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CNC-WEST

Volume 37 - Issue 4

THE MAGAZINE FOR WESTERN METAL WORKING MANUFACTURING

SOFTWARE & CONTROLS

- STUDENTS IN CONTROL WITH ACU-RITE
- CASCADE ENGINEERING TECHNOLOGIES STARTING WITH THE END IN MIND
- SHARKS INVEST WITH SEAL - SEAL INVESTS IN HURCO
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CNC West

April/May 2019 • Volume XXXVII No 4

Feature Stories

Departments

UC Davis School of Engineering relies on Acu-Rite Controllers in the learning process for their students.....Pg.22

An Oregon aerospace manufacturer utilizes Vericut to make sure every part is verified before it gets on a machine.....Page 32

An ex-Navy Seal got funded via the TV show Shark Tank and used the money to buy a Hurco cell and grow a thriving business.....Pg.40

Coming in June/July 2019

Turning, Screw Machine and Medical Issue —This special issue features turning centers and screw machining. It highlights western shops that combine both machining and turning to streamline output.

Editorial: May 22, 2019
Ad Space: May 24, 2019
Ad Material: June 5, 2019

CNC WEST

VOL. XXXVII NO.4

April/May 2019

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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Sofware & Control Issue

This is our annual Software & Controls issue and I hope you enjoy reading it as much as I did putting it together. Our cover article is about the UC Davis College of Engineering and how they utilize Acu-Rite Controls. It always puts a smile on my face when I see our younger generation getting interested in metalworking manufacturing. This can be an exciting industry and the more young people that show an interest in it or at least know about it the better. It seems that the UC Davis College of Engineering is doing a great job of that. You will find out for yourself when your read the article beginning on page 22.

Another article deals with a shop in Oregon that uses a sales pitch that they are who you want when it comes to manufacturing large, complex, monolithic, thin walled structures because of their metrol-ogy focus. They are well versed in metrology with seven Zeiss CMM's and utilize Vericut Software to simulate parts before they actually cut the material.

CNC WEST editor Sean Buur's other article took him to Arizona where he met up with an ex-Navy Seal who went on the TV show Shark Tank to help fund his project for bullet bottle openers. The sharks were impressed with the seal and he received money to purchase a Hurco cell which makes his popular product. One of the reasons he chose the Hurco was the ease of use on the control.

We have an article about a northern California bicycle manufacturer who utilizes Mastercam CNC Software to get the company rolling. (pun intended). They prototype the bikes then manufacture them and have become world known in the mountain bike community.

As always, Tim Paul offers his insights and delivers and interesting read on pages 60 and 61. There are other supplied stories from Nikon, Mitee Bite and Shop Floor Automations. This is in addition to a preview of the upcoming machine tool show in Portland along with our new product section and industry news. Thanks for reading and if you lose your copy of CNC WEST or someone steals it you can see each issue online at cnc-west.com

Sincerely
Shawn Arnold

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Publisher

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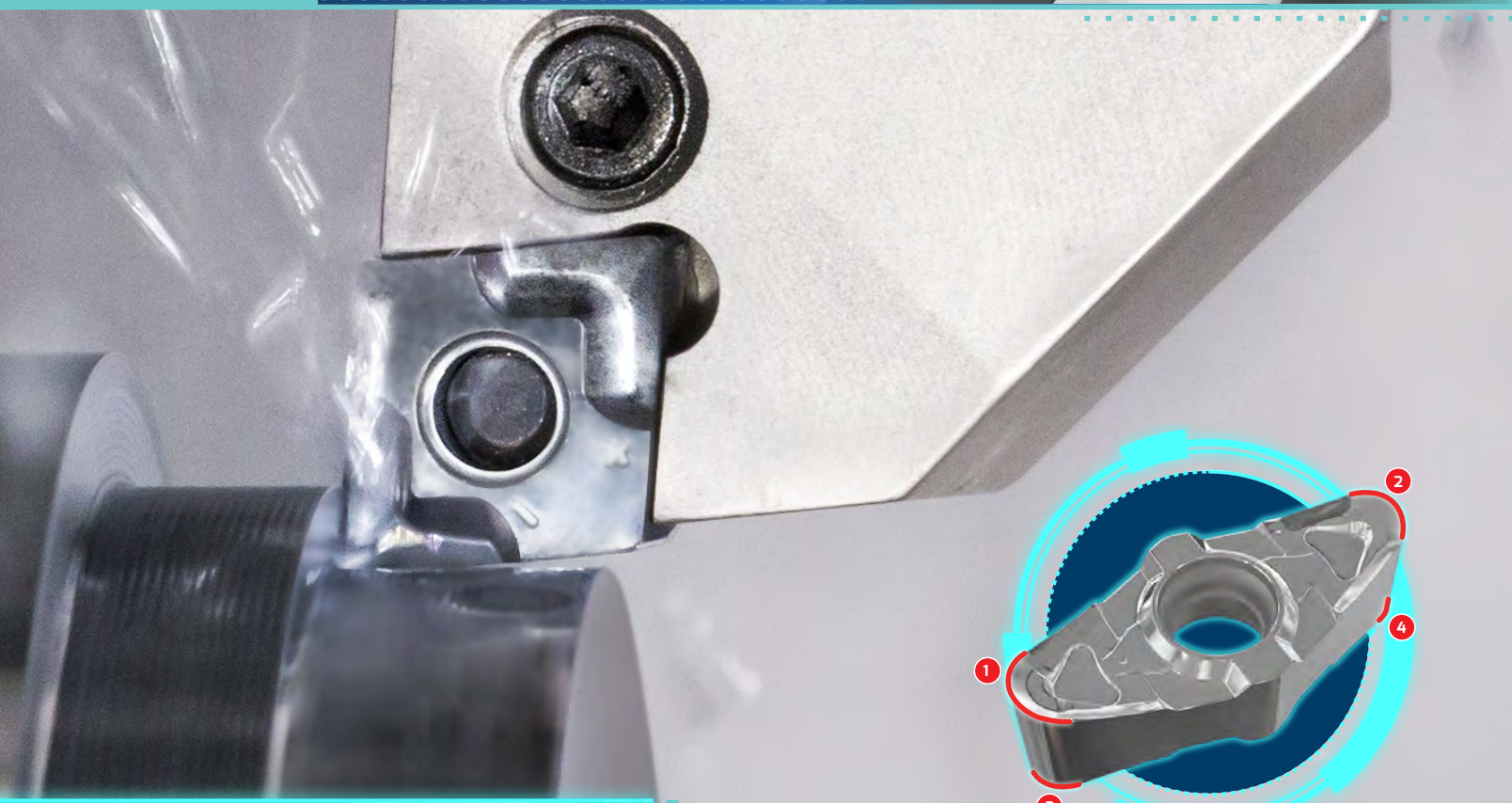

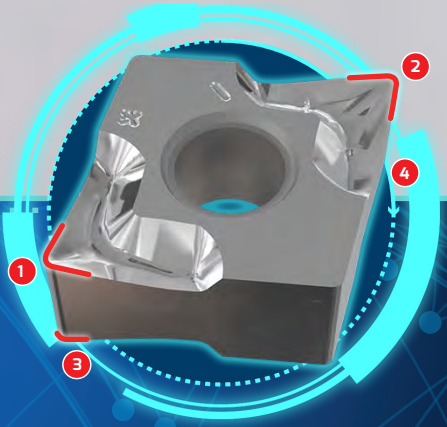

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Boeing in El Segundo Secures Work

The Boeing Co. has been awarded a $4 billion modification contract by the Department of Defense to produce 78 F/A-18 Super Hornet fighter jets for the U.S. Navy.

The contract stipulates the production and delivery of 78 F/A-18 aircraft, specifically 61 F/A-18E and 17 F/A-18F aircraft for fiscal years 2018 through 2021, according to the Department of Defense.

The company's El Segundo, California, plant will get 61 percent of the work with a variety of other operations filling out the rest.

