTEGREX i-200S Multi-Tasking Machine and QUICK TURN 250MSY Turning Center; the small footprint of the QUICK TURN PRIMOS 100 Turning Machine; and the super cyber security of the Mazak SmartBox for connecting equipment to the Industrial Internet of Things (IIoT).

Mazak's Value Inspired Partners (VIPs) ESPRIT CAM by DP Technology and Sandvik Coromant will also be on hand to discuss the latest advances in automated part programming and toolholding technologies.

Each day of the event, Mazak will provide lunch as well as soft drinks and snacks. Participants should register online at www.mazakusa.com.

Chemeketa CC in Oregon, DMG Mori Enter Educational Partnership

Furthering educational opportunities for students through technology was the intent when Chemeketa Community College signed an agreement for an educational partnership between itself, the college's machining technology program and DMG Mori at the Salem, Oregon campus on Feb. 2.

DMG Mori is a global manufacturer of machines, tools and software used

in the machining field.

"We are partnering with a world-class company," said Johnny Mack, Chemeketa's executive dean of career and technical education.

Sheldon Schnider, machining instructor, said in conjunction with the partnership, Chemeketa has been recognized by DMG Mori as one of only five regional education centers of excellence in the country.

The excellence of Chemeketa's program and the workers it is turning out was recognized during the ceremony by Marlow Knabach, DMG Mori's chief technology officer.

"What you have through these doors is what drew me into the industry," Knabach said of Chemeketa's machining labs.



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President Julie Huckestein said one of the proudest moments for the college outside of graduation is when partnerships like the one with DMG Mori can be celebrated.

“It’s pretty easy with this (machining) program to be proud of it,” Huckestein said.

ANCA Names Sales Manager

ANCA Machine Tools (AMT) has named Keith Grillot sales manager for its USA and Canadian markets, according to Russell Riddiford, ANCA president. Grillot has previously held key positions with the Australia-based machinery builder.

ANCA has a history of serv-

ing its customers with advanced, cost-effective grinding solutions and world class service support. ANCA has provided

leading edge CNC grinding machines for a wide span of industries, including automotive, aerospace, medical, hydraulic, power generation and more.

“We have a solid core group of highly competent associates and dealers and we will continue to work hard to exceed the expectations of our customers with the highest quality machine tools and professional compe-



tence in applications engineering and service,” Grillot said.

Recently, ANCA announced it is expanding its plant in Michigan by 50% to accommodate a greater inventory and spare parts warehouse capacity and a dedicated customer focus and training center. It will also double its machine demonstration area.

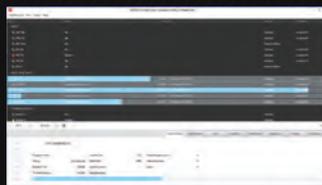
Renishaw Readies For Continued Growth in North America With New Multi-purpose Facility

Renishaw, Inc. is preparing to move into a new 133,000 sq. ft. office and warehouse facility in West Dundee, IL, about 40 miles from Chicago. The two-

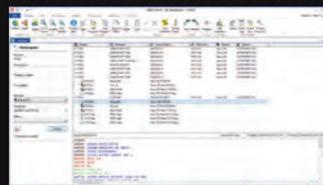
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HMC-518	543-6460	Wallace	00:07	03:40	Running
VMC-3Axis		Ingen	00:00	00:00	Running
HMC-48	1404	Roark Jr	03:21	03:50	Running
	507-5420	Stan	06:24	06:20	Running
	509-0159	Dwight	00:08	02:45	Running
VRX-S		Ingen	00:00	00:00	Running

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story facility will be the company's new North American headquarters, but also includes space for product development, testing, warehousing and distribution. It includes the new U.S. additive manufacturing solutions Center – part of Renishaw's network of global solutions centers, opening over the next year.

The centers are designed to provide venues where the additive manufacturing adoption process can be accelerated. "We can give companies cost-effective, hands-on experience of metal additive manufacturing, combined with application engineering support to optimize their design, and post-processing capabilities to ensure that it performs as it should," said Sir David McMurtry, chairman and CEO of Renishaw.

Renishaw plans to set up regional technical and sales offices throughout the United States, as the company continues to get closer to customers. "With the popularity and adoption of Industry 4.0 and Smart Factory philosophies, our products and services are relevant to a larger and more diverse group of manufacturing operations," said Howard Salt, president of Renishaw, Inc. "These new facilities makes it more feasible, logistically, for us to work cooperatively with customers and potential customers in North America, and develop solutions specific to them."

A ribbon-cutting event is scheduled for March, and the company plans to be fully relocated by October. The new address is 1001 Wesemann Drive, West Dundee, IL 60118. All other contact

information, including phone/fax numbers, email addresses and website, will remain the same.

TRUMPF Opens Technology and Laser Center in Silicon Valley

Laser system manufacturer TRUMPF has opened a new technology and laser center in Santa Clara, CA. Its location in Silicon Valley puts the laboratory close to key customers and partners from a wide range of industries.

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to our customers and partners in this region,” said Peter Leibinger, vice-chairman of the managing board of the TRUMPF Group and head of the Laser Technology/Electronics division. “This means we can examine each customer’s individual requirements and ideas on site”.

The Santa Clara application laboratory is equipped with cutting-edge technology, including continuous wave (CW) lasers, short and ultra-short pulsed lasers, and the latest beam sources and generators.

Arno Werkzeuge Names Gardner President of Arno USA

Arno Werkzeuge, a German-based manufacturer of high-precision cutting tools and solutions, has appointed Martin Gardner as President of Arno USA.

Gardner will be responsible for managing all U.S. operations, including product line management, sales, business development and marketing.

Beginning as an apprentice at a machine shop in England, Gardner has over 30 years of machine and cutting tool industry experience with expertise in sales management, business management, product management, engineering and channel development. He has served at Mazak’s UK Machine Tool Division and Stellram, the Swiss cutting tool manufacturing company. Most recently, he served at Arno USA in business development prior to being named president.

Diamond Technology Innovations Purchased

Bourn & Koch a subsidiary of Alleghany Capital Corp., has acquired Diamond Technology Innovations

(DTI; Olympia, Washington), a manufacturer of waterjet orifices, nozzles and related products.