Palmdale, CA Company Produces 500th Center Fuselage

Northrop Grumman Corp. produced its 500th center fuselage for the F-35 Lighting II jet fighter in late February at its Palmdale manufacturing facility, the company announced.

The aerospace and defense contractor said it was ahead of schedule with this delivery.

Northrop produces the fuselage using an integrated assembly line that employs robotics and automation. The fuselages are sent for final assembly to a Fort Worth, Texas plant operated by Lockheed Martin Corp.

Kevin Mickey, sector vice president and general manager of military aircraft systems in Palmdale, said that Northrop has set the standard for producing military aircraft.

"Our teams and suppliers are constantly finding better, more affordable ways to deliver a superior product on-time, at-cost and, as with this center fuselage, ahead of schedule," Mickey said in a statement.

The F-35 is the newest single-seat fighter developed for the U.S. and foreign militaries. The aircraft comes in three versions – conventional takeoff and landing for the U.S. Air Force, carrier takeoff and landing for the U.S. Navy and short takeoff and vertical landing.

San Diego Based Kratos Buys Florida Turbine Technologies

Kratos Defense, which has a business building small military drones, may soon build its own jet engines for those aircraft.

The San Diego company announced Feb. 28 that it acquired a majority stake in Florida Turbine Technologies Inc. for $60 million. Kratos is paying $33 million in cash and $27 million in Kratos stock.

Kratos also announced the formation of a new business unit focused on small, affordable, high-performance jet engines, to be led by executive Stacey Rock.

The deal gives Kratos an 80.1 percent stake in FTT. The San Diego business will have the option to buy the remaining 19.9 percent at an unspecified date in the future.

Vector Secures Additional $70M in Series B Financing

Vector, a leading microsatellite launch company with manufacturing in Arizona comprised of New Space and enterprise software industry veterans from SpaceX, Virgin Galactic, McDonnell Douglas, Boeing, Sea Launch and VMware,recently announced that it has secured $70M in a Series B funding round led by Kodem Growth Partners, in conjunction with Morgan Stanley Alternative Investment Partners. Existing investors Sequoia Capital, Lightspeed Venture Partners and Shasta Ventures also participated in the round.

"Vector's solution for routine and affordable access to space is what motivated Sequoia to partner with Vector in their Series A," said Bill Coughran, Partner at Sequoia. "Since then, Vector has grown rapidly and we look forward to continuing the journey with this tenacious team."

"Low earth orbit satellite launches are projected to grow nearly four times in the next four years, but no dedicated launch platform exists with robust capability to get small satellites into space," said Alex Taussig, Partner at Lightspeed Venture Partners. "

Over the next few months, Vector will expand its sales and marketing teams, effectively doubling its footprint in Silicon Valley. In addition, as the company enters into the production phase of its launch vehicles, Vector expects to break ground on its state-of-the-art factory in Tucson, AZ

Continued on page 96.....

NORTHWEST MACHINE TOOL EXPO
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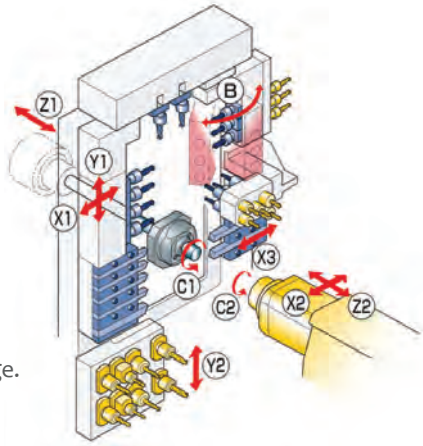

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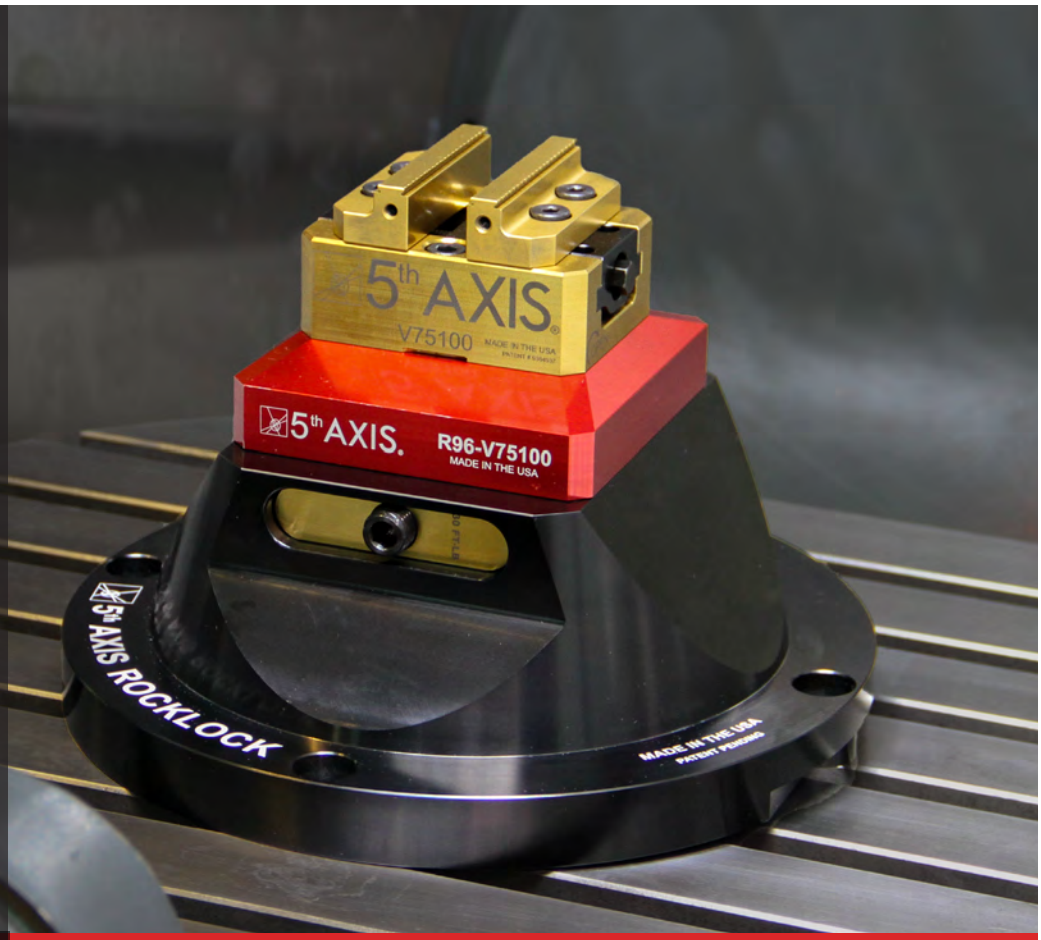

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For Kitagawa, Strong, Samchully, MMK & Howa Chucks

- For CNC lathe chucks with 1.5mm x 60° serrations
- Also available in steel or cast iron
- Additional heights available
- Up to 32" diameter
- Round Jaws MADE IN USA!