“The acquisition of DTI enhances Bourn & Koch’s existing business in machine tool consumables and spare parts, and provides an entrance into the waterjet market,” says Terry Derrico, Bourn & Koch president.

Ted Jernigan, president of DTI, will continue in his role, and the company’s day-to-day operations will not be impacted by the transaction, according to Bourn & Koch.

DTI offers a variety of waterjet orifice materials including low-cost, short-life ruby and sapphire; mid-grade, low-cost/high-performance TetraCore; and premium-grade DTICore Diamond. In addition to orifices, the company has also created nozzles for the 3D printing industry.

Steel Supplier Moves Headquarters to Elk Grove, CA.

PDM Steel Service Centers, a steel supplier for the western states, has moved its headquarters from Stockton to Elk Grove, city officials announced in mid-January. The company employs 19 managers and administrators at its headquarters.

PDM Steel Service Centers Inc. is a 60-year-old steel supplier with 10 locations in California, Washington, Nevada, Colorado, Idaho and Utah.

The company said in a blog post in August it was moving to Elk Grove because of its proximity to Sacramento, which it said would provide “greater accessibility for our people, our customers and our business partners.”

“We know our employees will be happy being part of the Elk Grove community, and we’re all very excited about this next chapter in our company’s long history,” said Sean Mollins, president and chief operating

officer of PDM Steel, in a statement prepared by the city.

The company has signed a lease for 10,000 square feet of office space at 9245 Laguna Springs Dr. The site is within a 72,000-square-foot office building at the Laguna Gateway project by Jackson Properties. Following the relocation, Laguna Gateway is now 100 percent occupied.

PDM Steel distributes a line of steel products to a range of industries. The company is a wholly owned subsidiary of Los Angeles-based Reliance Steel & Aluminum.

Haimer Signs Cooperation Agreement with DMG MORI, Acquires Tool Presetting Company

The cooperative partnership between the Haimer Group and DMG MORI has been strengthened with a cooperation agreement partnership involving Haimer’s tool presetting, balancing and shrinking products. DMG MORI will source all products related to tool presetting, balancing and shrinking, including shrink-fit holders as well tool rooms, exclusively from Haimer.

All DMG MORI technology and solution centers as well as production plants will be equipped with Haimer products.

In addition to the partnership, Haimer acquired DMG MORI’s company Microset GmbH, which now operates under the name Haimer Microset GmbH. The company makes tool presetting technology.

Industry News

F. Zimmermann Expands in U. S.

F. Zimmermann GmbH a few months ago, hosted a grand opening ceremony for a new branch in Wixom, Michigan. With this 13,250-square-foot facility, the milling machine manufacturer aims to expand its activities in North America. The guests, some 40 in all, included employees, business partners, customers and representatives of the county and state.

Zimmerman personnel at the event stressed the company's resolve to be a stronger and more reliable partner through local service and support and fast deliveries of replacement parts. In addition to serving traditional gantry customers, the company will focus on the new five-/six-axis FZH400

horizontal machining center, which is said to be well-suited for aerospace structural components.

GF Machining Solutions Names New Head of Sales in West

GF Machining Solutions has named Martin Gorski as its new head of sales in the West region of the United States. In this new role, Gorski will be responsible for enhancing the sales, service and support for the company's milling, EDM, additive, laser texturing and automation & tooling solutions. This comprehensive portfolio of products ensures the success of customers in the aerospace, energy, automotive, medical, ICT, oil/gas and other industries.

Based in Orange County, Calif., Gorski oversees the overall sales and service for the company's offerings in his territory, which includes 13 states and Mexico. He is also responsible for ensuring that customers receive top-notch technical training, applications engineering support and assistance with turnkey solutions.



Gorski joined GF Machining Solutions in 1995 after earning a bachelor's degree from the New York Institute of Technology (NYIT). He has served the company as AgieCharmilles vice president of sales, head of sales for the west region, and most recently as

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the market segment manager for GF Machining Solutions' Information Communication Technologies (ITC) customers.

According to Don McMillan, director of sales for GF Machining Solutions, Gorski is an experienced sales professional who has strong relationships with customers and distributors throughout the territory.

"As a GF Machining Solutions veteran of more than 20 years, Martin has a complete understanding of the advanced, highly efficient machining technology solutions we provide to our customers," said McMillan. "He's well-equipped to lead the Western team as we continue to raise the bar in terms of technology, service and support."

Kitamura Appoints AME Dealer for Three Western States

Kitamura Machinery of USA Inc. recently appointed Advanced Manufacturing Engineering (AME) as its dealer covering the states of Colorado, Wyoming and New Mexico.

"AME's experience in sales, service and applications will help assist and support our users out West," said Cari Vanik, marketing manager for Kitamura Machinery. "AME was founded in 2005 by experienced industry sales and application personnel with over 100 years of combined service". She added, "AME brings a focused approach to continuous improvement in the production needs of its customers. They have an approach that offers users more in-depth product and training support that will keep the Kitamura

name growing in these states for many years. We welcome the increased and targeted coverage our users in these states will receive."

Walter USA Names New Director of Business Development

Walter USA has appointed Thomas Benjamin director of business development for North America. In his new position, Mr. Benjamin will be responsible for conducting market analysis for strategic planning and supporting the development and implementation of business plans in North America.

Mr. Benjamin joined Valenite/Walter in 2003 and has held a variety of positions including director of product marketing and product manager. Prior to Walter he was marketing manager for a variety of companies and industries including Ingersoll Cutting Tool.

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New Products

Digital Grip Force Analyzer Software —Kitagawa NorthTech

Kitagawa NorthTech offers its Digital Grip Force Analyzer software and kit (PC version) designed to enable users to easily, accurately and quickly analyze and measure grip force performance of their CNC lathes and turning centers via a desktop PC, laptop or tablet. The software comes bundled as a complete kit with carrying case, powerful Bluetooth dongle loaded with PC analyzer software, digital load meter, and the traditional handheld pendant for manual diagnostics, testing and measurement.

Once the user inputs the required data and commences a run test, the

software will compile a G-code program to run the test on the machine. Once the test has run and is completed, the software will then plot on the PC screen the actual gripping force of the machine at all rpm speeds the user entered.