MADE IN USA

Model	Chuck Size	Groove Width	Screw Size	Hole Space	Hgt Inch	ALUMINUM Part Number	ALUMINUM Set Price
Kit B206 N206 HS-06	6"	0.472	10MM	0.787	2	RKT-6200A	$ 72.61
					3	RKT-6300A	$104.86
					4	RKT-6400A	$118.88
Kit B208 N208 HS-08	8"	0.551	12MM	0.984	2	RKT-8200A	$ 85.36
					3	RKT-8300A	$134.30
					4	RKT-8400A	$159.83
Kit B210 HS-10	10"	0.630	12MM	1.181	2	RKT-10200A	$126.28
					4	RKT-10400A	$193.60
Kit B12 HS-12	12"	0.709	14MM	1.181	2	RKT-12200A	$184.71
					3	RKT-12300A	$245.72
Kit B212 BBM 315	12"	0.827	16MM	1.181	2	RKT-12208A	$184.71
					3	RKT-12308A	$278.56

GRIP-RITE HARD JAWS XTRA BITE

For 1.5mm x 60° Serrations Chucks

OEM STYLE

XTRA BITE

- Designed for first operation roughing, **expect runout between 0.005-0.010**
- Reversible- for OD & ID workholding
- 2 steps (1 step hard jaws also available)
- Both styles feature ground body for improved run-out
- **OEM Style** features ground tips
- **XTRA BITE:** Very aggressive bite with conical teeth for extra gripping
- For Kitagawa™, Samchully™ & other chucks

Chuck Model	Chuck Dia	GRIP-RITE OEM STYLE Part Number	GRIP-RITE OEM STYLE Price Per Set	XTRA BITE Part Number	XTRA BITE Price Per Set
B206, HS06	6"	KT-60HJ2-U	$245.75	KT-60HJ2-X	$256.55
B208, HS08	8"	KT-80HJ2-U	$294.53	KT-80HJ2-X	$312.71
B210, HS10	10"	KT-100HJ2-U	$336.60	KT-100HJ2-X	$370.44
B-12	12"	KT-120HJ2-U	$391.99	KT-120HJ2-X	$415.42
B-212, HS12	12"	KT-128HJ2-U	$390.92	KT-128HJ2-X	$416.29
B-15	15"	KT-150HJ2-U	$504.90	KT-150HJ2-X	$554.85

USST JAW BORING RING

A Faster, Easier & Accurate Way To Bore Soft Jaws!

- Ideal for machining soft jaws
- Attaches quickly without tools
- Bore jaws in a single operation
- Reduces set-up time
- Allows for through boring of jaws

Fits Kitagawa, Samchully, Strong,TMX, MMK, Howa, SMW, Seoam, Autoblock and other CNC chucks!

Chuck Dia	Part #	Price
4"	JBR-04	$162.00
5"	JBR-05	$162.00
6"	JBR-06	$184.25
8"	JBR-08	$226.48
10"	JBR-10	$255.67
12"	JBR-12	$284.23
15"	JBR-15	$427.06

ADJUSTABLE JAW BORING RING

NEW ITEM!

- Suitable for CNC lathes
- Easy to attach-no tools needed!
- Jaws are bored at same clamping pressure used to hold part
- Economical-3 jaw boring rings cover chucks sizes from 5"-12"!

Chuck Size	ID	OD	Part Number	PRICE
5,6,8"	3.94	6.7	JBR-TL5-8	$379.00
6,8,10"	4.92	7.9	JBR-TL6-10	$439.00
8,10,12"	6.30	9.8	JBR-TL8-12	$519.00

USST SOFT CHUCK JAWS

For Kitagawa, Strong, Samchully, MMK & Howa Chucks

- For CNC lathe chucks with 1.5mm x 60° serrations
- Available in steel or aluminum
- Flat end or pointed
- Additional heights available

IN STOCK & READY TO SHIP!

QUANTITY DISCOUNTS!
5% OFF 5 Sets or More Soft Jaws!
(Must be same part number)

MADE IN USA

Model	Chuck Size	Groove Width	Screw Size	Hole Space	Hgt Inch	STEEL Part Number	STEEL Set Price	ALUMINUM Part Number	ALUMINUM Set Price
Kit B206 HO27M6 HS-06	6"	0.472	10MM	0.787	2	KT-6200F	$ 34.37	KT-6200AF	$ 31.59
					3	KT-6300F	$ 44.99	KT-6300AF	$ 41.12
					4	KT-6400F	$ 95.71	KT-6400AF	$ 86.08
Kit B208 ZA6-8 HS-08	8"	0.551	12MM	0.984	2	KT-8200F	$ 40.70	KT-8200AF	$ 38.56
					3	KT-8300F	$ 46.82	KT-8300AF	$ 50.90
					4	KT-8400F	$ 61.00	KT-8400AF	$ 62.11
Kit B210 HS-10	10"	0.630	12MM	1.181	2	KT-10200F	$ 45.84	KT-10200AF	$ 46.66
					4	KT-10400F	$ 76.14	KT-10400AF	$ 67.46
Kit B12 HS-12	12"	0.709	14MM	1.181	2	KT-12200F	$ 72.00	KT-12200AF	$ 74.05
					3	KT-12300F	$ 107.96	KT-12300AF	$ 90.10
Kit B212 BBM 315	12"	0.827	16MM	1.181	2	KT-12208F	$ 72.00	KT-12208AF	$ 74.05
					3	KT-12308F	$ 107.96	KT-12308AF	$ 90.10

*For Pointed Soft Jaw s, replace the "F" w ith "P" & add $4.00 (6"-10") /$7.00 (12" & above) per set.

USST AMERICAN STANDARD TONGUE & GROOVE CHUCK JAWS

For Bison, Buck, BTC, Cushman, TMX, PBA & Rohm Chucks

- Many more sizes & styles available
- American Standard tongue & groove
- Chuck Jaws stocked in California & Michigan!
- 100% MADE IN THE USA!

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Chuck Size	Groove Width	Tongue Width	Screw Size	Hole Space	Hgt Inch	STEEL SOFT JAWS Part Number	STEEL SOFT JAWS Set Price	ALUMINUM ROUND JAWS Pie Dia	ALUMINUM ROUND JAWS Part Number	ALUMINUM ROUND JAWS Set Price
6"	.312	.499	3/8	1.500	2	TG-6200F	$ 41.64	6"	RTG-6200A	$ 76.66
					4	TG-6400F	$ 71.66	8"	8-RTG-6400A	$ 158.83
8"	.312	.499	3/8	1.750	2	TG-8200F	$ 22.15	8"	RTG-8200A	$ 103.80
					3	TG-8300F	$ 64.44	10"	10-RTG-8300A	$ 240.33
10"	.501	.749	1/2	2.125	2	TG-10200F	$ 23.83	12"	12-RTG-10200A	$ 184.94
					4	TG-10400F	$ 75.33	15"	15-RTG-10400A	$ 607.05
12"	.501	.749	1/2	2.500	2.5	TG-12250F	$ 72.22	15"	15-RTG-12250A	$ 494.11
					4	TG-12400F	$102.35	18"	18-RTG-12400A	$ 851.69
15"	.501	.749	5/8	3.000	2.5	TG-15250F	$ 87.22	21"	21-RTG-15250A	$ 908.09
					4	TG-15400F	$113.74	24"	24-RTG-15400A	$ 1,550.55

*For Pointed Soft Jaws, replace the "F" with "P" & add $4.00 (6"-10")/$7.00 (12" & above) per set.

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- Fits standard 5C collets with internal threads
- 6 hardened steel stop rods included-1/16", 1/8", 3/16", 1/4", 3/8", 3/4"
- 3/4" stop rod keeps parts square to spindle axis
- Proprietary locking system prevents the possibility of the stop rod slipping in the body
- Body is red anodized 6061-T6 aluminum
- Body fits a 7/8" wrench

NEW ITEM!

5C COLLET STOP
Part # EDGE-45000
Mfg's List: $49.99
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COLLET PADS & TOP JAWS

Convert Your 3 Jaw Chuck Into A Precision Bar Machine!

MADE IN USA

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Warner & Swasey Collet Pads	"S" Style Collet Pads	Top Jaws For 8" CNC Chucks
Prices Starting At:	Prices Starting At:	Prices Starting At:
$53.74 Set	$54.60 Set	$452.00 Set
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3 JAW FORGED STEEL BODY CHUCKS

- **Fine adjustment 0.0006" TIR**
- **Forged steel body**
- Two piece "master jaw" style top reversible jaws
- Each scroll precisely balanced
- Plain back-backplates and replacement parts available
- MADE IN POLAND

10% OFF Mfg's List

Size	Thru Hole	Max RPM	Part Number	Mfg's List	SPECIAL!
6"	1.65	4600	BI-3866-0600P	$ 916.52	$ 824.87
8"	2.17	4000	BI-3866-0800P	$1,096.20	$ 986.58
10"	2.99	3500	BI-3866-1000P	$1,515.66	$1,364.09
12"	4.06	2800	BI-3866-1200P	$1,946.25	$1,751.63
15"	5.35	2000	BI-3866-1600P	$3,716.41	$3,344.77

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Bush Rite™

- Type C, Z, J, LB, LBF, B & Boring Bar Sleeves!
- Concentric ground & diamond polished
- Wrench flats for easy removal
- "Easy Entry" feature on OD
- Large variety available

TYPE J	TYPE C	TYPE Z
Starting At:	Starting At:	Starting At:
$38.33 each	$50.43 each	$60.52 each
Part # TBJ-07-0250-B	Part # TBC-07-0250-B	Part # TBZ-07-0375-B

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- +/– 0.00005" TIR guaranteed
- Standard point angle is 60°
- Rotating point is hardened for wear resistance
- Sturdy, low cost, American made center for light/medium-duty work

Value-Turn®

Taper	Max RPM	Wt. of WP (lbs)	Thrust Load	Part Number	Price Each
1 MT	5,000	390	3,730	ROY-10851	$296.40
2 MT	5,000	390	3,730	ROY-10852	$274.55
3 MT	5,000	390	3,730	ROY-10853	$295.45
4 MT	4,500	750	4,990	ROY-10854	$358.15
5 MT	4,500	750	4,990	ROY-10855	$402.80

EDGE TECHNOLOGY CHUCK STOP SET

- 10 sets of hardened parallel bars
- 0.0002" parallelism accuracy
- Parallel heights:1/2" to 1-5/8" x 1/8" inc.
- Magnets secure the stop to chuck face
- Centering plug fits ID of the chuck and keeps the Chuck Stop centered
- Included centering plug diameters are 1.4", 2.0", 2.5", 3.0", 3.5", and 4.0"
- The Chuck Stop is 6.0" in diameter
- Designed for 3 jaw chucks only
- For use on 6" diameter chucks and larger

NEW ITEM!

CHUCK STOP SET
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With Internal Threads

- Crafted to exacting standards from alloy steel
- Heat treated threads and spring tempered body for accuracy and long life
- **Internal threads** for use with threaded collet stops
- Large variety of round, hex and square sizes
- **EMERGENCY COLLETS** also available in 5C, 3J & 16C

16C & 3J ROUND Collets	16C & 3J SQUARE Collets	16C & 3J HEX Collets
$59.00 ea	$74.00 ea	$69.00 ea

PH Workholding 5C STEP COLLETS

- For OD workholding
- Allows for large diameter parts to be held in 5C collets
- Soft face for easy machining
- Diameters from 2" to 6"

Head Dia	Part Number	Price EA
2"	550-002-PH	$45.16
3"	550-003-PH	$52.42
4"	550-004-PH	$76.40
5"	550-005-PH	$109.90
6"	550-006-PH	$128.34

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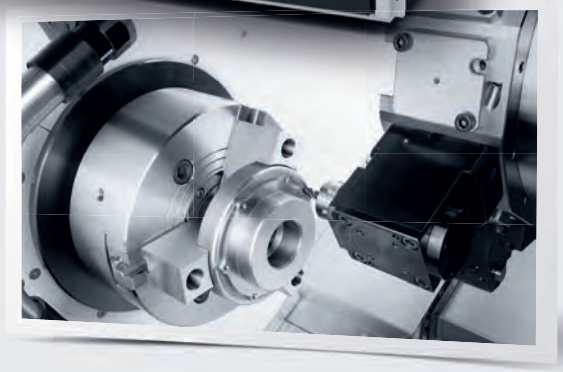

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How Modern-Day Apprentice-Ships Can Help Manufacturers Succeed

Steven Brand - CMTC - www.cmtc.com

By now, you've probably heard the troubling statistics. IndustryWeek reports that nearly 25% of manufacturing employees are age 55 or older, and many will soon be leaving to enjoy a well-earned retirement. Unfortunately, there's no influx of new talent waiting to take their places. Some people feel shut out of job opportunities by degree requirements they don't have; others lack on-the-job experience they can't get; and then there are those who still view all manufacturing jobs as "dark, dirty, and dangerous," and simply aren't interested in the industry.

Because of this talent shortage, experts predict that there will be a total of two million skilled manufacturing jobs unfilled by 2025 if nothing is done now. To combat the next generation of workers' concerns about training and misconceptions about manufacturing, manufacturers of all sizes have once again begun embracing apprenticeships—that age-old method of transferring the tribal knowledge of one generation to the next.

The Re-emergence of Apprenticeships

When you hear the word "apprenticeship," your mind may have you traveling back to 16th century England, when a young man—sometimes barely into his teenage years—would indenture himself to a "master" who would train him in a skilled profession, such as blacksmithing, in return for a bed, daily bread, and maybe a few shillings. Apprenticeships in the 21st century look much different, and since January 2017, employers have hired nearly 410,000 apprentices! Today's apprentices are male and female, ranging in age from late teens to middle-age. Apprentices can be found in a diverse number of fields, including healthcare, hospitality, finance, construction, energy, information technology, transportation, and of course, manufacturing. Some of the most in-demand manufacturing apprenticeships include CNC Set-Up Programer, Precision Machinist, Industrial Maintenance Repairer, Mold Maker, Die Caster, Plastics Fabricator, and Tool and Die Maker.

People accepting an apprenticeship begin their journey on the lowest rung of their chosen industry's ladder, usually making minimum wage—though some employers may offer a much more competitive salary to attract highly motivated apprentices. Moving up can take time, with some apprentices having to put in as many as 8,000 hours of work depending on the skill level required of the discipline. As apprentices put in more hours, their compensation increases and they begin to take on new levels of apprenticeship. After graduating from being an apprentice, they move into journeyman status and finally into a master craftsperson position. Aside from on-the-job training, many apprentices also benefit from in-house and college instruction; some manufacturers are even paying all or part of their apprentices' and journeymens' tuition, enabling them to obtain a college degree or advanced certification while still earning money.

.