Grinder Now Equipped With OSP-P Control —Okuma

Okuma's GA26W grinder is now equipped with Easy Operation OSP-P300G CNC control. Okuma's open architecture OSP-P control runs on a Windows-based platform and fully integrates the machine, motors, drives and encoders, enabling enhanced

machine performance and true customization to suit particular machining needs. Okuma reports the Easy Operation control and touchscreen increase efficiency by enabling users to easily toggle between machine operations, programming and wheel preparation screens.

According to Okuma, the CNC grinders' wheelhead traverse structure gives the machine a solid, compact footprint that saves floor space while the user-friendly design eases loading various workpieces for automation in high-production environments. The rigid foundation paired with Okuma's hydrodynamic wheel spindle supports heavy-duty grinding. The 7.5-kW (15-kW-optional) grinding wheel spindle is ideal for grinding mass-

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produced parts with precision. The GA26W grinder is equipped with standard chatter control function that automatically adjusts wheel speed for accurate, stable machining.

Features include IGAP+ conversational programming, a large 24" grinding wheel, and a tailstock quill stroke of 50 mm. Also included is a wheel spindle motor with speeds ranging to 10 hp, or an optional 20-hp spindle motor. The machine features high feed rates of 30 m/min. on the X axis and 20 m/min. on the Z axis. A variety of loader patterns is included for easy automation.

High Accuracy Angle Encoder Introduced —Heidenhain

Heidenhain updates its kit angle encoder line by modifying the ECA 4000 ring encoder to be able to survive and provide angular motion feedback within various machine types using a vacuum environment. Now able to handle a vacuum environment down to 10⁻⁷ mbar, the ECA 4000V encoder series has had a number of technical updates to accommodate high resolution and accuracy inside the vacuum chamber. The ECA 4000V encoder is suited for applications in semiconductor, flat panel, and instrumentation markets.

Careful consideration was made during the development of the ECA 4000V with regard to epoxies and materials of the drum and scanning unit so as to limit the amount of residual gas in the vacuum chamber. The scanning units now have vents to allow air to escape, and a special tin-plated copper outer shield for cabling, with a 15-pin vacuum rated connector to plug into the firewall feedthrough. Both the drum and scanning unit are produced on a special clean production line and are baked out to 100°C for 48 hours before being put inside vacuum-compatible packaging with two layers, the outer layer being nitrogen flushed. Residual

gas data in the vacuum chamber is actually displayed in the brochure of the encoder.

The ECA 4000V is centered onto the customer bearing in the same intuitive quick way as the ECA 4000. Vari-

ous drum diameters are available, from 70mm inner diameter up to 512mm inner diameter. Resolutions depend on drum size and range from 27 to 29 bits, with drum accuracies from +/- 1.5 arc seconds to +/- 3 arc seconds.

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New Products



Smart Damper Specifically Designed for Turning —Big Kaiser

As part of a growing offering of turning solutions unveiled at IMTS, Big Kaiser announces the release of the Smart Damper boring bar for lathe applications.

A heavyweight, strengthened damping mechanism integrated into the tool holder functions as both a dy-

namic counter and friction damper. It instantaneously absorbs vibration and eliminates chatter helping to achieve higher machining accuracy, better surface finishes and increased metal removal rates. It's also designed with the capability of supplying coolant through the body directly to the cutting edge.

The Smart Damper boring bar features three modular insert holders, optimized for right-hand I.D. turning with ISO standard inserts at a minimum diameter of Ø1.58". Metric bodies are available in Ø32 and 40mm, with inch versions at Ø1.250 and 1.500". The general rule of thumb with this system is boring depths are possible at approximately 7xd.

"Normally, when vibration occurs cutting speeds need to be reduced. These cutting speeds affect efficiency,

surface finish and tool life. The Smart Damper series has been so impactful for our customers, we made bringing this boring bar to market one of our top priorities as we expand our turning line," says Jack Burley, Big Kaiser vice president of sales and engineering.

New Large Vertical Turning Center —SMTCL Americas

SMTCL Americas has introduced the EVC160100s vertical turning center designed for manufacturers that compete in the world market and do large vertical turning. "The EVC160100s is a large, reliable and rugged vertical turning center that has been designed for machining a variety



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New Products

of materials including cast iron, aluminum, steel and composites,” said a company spokesperson.

“We have developed the EVC160100s configuration based on the needs of manufacturers in the aerospace, rail and energy industries,” said Jerry McCarty, chief operating officer. “Manufacturers love the capacity of this machine and its metalcutting ability and accuracy.” SMTCL includes a tool changer, Heidenhain scales and a chip conveyor as standard components.

The EVC160100s has a 55” chuck and swing of 63”. The machine has Z-axis travel of 39” and a 60 HP motor. The EVC160100s has a weight of 55,000 lbs. The machine is controlled by a Fanuc 0i-TF control with a 10 -inch screen and USB, PC/MIA and Ethernet interfaces.

Multi-tasking Turning Center Offers 100” Turning Length —Doosan

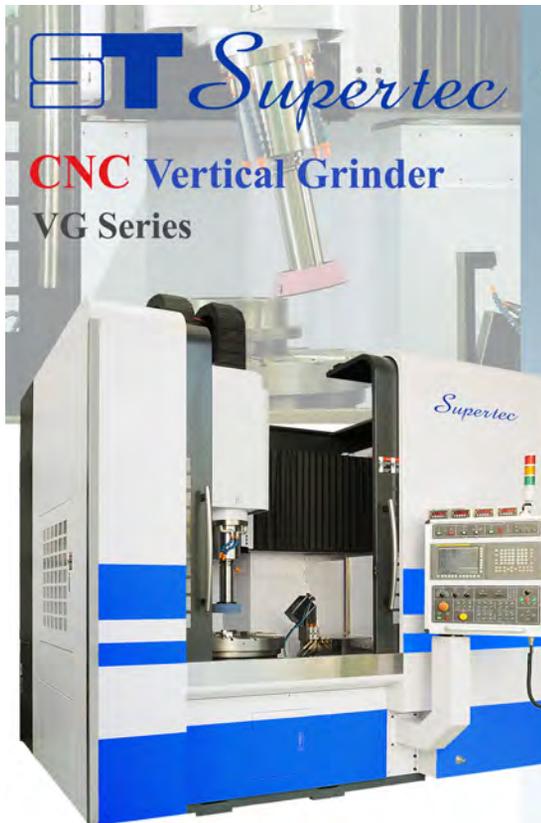
Doosan America has introduced the new Puma SMX 3100L tailstock model, which offers an extra long turning length of 100”.