How to Start an Apprenticeship Program

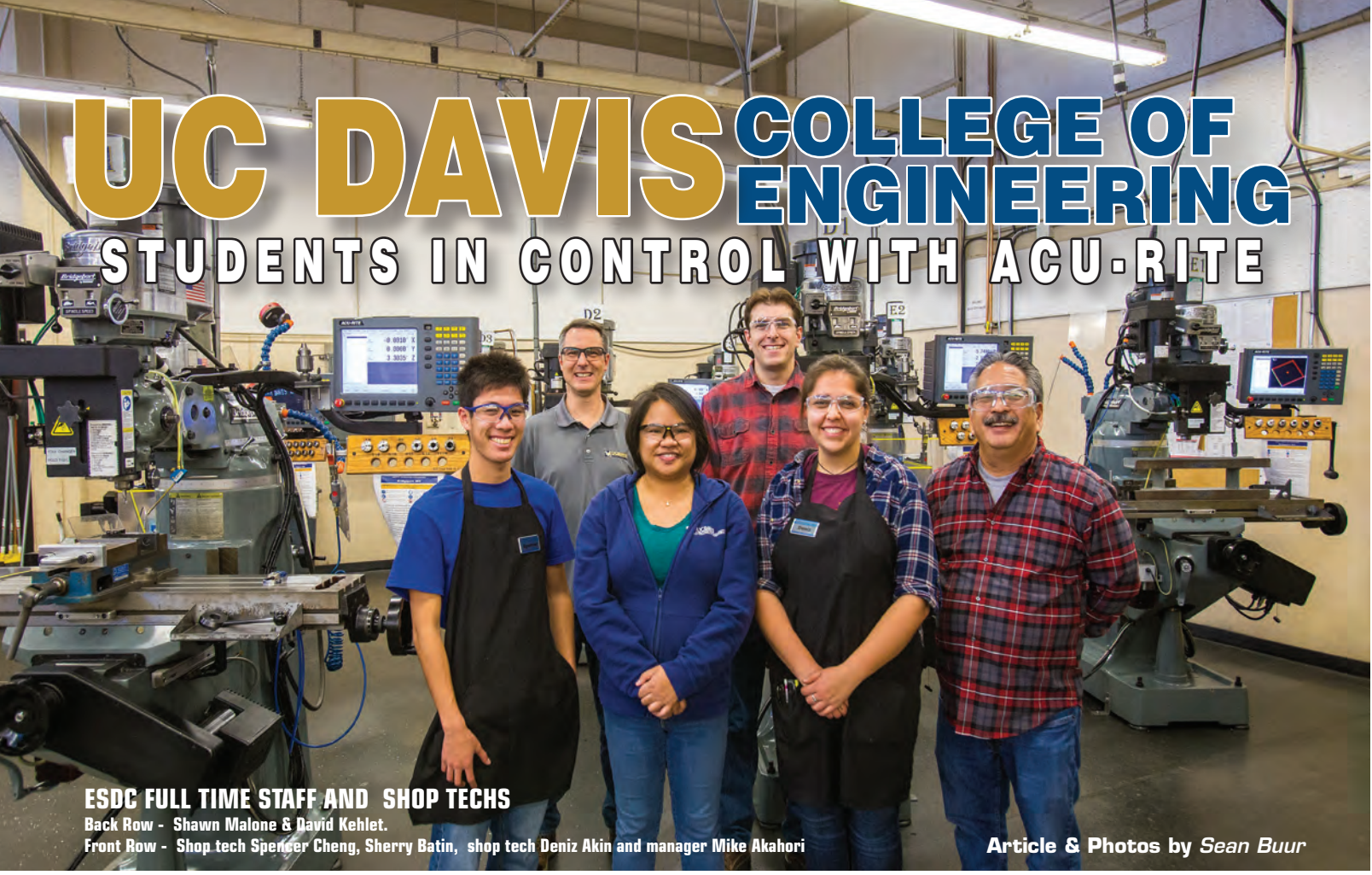
Support for apprenticeships continues to grow—and hybrid programs offering a combination of online learning and in-house training are also picking up steam. In mid-2018, Congress significantly increased the federal appropriation for apprenticeship to $145 million. If you're interested in developing an apprenticeship program for your manufacturing business, there are a number of resources available on the U.S. Department of Labor website. Here, you'll find the information and building blocks you need to start building your program, including:

- Apprenticeship FAQs, because you're certain to have questions.
- A Quick-Start Toolkit, offering a step-by-step guide to starting an apprenticeship program.
- A Federal Resources Playbook, offering an overview of federal programs that are available to support your apprenticeship program.
- An Apprenticeship Registration Tool to help you register your program.

Apprenticeships have been around for centuries, but temporarily took a backseat to the pursuit of college degrees. Now, however, apprenticeships are making a big comeback—and they're a win-win for workers and employers alike. Apprentices' learn valuable skills without having to pursue a degree that many can't afford, while employers benefit from increased productivity and retention (without losing valuable tribal knowledge that might otherwise leave the company along with retirees). If you're looking to bring new talent to your factory floor, there's no time like the present.

UC DAVIS COLLEGE OF ENGINEERING

STUDENTS IN CONTROL WITH ACU-RITE



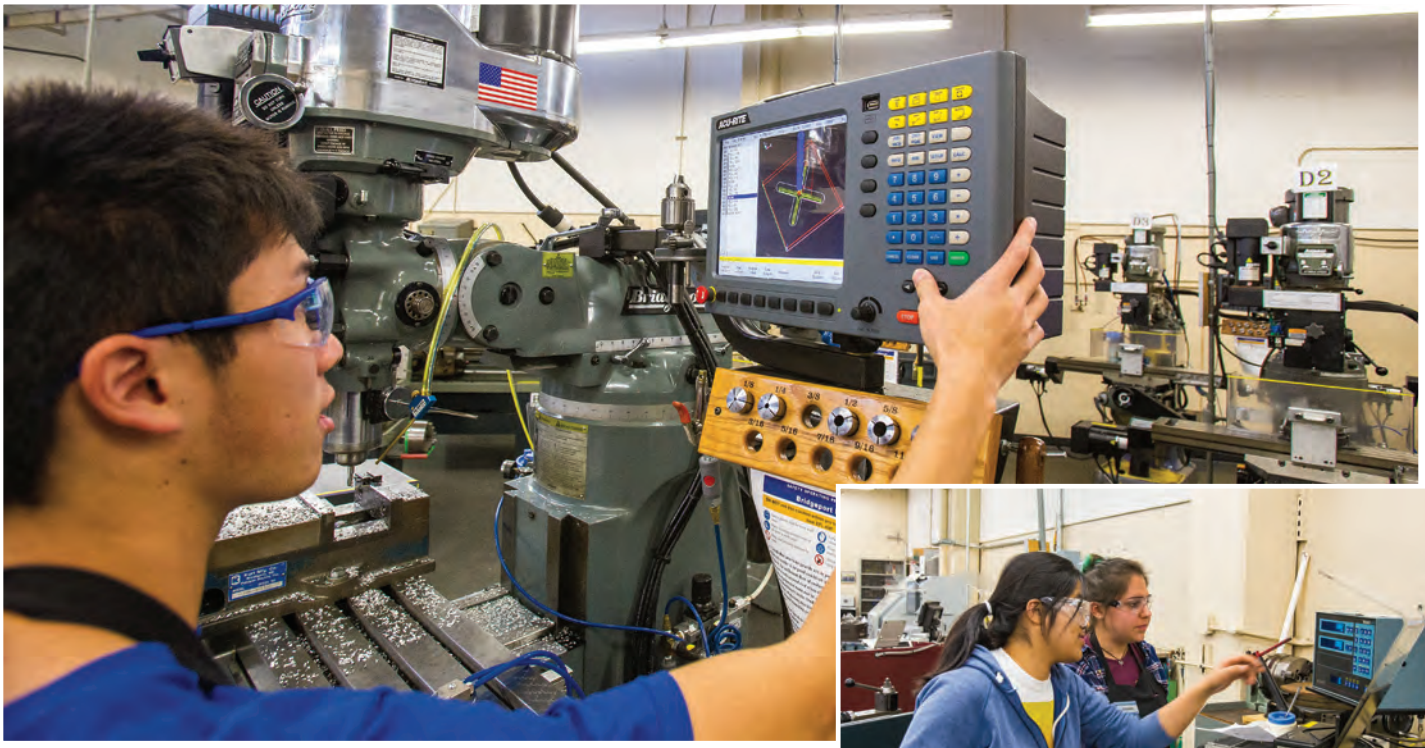
ESDC FULL TIME STAFF AND SHOP TECHS
Back Row - Shawn Malone & David Kehlet.
Front Row - Shop tech Spencer Cheng, Sherry Batin, shop tech Deniz Akin and manager Mike Akahori

Article & Photos by *Sean Buur*

UC Davis is regarded as one of the top public universities in the nation, and their College of Engineering is a primary reason why. Students are demanding more and more technology and UC Davis is keeping up with that demand.

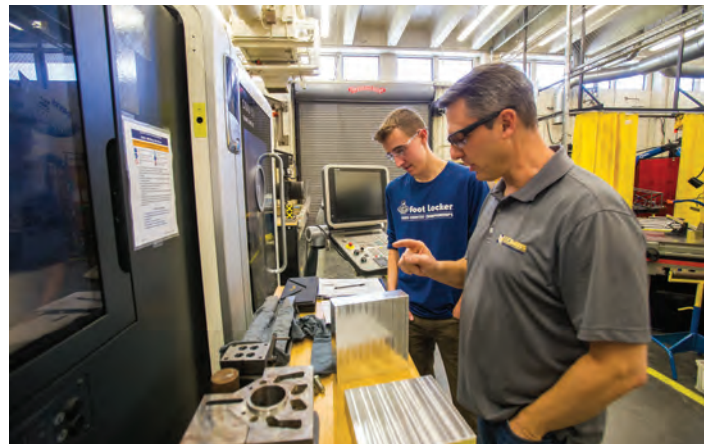
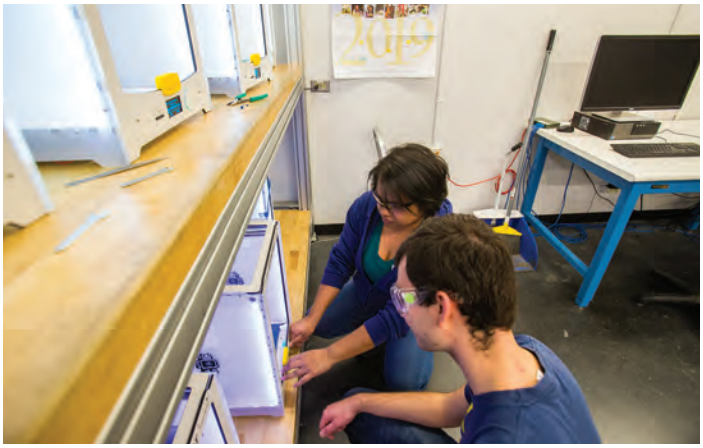
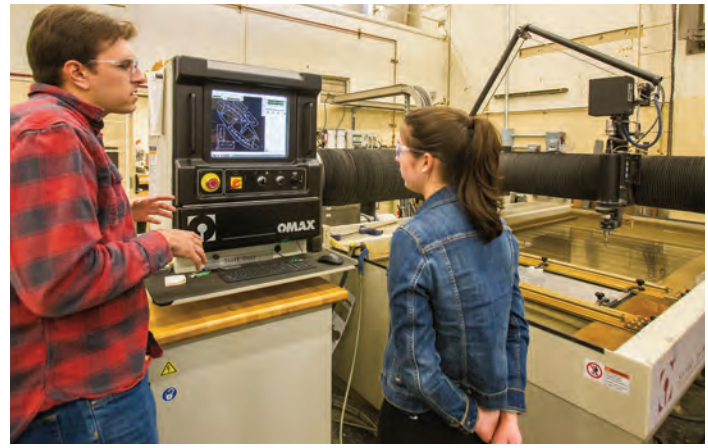
At the heart of it all is the Engineering Student Design Center (ESDC) headed up by a staff of four and a student staff of 18. It is a 10,500 sq.ft. resource of learning prowess and manufacturing awesomeness. Just some of the equipment in the ESDC are: FARO Arm Scanner, a DMG MORI DMC 1035V ecoline mill, a DMG MORI DMU 50 5-axis mill, DMG MORI ecoTurn 450 lathe, a Sodick AP350 wire EDM, CO2 laser, an Omax 55100 water jet, 10 Bridgeport mills with ACU-RITE G2 controllers, and 10 Harrison-Clausing lathes with ACU-RITE controls, welding, saws and all support equipment needed for the many disciplines at the College of Engineering. The ESDC is better equipped than many of the local area shops. "All the machine tools are part of the student's mental tool box when it comes to designing elements and producing them," explains 25-year shop manager Mike Akahori. "We are very well equipped as a shop when it comes to machines and staff. The student that comes here to do graduate work is pleasantly surprised when they see the machine tools available to them. I am sure they didn't have the same level of shop at their previous school. Our students are a bit spoiled and think it is this good everywhere, but honestly, UC Davis offers a pretty well balanced program." Some schools like UC Berkley are more analytically based, while the Maritime Academy is even more hands on and directed primarily at ships. UC Davis College of Engineering falls about in the middle and offers plenty of both. "The College of Engineering invests a lot of money to have a facility like this, and to be able to staff it properly," continues Mike. "We are very fortunate to have a leadership team that supports us and the program. Student and parent expectations get higher and higher every year so we constantly are raising the bar. It is great for the students. Chevron is one of our program sponsors and they are looking for graduates who are work ready. They can't afford to babysit new hires for a few years and love how prepared our graduates are."

Every year approximately 8000 students make their way into the ESDC for one project or another. Five hundred new students get introduced to the shop year after year, the majority of them coming from the mechanical engineering program. "Here at the ESDC we have courses scheduled throughout the week, both lecture and lab," tells R & D engineer David Kehlet. "Students spend about 30 hours a quarter in the lab. They use that time learning the culture of the shop as well as the basics



Shop techs are a key part of the ESDC. With only four full-time staff the ESDC relies on 18 shop techs to keep the lab running smoothly. Some days 18 isn't even enough to support the shop. Spencer Cheng (above) hopes to get a job in manufacturing after graduation. (Right) Shop tech Deniz Akin helps a fellow student on a lathe op. Her only experience with tools came in the EME50 class, but that has sparked a desire in her to learn more about CNC.

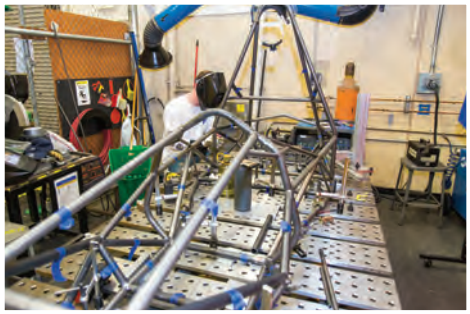
The BIM 110L project is a digital microscope assembly. The assembly is a cell phone stand embedded with an inexpensive magnifying lens to which the cell phone's camera is aligned producing a magnified image of a specimen with focus capabilities. Everything they program they do directly on the ACU-RITE G2 controllers and it is easy. The controls are easy to learn, easy to use and user intuitive. The ACU-RITE G2 controllers are extremely powerful, and once the students figure them out they have no problems programming.

The staff in the UC Davis ESDC have over a century of manufacturing and educational experience between them. Each has their own area of expertise.

on cleanup, shop management, machine use and so forth. After they progress past the basic EME50 class they are welcome to come back any time during our open lab periods. Anyone qualified to use the machines is welcome to do so during open lab time. It might be for a specific course or for senior projects like Formula SAE or the steel bridge competition." Machine time is first come first serve for the most part, but if a student requires staff assistance they need to make an appointment. Students are encouraged to figure things out themselves, but occasionally they need assistance on the water jet or building a fixture for the DMG MORI machines. Students spend on average 2.5 years in the shop as they complete their studies. "We get better student retention as engineering majors by getting them involved in the ESDC sooner rather than later," tells Mike. "Analytically and theoretically are not nearly as much fun as hands on experience building and exploring. Other schools even utilize our projects as part of their curriculum because it is a proven learning tool. The EME50 gyroscope project has been going on since the mid 70's, and is a right of passage for students. It's not uncommon for graduates to interview for a job and see a gyroscope on the shelf behind the person conducting the interview. They try and play it cool, but every one of them knows exactly what their time was and how they placed in the contest."

All shop projects begin with a manual process and transitions into doing a similar process via CNC. From the Mechanical's gyroscope and totem projects to the Bio Med's digital microscope, the teaching and learning prac-




Engineering Student Design Center (ESDC) is 10,500sq.ft. of manufacturing and learning bliss. With EDM, milling, turning, lasers, 3D printing, a full fab shop and an electronics lab the ESDC is better equipped than many of the local area shops.