Region manager Carl Barthelson said that the new line is a reflection of Doosan’s larger product development approach, which is to research customers’ needs and provide solutions, sometimes with specific niche applications in mind. “For example, the new Puma SMX 3100L model has the new longer 100 inch turning length dimension as a direct result of listening to our customers,” he said. “Many manufacturers in the aerospace and power generation markets need that extra capacity for their parts. Likewise for the medical industry, several companies in that market liked what we were doing in multitasking, but did not need such large equipment So, we now have

models that are ideal for medical and other smaller parts.”

In addition to the highlighted Z-axis travel of 100” other key specifications of the Puma SMX 3100L include a 4”

bar capacity and a maximum turning diameter of 26”. A range of chuck sizes can be accommodated. The main spindle is powered by 40 HP, 3,000 RPM motors. The Y-axis travel is



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11.8" and features the B-axis 12,000 RPM milling spindle that has a 0.0001° incremental accuracy control function and programmable C-axes.

Features and materials have been designed and built in to provide high rigidity, accuracy, thermal compensation and optimal ergonomics. In addition to using robust materials for mass, high rigidity and precision are also achieved through the use of roller-type linear motion components on all guideways.

The SMX machines allow tools to be loaded in the 80-tool magazine from the front. The Fancu 31i-B5 control panel moves from side to side and swivels.

Talent CNC Turning Centers

—Hardinge

Hardinge's Talent series of CNC turning centers, including the 42 and 51 models, are designed for accuracy, flexibility and durability in a compact machine. The series offers two separate base structures providing short and standard bed lengths. The machines feature robust one-piece cast iron bases, heavy-duty roller linear guideways and ballscrews. The collet-ready design of the main spindle and subspindle increases part accuracy and improves surface finish, the company says.

The turning centers are equipped with through-tool and headwall air/

coolant for both the main spindle and subspindle, foot switches, chip conveyor interface, bar feed interface, and an air hose with an air gun. A Fancu OiTF CNC is provided as the control. Additionally, the Talent series is available with a variety of options including: live tooling, Y axis, servo tailstock, subspindle, parts catcher, chip conveyor and bar feeds.

SmartTouch™ Shop Floor Interface

—Spectrum CNC

Spectrum CNC Technologies™ announces the release of SmartTouch™; the intelligent interface



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provides machine operators with easy touch screen access to Multi-DNC files and serves as a feedback loop for job status information. Operators can report parts counts, downtime reasons and much more. Customizable 'one-touch' buttons make feedback fast and easy.

SmartTouch supports both Multi-

DNC and Machine Monitoring applications on the shop floor. Based on a rugged shop-tested touch screen, the SmartTouch can be configured to support individual job status feedback from operators as well as electronic parts counts. All shop floor DNC files and functions as well as customized monitoring feedback are accessed through SmartTouch.

SmartTouch serves as a shop floor interface for Multi-DNC™ Software, providing machine communications and control. Multi-DNC software, coupled with state-of-the-art communication hardware networks CNC machines and robots. It supports CNC communications for uploading, downloading and dripfeeding. Multi-DNC manages CNC programs, offsets,

parameters and can automatically capture probe data.

SmartTouch serves as an operator feedback interface for Multi-MDC Machine Monitoring, a browser based real-time machine monitoring system that automatically collects machine output data to an MS-SQL database. Real time dashboards and production reports display shop floor manufacturing data including OEE, cycle, alarm, spindle, tool usage, idle, setup, tear-down, machine downtime and more.

SmartTouch, Mutli-DNC software and the Multi-MDC Machine Monitoring application are all connected to the shop floor via a wireless and wired network made possible by WiBox, communication hardware.

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New Vacuum Workholding Solutions —TCI Precision Metals

TCI Precision Metals announces its new vacuum workholding solutions designed to reduce overall production time and improve part holding when using flat stock. The specialized vacuum chucks are available in standard size configurations, but can also be custom produced to support unique customer requirements.

Vacuum workholding is an ideal solution to secure hard-to-hold parts and with no clamps, the number of set ups is also reduced. TCI Precision Metals specialize in making flat, close tolerance, machine-ready blanks and has perfected the vacuum workholding solutions required to hold them.

TCI Precision Metals has ap-

plied extensive experience in production machining, workholding and the realities of the production environment to the development of their vacuum workholding solutions. Each Solution is built to last with industrial grade components and hard anodized finish for extended wear. TCI Precision Metals reports their vacuum workholding solutions are suitable for many applications, including: vertical machining centers,



horizontal machining centers, router milling machines, tombstones, pallet changers, grinders and rotary tables

Tri-Cam Countersink introduced —Rocky Mountain Twist

The new Rocky Mountain Twist Tri-Cam Countersinks are designed with high-flow flutes for excellent material evacuations and finely tuned cutting edges for a smoother countersink finish. This results in a smooth, consistent finish for true fastener interface.

The countersinks are manufactured from fully hardened steel for optimum cutting edge and thread life and are available in both M2 high-speed tool steel and M42 cobalt. Precision CNC



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RMT's countersinks are designed, engineered and manufactured in the USA.



New XM-60 Multi-Axis Calibrator —Renishaw

Renishaw's new XM-60 multi-axis calibrator is capable of measuring all six degrees of freedom from a single set-up, in any orientation for linear axes.

As demands on component tolerances increase, manufacturers are now required to consider all error sources from the machines producing parts; angular errors as well as linear and straightness errors. XM-60 captures all these errors in a single set-up. Designed for the machine tool market, the XM-60 multi-axis calibrator complements Renishaw's calibration product line that includes the XL-80 laser system, XR20-W rotary axis calibra-

tor and QC20-W wireless ballbar. The XM-60 uses the XC-80 environmental compensator to correct for environmental conditions.

The XM-60 multi-axis calibrator provides a highly accurate laser system that incorporates unique technology with a patented optical roll measurement and fiber optic launch system. The compact launch unit is remote from the laser unit, reducing heat effects at the point of measurement. It can be mounted directly to the machine on its side, upside down and even on its back, which is particularly beneficial in areas with difficult machine access.