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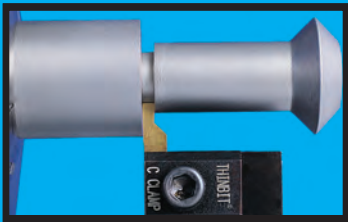

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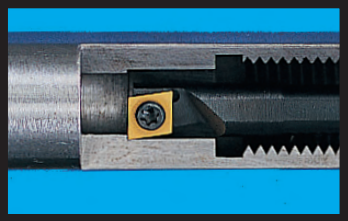

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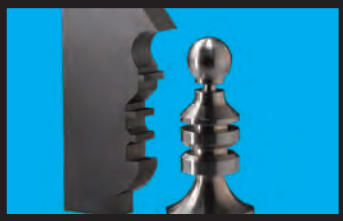

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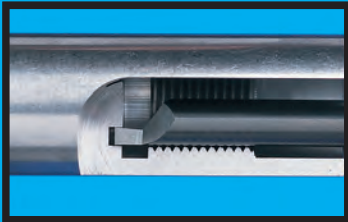

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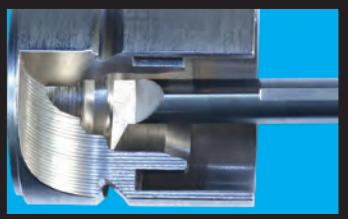

PROFILING

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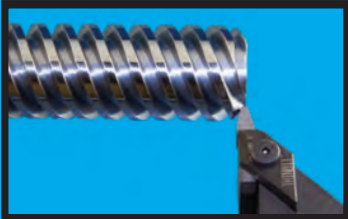

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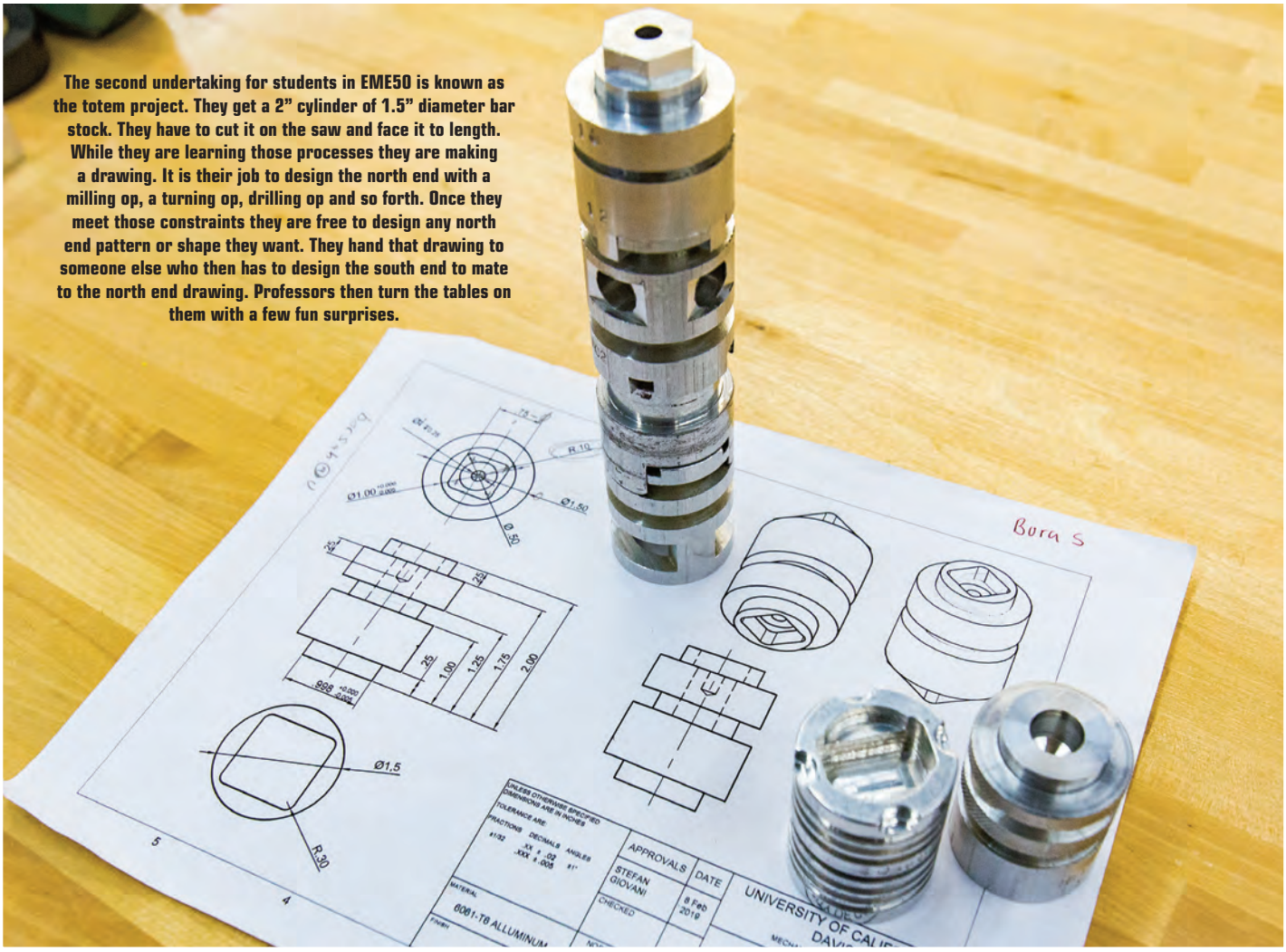
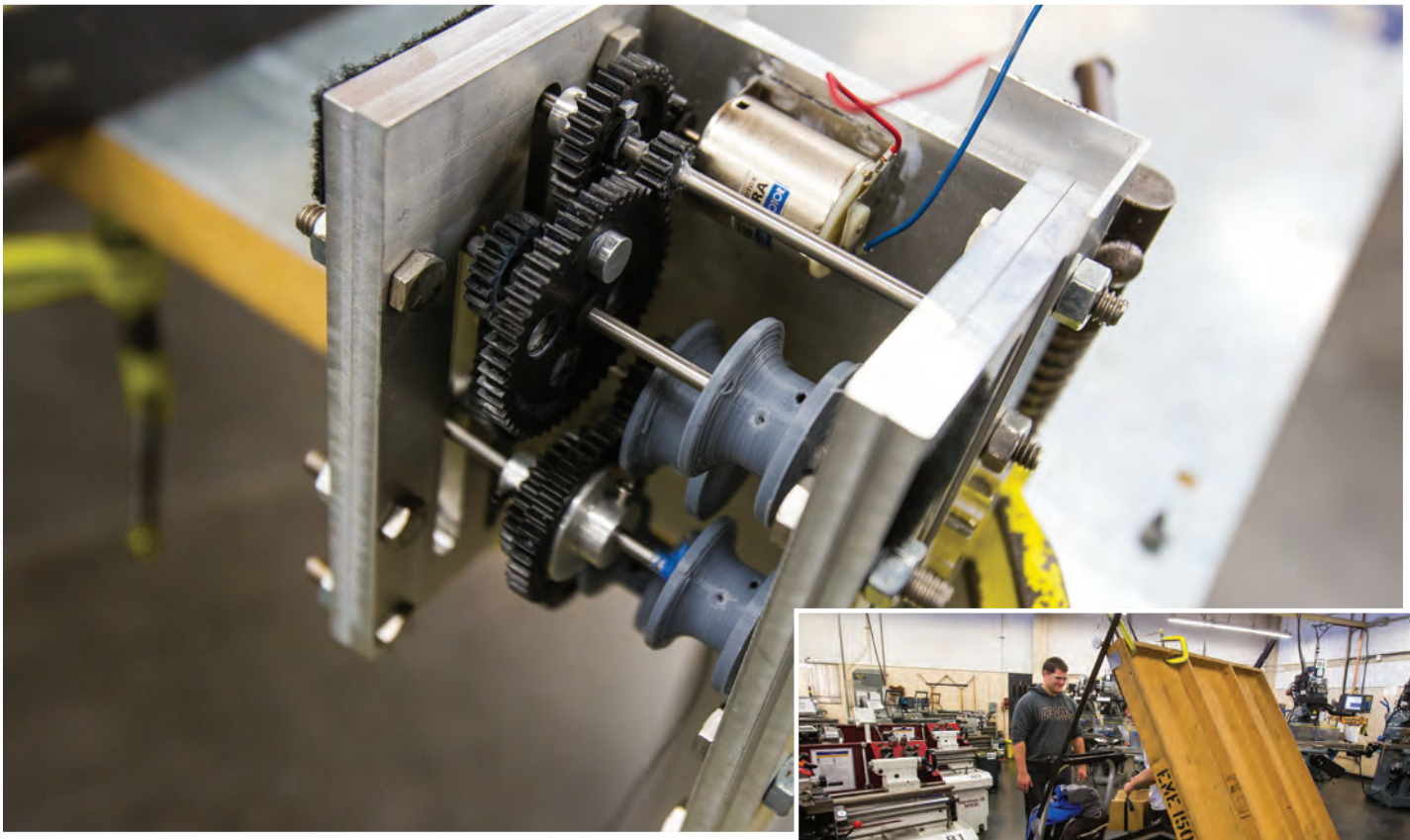