Reducing uncertainties of measurement is paramount for any user. The Renishaw XM-60 has been designed to measure machine errors directly,

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reducing the inaccuracies that can result from complex mathematics used in some alternative measurement techniques. Direct measurement makes comparison before and after machine adjustments a quick and simple task with users existing part programs for XL-80 measurement. The receiver is fully wireless and powered by rechargeable batteries, avoiding trailing cables during machine moves that could cause inaccuracies or break the laser beam during measurement.

Behringer Expands VA-L Line Of High Performance Circular Cold Saws —Behringer

Behringer Saws, Inc., announced it has added the VA-L 500 to its line of high performance circular cold saws. Behringer Eisele GmbH designed the VA-L 500 sawing system specifically for production cutting of aluminum and non-ferrous materials. With a frequency-controlled main drive system and adjustable cutting speeds, the VA-L 500 can saw the full range of aluminum alloys and other non-ferrous materials in solids, thin-walled pipe and profiles highly efficiently.

The VA-L 500 saw comes standard



with a 32 H.P. frequency controlled drive motor with 800-3400 RPM speed range and a servo-driven downfeed with an adjustable rate from .39"/sec to 19.6"/sec. The fully automatic high-performance circular cold saw has a cutting range of 6.0" for round materi-

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als or 6" x 6" for square materials at 90° using a carbide-tipped circular saw blade with a diameter of 19.6".

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A Lift-and-shift device for material feed, a ensures the material is lifted slightly over the material support table, enabling the material to be "freely" fed without touching the material table and clamping jaws, eliminating damage to the surface of the material. Furthermore, to reduce buildup of chips and scratching of material, a blowing device rapidly removes chips

from the clamping area. Standard on the VA-L 500 is a material disposal/discharge unit.

New Hollow Shaft Connection Encoders —Heidenhain

Heidenhain introduces a new series of functionally safe hollow-shaft connection encoders to the manufacturing equipment industry. Called the ECN/EQN/ERN 400 series, these new rotary encoders are especially useful in applications where quick machine shut-off is required in dangerous situations.

Featuring a new shaft coupling which provides mechanical fault exclusion for connection to the customer's



machine shaft, these new ECN/EQN/ERN 400s are of particular use in safety-related applications up to SIL 2 PL d category 3 levels. The encoders are available with a blind hollow shaft or a hollow through shaft with a choice of 10mm or 12mm diameter.

The safe ECN/EQN/ERN 400 hollow-shaft encoders will be offered with either the EnDat 2.2 or DRIVE-

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CLiQ absolute serial interfaces or even an analog 1 VPP output. Encoders using the EnDat2.2 and Drive-CLiQ outputs will additionally feature an internal temperature sensor integrated in the encoder electronics as well as an evaluation circuit for an external temperature sensor to use for evaluation of the motor temperature.



New High Precision Jig Grinding Machines —Supertec

Supertec introduces 3 sizes of jig grinders covering a full range of capability. Models offered include the JG-

510M (20" x 12" x 4" x 13" X,Y,Z,W), the JG-1270CM (47" x 27" x 4" x 16"), and the JG-1010G (39" x 39" x 10" x 16") a double column style.

The JG-510CM model has an X

and Y axis positioning accuracy of $\pm 0.000060''$ and a planetary grinding roundness of $\leq .00004''$. The Z axis is driven by a high speed linear motor for faster acceleration and greater repeatability.

All models utilize the Fanuc31i-B control for 4 axis simultaneous movement with 12 grinding modes including user friendly automatic pecking macros.

A KSK brand German made hydrostatic spindle with RPM's up to 60,000 is used for greater accuracy and reliability. Air spindles for speeds up to 150,000 rpm are available based on application.

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New Products



Kentucky Built VTC Delivers Speed and Power —Mazak

The new Mazak VTC-805E vertical traveling column machining center combines an increased Y-axis stroke, long bed/table size, high spindle speed and torque and Mazak's new SmoothG

CNC control for efficient, powerful machining.

The VTC-805E provides an extended Y-axis travel of 32" as a cost-effective alternative to a bridge-style machine. The machine's fixed table measures 82.7" x 32.3" while its moving column design provides a 69.3" X axis and 28.3" Z axis.

With an optional center partition, it is possible to transform the VTC-805E's table into two separate work areas to process parts on one side, while operators load/unload parts on the other for an overall reduction in cycle times. A special turret-style magazine accommodates 40 tools for longer

periods of uninterrupted production.

Mazak equipped the VTC-805E with a powerful 30-hp, CAT 50-taper, 6,000-rpm spindle that easily tackles a wide variety of materials including titanium, aluminum, steel and cast iron. Mazak offers an optional 40-hp, CAT 50-taper, 10,000-rpm spindle.

The VTC-805E features the new Mazatrol SmoothG CNC that makes it easy to generate programs for off-centerline machining as well as angled drilling, milling and tapping operations. Advanced hardware including a tilting CNC panel and intuitive, multi-touch control screen allows for complete ease of use.

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Precision Tools

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Smallest Mini-Skimmer To Date Comes with On/Off Switch

—Wayne Products

Wayne Products releases the Mini-Skimmer R.S., a belt-type oil skimmer that collects over a quart of oil per hour despite its tiny housing that measures just 3"x3"x2.75". Designed as an easy-to-use solution for small machine shops, Mini-Skimmer R.S. skims unwanted tramp oils from coolants, but can rest easily with the flip of a switch once its job is complete.

Named after Rich Segermark, the company's founder and inspirational innovator, Mini-Skimmer R.S. is the smallest of Wayne Products' expanding family of oil skimming products.

The company reports it is the only oil skimmer on the market with an on/off switch, allowing users to easily monitor its activity, and is lightweight and small for seamless transportation between machines. "This oil skimmer is the perfect solution for small machining operations. It has been designed from scratch to address key customer needs while hitting a price point previously unattainable", says Don Ware, president of Wayne



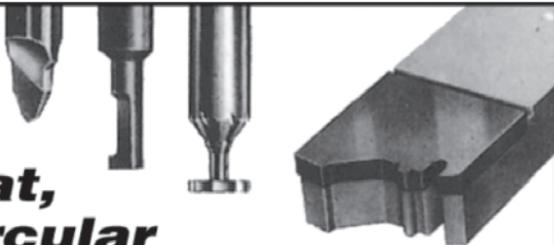
Products.

The design of Mini-Skimmer R.S. emphasizes ease of use, knowing that smaller machine shops sometimes need a small, simple product that is portable, yet effective. Mini-Skimmer R.S. comes with the company's industry-standard, stretch-resistant, fiberglass-reinforced cogged belt but has a liquid tight housing made of anodized aluminum and a motor with high torque for a skimmer of its size.

New a120nx Horizontal Machining Center

—Makino

Makino announces the a120nx horizontal machining center. This machine is built to take on oversized structural



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components, while delivering high levels of speed and accuracy.

The a120nx features X-, Y- and Z-axis travels of 74.8 inches, 63 inches and 66.9 inches and the machine's standard large pallet size of 39.4 inches by 39.4 inches provides capacity for parts weighing up to 11,000 pounds. The machine's automatic pallet changer switches from one pallet to the next in 38 seconds. Capable of storing up to 204 tools of wide-ranging sizes and designs, the a120nx accommodates tools up to 35.4 inches long, 14.0 inches in diameter, and weighing up to 77 pounds.

At the foundation of the machine is a three-point supported bed casting to ensure all points are stable and contacting the floor. Building on the rigidity

of the bed casting, the a120nx uses a unique tiered column design that delivers greater resistance to Z-axis cutting forces throughout the work envelope.

The a120nx is equipped with Makino's four cone pallet location and clamping system that delivers a secure 46,500 pounds of force on the pallet. This clamping capability, combined with all pallets built to a master pallet, eliminates deflection.

The a120nx has a number of systems in place to manage the heat generated by rapid traverse of 2,126 inches per minute. The ballscrews are core-cooled in all axes. Moreover, the ballscrews are all dual supported and pre-tensioned. Feature-to-feature movement distances on large parts are typically much greater, so rapid

traverse rates were increased.

It has a standard high torque 8,000-rpm spindle. With 50 continuous (74 peak) horsepower available, this spindle is ideally suited for heavy roughing of iron castings and hard-metal applications.

The a120nx offers supplementary management features, including a sloped surface to remove obstacles between the workpiece and an external chip conveyor, letting chips fall freely. The trough design facilitates rapid chip and coolant evacuation and reduces maintenance needs with a solid panel Z-axis cover design.

The a120nx comes to the market 'automation ready'.

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New Products



New PJ812 Three-Axis CNC Precision Profile Center

—Mitsui Seiki

The new Mitsui Seiki PJ812 precision profile center is a three-axis CNC vertical jig mill engineered to perform

high-precision contour machining and ultra precise boring of components with critical tolerances. It is ideal for processing parts for the mold and die, optical, aerospace and medical industries.

The PJ812 machining center provides positioning accuracy and repeatability of +/- 1µm. A thermal compensation system employs sensors on the machine faceplate and inside the spindle to minimize the effects of temperature changes on part accuracy and cut temperature-generated displacement by 60 percent. Mitsui Seiki reports this system also reduces Z-axis thermal growth and deflection by 30 percent. Cooling systems for slide way lubrication and ball screw cores stabilize axis feed precision.

Mechanical design features that

maximize machine rigidity and accuracy include hardened and ground tool steel box slideways as well as contact elements that enhance acceleration, reduce stick-slip, and allow for feed accuracy of 0.1 µm. Another proprietary engineering detail drastically improves the static rigidity of the Z-axis to more than six times that of conventional Z-axis arrangements.

The PJ812 machining center spindle choices up to 30,000 RPM are all 50-Taper, with 40/20 hp direct drive motors. X-, Y- and Z-axis travels are 48", 32", and 20" respectively. The machine table can accommodate a maximum load of 3,300 lbs on its 48" x 32" work surface. Overall machine footprint is 189" by 120". A 40-tool capacity ATC is standard.

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The fully enclosed machine enclosure allows for complete containment of chips and coolant, while affording excellent work loading and set up ergonomics.

The PJ812 possesses an energy saving circuit that reduces electric power consumption by up to 90 percent and compressed air consumption by up to 40 percent. The latest FANUC 31iM-B CNC is equipped with a new HMI and a 19" LCD screen for ease of operation and at-machine programming

DSM Heavy-Duty Duplex Milling Machines

—You Ji

The DSM series of heavy-duty duplex milling machines from You Ji is

engineered specifically for two-, four-, or six-sided production squaring and chamfering of square and rectangular workpieces. Depending on the machine configuration chosen, end users can machine blocks as small as 0.750" x 0.750" and as large as 47" x 47" in maximum thicknesses ranging from 6" (150 mm with 10" cutter) to 16" (400 mm with 16.5" cutter).

The machines' duplex spindle design enables simultaneous two-sided milling that produces consistent parallelism and perpendicularity as well as tight tolerances and fine surface finishes. Heavy one-piece cast-iron machine bases are engineered via Finite Element Analysis (FEA) modeling technology.

These duplex milling machines feature rotary worktables that move



in the X-axis on roller-type linear ways and index from 0° to 315° at 45° intervals. Hydraulic clamping and Hirth couplings combine to produce positioning accuracy of +/- 0.0003" and repeatability of 0.0002".

The machines' twin milling heads move on rigid box ways along the Z-axis. The heads feature variable-speed NT50- or NT60-taper spindles and 15 or 30 hp, depending on the machine

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model. The spindles produce high levels of torque at low rpm.

Machine operation is semi-automatic, as workpieces are shuttled in manually then automatically centered, clamped and checked. Clamping pressure increases in steps to expedite accurate centering and provide sufficient clamping force to eliminate chatter.

Clamping fixtures are modular and can be tailored to specific workpiece shapes.

Every DSM series machine utilizes a Mitsubishi C-70 control with a touch-screen interface and HMI (Human Machine Interface) customized to You Ji specifications. Operator-friendly software speeds setups and reduces

changeover time by allowing subsequent jobs to be set up while machining is in process. A Cutting Memory Module stores workpiece-material-based cutting data that can be applied to new parts.

Each DSM milling machine includes standard automatic measuring and positioning functions as well as a control cabinet heat exchanger, chip conveyor, semi-enclosed machine guarding, and ten sets of clamping fixtures.

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New 125 mm Vise —Jergens Inc.

Jergens Inc. introduces its 125 mm vise and 96 mm Drop & Lock™ pallet as a universal quick-change solution. The two work together on vertical and horizontal machining centers, and significantly open up possibilities on five-axis / multi-axis machining centers for increased machining access and the quick change over of both top tooling and machineable parts.

The new 125mm multi-axis, low-profile, self-centering vise features a compact footprint for broad use on quick-change pallets systems. The vise is constructed from 4100 series steel and precision ground to ensure accuracy and repeatability. With the addition of pull studs, this vise is compatible with products like the Quick-Point® system. When used with the new 96mm Drop & Lock™ pallet, the vise is completely compatible with all Jergens 5-axis fixture pro® multi axis

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The 96mm Universal Drop & Lock™ pallet is a new Jergens pattern that is compatible with popular top tooling such as Makro-Grip® workholding products and Jergens Fixture Pro products.



Dial Test Indicators Released —Mitutoyo

Mitutoyo America Corporation announces the release of lever-type dial test indicators with increased durability, sensitivity and readability.

A wide array of styli and ruby tips allows for probing of many applications. Stylus length is marked on the dial face to assist customers when ordering replacement styli.

To improve readability, a glare-free, flat crystal face has been incorporated to allow for easy viewing of graduations. In addition, the font and dial face color were changed. Multiple layers of hard, smudge-resistant coatings on the crystal prevent scratches and contamination.

An O-ring seal on the bezel provides smooth rotation and prevents oil and dust from contaminating the dial face. A flange was added to prevent the bezel from becoming detached during use. Optional limit hands can be attached to the bezel, allowing for easy identification of tolerance limits.

Improved impact-resistance and a one-piece internal assembly protect your indicator. The one-piece assembly also makes replacement of internal

components simple, should service be required. A unique sub-plate structure has been incorporated into all models to prevent the stylus from becoming loose. Redesigned mounting of the gears allows the indicators to maintain good trackability even with prolonged use.

Choose from a variety of dial positions: horizontal, horizontal with a 20-degree tilted face, vertical and parallel.

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Carlsbad, CA Company Begins Design of ViaSat-3 Satellites

ViaSat Inc. said its first two ViaSat-3 satellites have completed their first important step toward production and launch – a stage in the process called preliminary design review.

ViaSat plans a constellation of three ViaSat-3 satellites, which will offer broadband services to consumers, airlines and other businesses, large and small. One will serve the Americas; a second will serve Europe, the Middle East and Africa; and a third will serve the Asia Pacific region. Its partner in the project is satellite-builder Boeing Co.

November's preliminary design review is "the first critical milestone toward confirming the ViaSat-3 satellites will satisfy performance specifications and requirements when operating on orbit," ViaSat said in a statement. "Completion of this step allows ViaSat and Boeing to begin detailed design work on each satellite."

The first flight hardware for ViaSat-3 is scheduled to arrive in ViaSat's Tempe, Ariz., satellite integration facility in late 2017, ViaSat said. Launch of the first ViaSat-3 class satellite is set for 2019.

The satellites are being built on the Boeing model 702 satellite platform.

For each ViaSat-3 class satellite, ViaSat will build the satellite payload, integrate the payload into the Boeing payload module and test the integrated payload. Boeing will provide system integration and test, launch vehicle integration and mission operations services.

Boeing, Jet2.com Finalize Order for Four Next Generation 737-800s

Boeing and UK Leisure Airline Jet2.com have finalized an order for four Next Generation 737-800s, valued at \$384 million at current list prices.

Jet2.com, an all-Boeing carrier, previously had 30 Next Generation 737-800s on order, eight have been delivered already in 2016.

Chula Vista, CA. Metals Distributor Acquired by New York Competitor

Plastics & Metals Enterprises, a Chula Vista, CA based provider of plastic and

metal sheets, tubes and rods that does business as Cal Plastics and Metals Inc., has been acquired by a large competitor based in Orchard Park, NY.

Buyer Curbell Plastics Inc. said the purchase will shorten lead times for its growing customers based on the West Coast customers. It added that Cal Plastics' customers will not experience interruption in their service or in the personnel serving them.

Vista Outdoor Announces Expansion in Lewiston, ID

Vista Outdoor Inc. has announced plans to expand its ammunition manufacturing capacity in Lewiston, ID, creating up to 137 new jobs. The company's current Lewiston operations (CCI, Speer and Southport locations) occupy approximately 400 acres and 315,000 sq. ft. And employ approximately 1,400 employees. Expansion plans include hiring engineers, program managers, technicians and manufacturing employees.

"Vista Outdoors' decision to expand its operations in Lewiston is an exciting addition to our existing ammunition and gun manufacturing sector in Nez Perce County," said Nez Perce county commissioner Bob Tippet. "This sector represents nearly one out of every five jobs in the county, and is a critical part of our economy."

Navy Awards Contracts to 3 Southern California Manufacturers

Two San Diego manufacturers – Delta Group Electronics Inc. and Quality Systems Integrated Corp. – are among three companies that the U.S. Navy tapped for custom fabricated electronic parts. The three will compete for up to \$12 million in task orders over two years, according to a Pentagon statement issued Jan. 30.

The third company is NPI Services Inc. in Costa Mesa. The deal calls for the three to provide custom parts using a variety of manufacturing capabilities in support of rapid prototyping.

The Navy may, at its option, extend the contracts up to five years and cap them at \$30 million.

Continued to page 98.....

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...Hotline Continued From 96

Maker of Electric Vehicle Components Sets up in West Sacramento

A Japanese company that manufactures components for electric vehicles is setting up its U.S. headquarters and first U.S. manufacturing facility in West Sacramento.

Mikuni Color Ltd., which also produces synthetic organic industrial dispersion ink, has moved into 21,000 square feet at Riverside Commerce Center. The exact address was not available, although the center is on Riverside Parkway, in the northern part of the city. The site appears to be owned by Westcore Properties.

According to a news release from the city of West Sacramento, the U.S. site will supply products for manufacturing lithium ion batteries, for use in electric vehicles.

Aerospace Groups Merge, Vow to Persuade Boeing to Make Next New Airliner in Puget Sound Region

Two Washington state aerospace industry groups have merged operations, saying they're eliminating overlap and joining forces to persuade Boeing to make its next new airliner in the Puget Sound region.

The boards of directors of the Aerospace Futures Alliance of Washington (AFA) and the Washington Aerospace Partnership (WAP) unanimously supported merging the two industry organizations, effective immediately, following a year of talks, said AFA President and CEO Kelly Maloney, who remains the leader of the combined entity.

"There was a lot of overlap between our boards of directors and members," AFA Board Chairman Ben Hempstead said. "By merging the organizations, we can streamline our offerings and lessen the confusion in the industry of having too many aerospace entities to belong to."

Hempstead, a senior executive with Boeing tool and factory automation supplier Electro-impact in Mukilteo, represents one of 1,400 aerospace and manufacturing companies that belong to the AFA, which aims to advance the interests of the aerospace sector in the state through its lobbying, outreach and education efforts, as well as recruiting new companies to move here.

The new group will retain both names: AFA

-The Washington Aerospace Partnership. The AFA recently announced it was publishing a new quarterly aerospace magazine called LIFT.

Pietsch said the new combined entity will lead the effort to encourage Boeing to build its next new airplane in Washington, which could be announced within the next few years.

General Atomics ASI Gets \$11.9 Million Royal Air Force Contract

General Atomics Aeronautical Systems Inc. has a new contract to provide the U.K. Royal Air Force with spare parts and support equipment for the U.K.'s fleet of remotely piloted MQ-9 Reaper aircraft.

The U.S. Air Force announced the \$11.9 million contract on Feb. 1. Work will be performed in Poway, CA. and run through November 2018.

The MQ-9 Reaper is an unmanned aircraft also known as the Preda.

Boeing Lands \$13.8 Billion Jet Order from Singapore Air

Boeing says Singapore Airlines has agreed to buy 39 wide-body jets, including 20 Boeing 777-9s and 19 Boeing 787-10 Dreamliners.

The aircrafts are set to be delivered starting in 2021, Singapore Air said in an announcement.

Boeing is scheduled to debut the 777-9s by 2020, according to Bloomberg News. The 787-10 is the longest Dreamliner model.

Boeing said state-owned Singapore Airlines also has committed to a previous order for 30 Boeing 787-10 airplanes.

High-Tech 'Megafactory' in San Jose to Create Hundreds of jobs

Velodyne LiDAR is in the final set-up stages of opening what it calls a "megafactory" in south San Jose to produce three-dimensional sensors in demand for the self-driving car market, among other uses.

"Production will start soon," a company spokesman said, who added that the facility will employ "hundreds" but not as many as 500.

"This Megafactory provides Velodyne LiDAR the space it requires to manufacture its cutting edge, long-range sensors in a single location, as well as the ability to scale to meet growing global customer demand for LiDAR while pursuing an aggressive growth strategy," Mark Shandley, Velodyne vice president of operations, said in a news release.



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Acu-Rite Co.	BackCover	Gosiger	18,19	Phase-A-Matic	92
Air Vac Systems	62	Haimer	88	Pierson Workholding	29
Arizona CNC.....	18	Hainbuch	59	Pioneer Tool.....	87
Autodesk.....	65	Hanwha Machinery.....	37	Precision Tool	53
Barton Intl	86	Hartwig	18	Q-Mark Mfg Inc.....	92
Bison.....	76	Heidenhain.	Back Cover	QPlus.....	88
Blum Novotest	64	Heimatec	89	Refresh Your Memory..	76,93
Bucci Industries	93	Helfer Tool Co.....	90	Renishaw.....	66
Cecor	94	Hogue Precision Machy.....	6	Rosco Precision Machinery	
CG Tech.....	61	Hurco	98	98
Chevalier Machinery.....	16	Intech Funding.....	52,84	Royal Products	86,95
Cimco	71	Iscar.....	7	Selway Machine Tool.....	2
City National Bank.....	36	Int'l Search Consultants....	91	Setco USA.....	79
CME.....	90	Jergens.....	67	Smart Skim	70
CNC Matters.....	15	K D Capital Equipment	87	SME/Westec.....	47
CNC Solutions	52,98	King Machine.....	53	Southwestern Industries	
Cobra.....	82	Kitamura	6	Inside Back Cover
Comex	88	Koma	68	Star CNC	9
Cygnus Expo/Portland	55	Lyndex Nikken	44	Supertec USA.....	81
CyTek.....	11,74,94	Lyon Group Holdings.....	41	Takisawa Taiwan.....	35
D & R Machinery	98	Machine Control Tech.....	78	Tornquist Machinery	35
Darmak.....	95	Machinery Sales.....	6,98	TQS	53
DIL.....	93	Machine Toolworks	46	Tsugami Rem Sales.....	28
Doosan Infracore.....	21	Mastercam CNC Software.....	10	US Shop Tools.....	15
Eco Green	83	Matsuura.....	2	Vac U Lok	85,91
EDM Network	45	Matt Clark Mfgs Service ..	84	Verisurf Software	69
Ellison Technologies	21	Methods Machine Tools.....	5	Webb Precision Mach.....	80
Fadal	1	Mini Mover.....	89	Western Metrology Sales	53
Fagor	Inside Front Cover	Mitutoyo America	63	Whipple Enterprise	89
Femco.....	14	North South Machinery.....	77	YCM.....	43
Fives Machining Systems.	17	Okuma	18	Zeiss,Carl IMT	27,53
Foothills Machinery Sls.....	98	Pacific Inspection.....	53	Zimmermann Products	73
Ganesh Machinery	52	Pacific Machine&Engrg	87		

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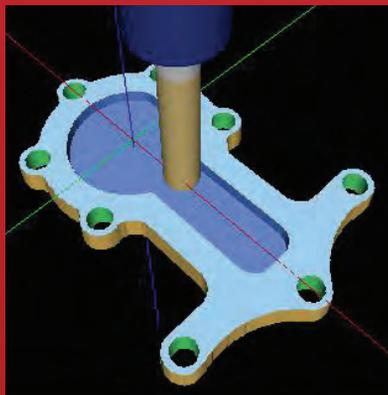
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