The second undertaking for students in EME50 is known as the totem project. They get a 2" cylinder of 1.5" diameter bar stock. They have to cut it on the saw and face it to length. While they are learning those processes they are making a drawing. It is their job to design the north end with a milling op, a turning op, drilling op and so forth. Once they meet those constraints they are free to design any north end pattern or shape they want. They hand that drawing to someone else who then has to design the south end to mate to the north end drawing. Professors then turn the tables on them with a few fun surprises.

tices are the same; manual ops then CNC ops. "The mechanical engineering students make a gyroscope in their ten week class," explains R & D engineer Shawn Malone. "I've been here at UC Davis for more than 20 years and the gyroscope is a staple of our program. Many engineering schools have students make a hammer or a screwdriver. We have them build a gyroscope. To pass the class it has to stand on its point for more than two minutes. We just got done with 88 students running the competition yesterday. The top time was just over seven minutes. We introduce to them manual machining processes first. So drill press for the holes, manual lathe for the spindle and so forth. They see the numbers go by and see the table move, take a radius curve and back. That starts imprinting the process in their mind. So, when they begin to use the ACU-RITE controller it isn't just punching a button, it is punching the button and knowing that the button makes the machine do a specific task that they already have done manually. Good or bad the computer does what you tell it to do, so for them to visually confirm what they are telling the machine to do via the ACU-RITE controllers is a huge part of their learning process." "You have to remember that we have a very diverse set of students that represents our diverse community," adds Sherry Batin, R & D engineer. "Besides kids coming from different walks of life and different countries, we have a huge skills gap between those well versed in using a tools to those who have never seen an electric drill before. Building confidence is a huge part of their success in the engineering programs."

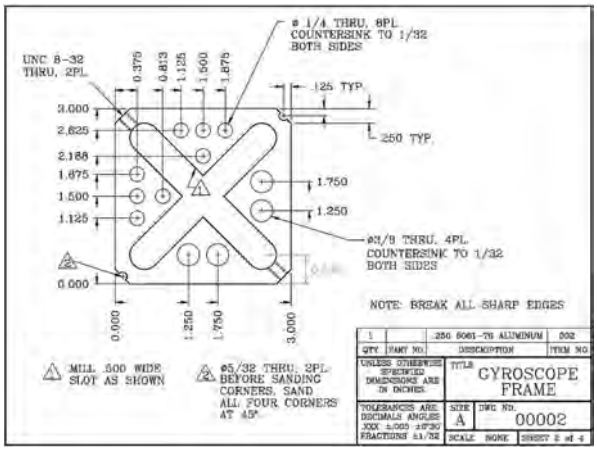
The second undertaking for students in EME50 is known as the totem project. They begin with a 2" tall by 1.5" diameter aluminum cylinder, which they have to cut from aluminum bar stock on the saw and then face it to length. While they are learning those processes they are making a drawing. It is their job to design the north end with a milling op, a turning op, drilling op and so forth. Once they meet those constraints they are free to design any north end pattern or shape they want. They hand that drawing to someone else who then has to design the south end to mate to the north end drawing. "We utilize a precision fit feature that they must meet," details David. "All 22 pieces must stack together in the end for them to pass. The fun part is once the drawings are finalized and everything is called out correctly, we make them exchange drawings with other students. The drawing they think they are going to make gets handed off to someone



Students are required to build a gearbox that hauls 20lbs of text books up a 60 degree slope. Fastest time wins and is usually under 80 seconds. For the last ten weeks students have been designing and fabricating the parts to make the gearbox. It is powered off of two AA batteries and a tiny little cheap electric motor. They are working with a lot of gears, making bearings, shafts and the chassis. They are turning RPM into torque.

else. Some students do complex designs with harder features, while others just do the bare minimum. The whole time they have thought it all through on how they are going to manufacture their drawing. Well surprise, they are working from a drawing they have never seen before, just like in industry." Students now have to figure out how to produce the part of the drawing and hope that all the information is easily conveyed. If not they have to go back to the designer and work with them to get the specs they need to produce the part correctly. That is just the north end. The south end is done on the CNC utilizing Fusion 360. "They learn to use the CAM software and see all the simulations," continues Sherry "They specify the tooling, speeds and feeds and all that goes along with it. Outputting the G Code to the correct machine, setting it up and running it. South is all CNC and north is all manual. It allows them to compare the two similar experiences. How long did it take you to make the north end? 2 hours, ok. How long to do the south end? Three hours to program it and 2 minutes cutting chips. Now they start to see the threshold of when is it worth their time to invest in the CAM software versus just cranking it out manually with a sketch drawing."

Mechanical engineering majors make up a large portion of the students enrolled at the UC Davis College of Engineering, but the Bio Med students have their own interesting shop project. The BIM 110L project is a digital microscope assembly. The assembly is a cell phone stand embedded with an inexpensive magnifying lens to which the cell phone's camera is aligned producing a magnified image of a specimen. Bio Med students are not as much into manufacturing, but they still need to learn how to program on the machines. "Our manual applications translate to the CNC on the Bridgeports," explains Shawn. "They really learn fast based off what we give them. They learn thread milling for example, and let me say left and right hand threads are a completely foreign concept to most of them. Always a manual op first, then again utilizing the 3 axis ACU-RITE controllers on our Bridgeports. The Bio Med students don't go through the CAM training, but instead they learn conversational right on the machine. Everything they program they do directly on the ACU-RITE controllers and it is easy. They pick it up really quickly. The controls are easy to learn, easy to use, and user intuitive. It is extremely powerful once you get to use to it."



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The UC Davis College of Engineering ESDC began utilizing ACU-RITE controllers back in the early 2000's and just recently invested in an upgraded version. Last school year they added four new Bridgeport mills to the shop and equipped them with the ACU-RITE G2 controller. They took that opportunity to upgrade all the controllers on all the mills. When it came time to invest in new controllers they looked no further than Dave McCarthy at Heidenhain Corp. "We love Dave," touts Mike. "His support of our program is amazing and product support is even better. We upgraded all the Bridgeport controls to the ACU-RITE G2 and couldn't be happier with them. We had other controls in the past, but the ease of use and durability we get with ACU-RITE is fantastic. As you can imagine with the number of students we get in this program they see a lot of use and inadvertently a lot of abuse. We don't worry too much because Dave makes sure we get great service and pricing on any replacement parts. The G2 controllers are a big bump in technology for us. The previous ACU-RITE version we were using still had floppy disk drives. Now we have USB. Our codes are not super complex, but even still we would run across a student not understanding why they couldn't save their program. You start doing 3D modeling in Fusion 360 and there is never enough space on the floppy. Dave is one of the good guys in the business. He drops by whenever he is in the area and takes a real interest in the students and our program."

The staff and shop techs all praised the ACU-RITE controlled machines as a great way to go from manual to CNC and back to manual as needed. All the teaching programs revolve around doing a manual element followed by a CNC element. Different projects for different majors, but the core concept of learning is the same. Here is the manual way, turn the crank and watch it move. Now program it to turn the crank for you. "You think about all the years they spent getting to this point in their education," concludes Mike. "They struggled though the pressures of school and taking only upper division classes to get into a good college, but they never took a shop class. The ESDC adds an element they've never known before. They take those senses you feel manually machining a part and transfer it into CNC experience. It isn't just a video game; they pick up a road feel that you only get by actually driving the machine. That experience translates directly to the next step in their journey."

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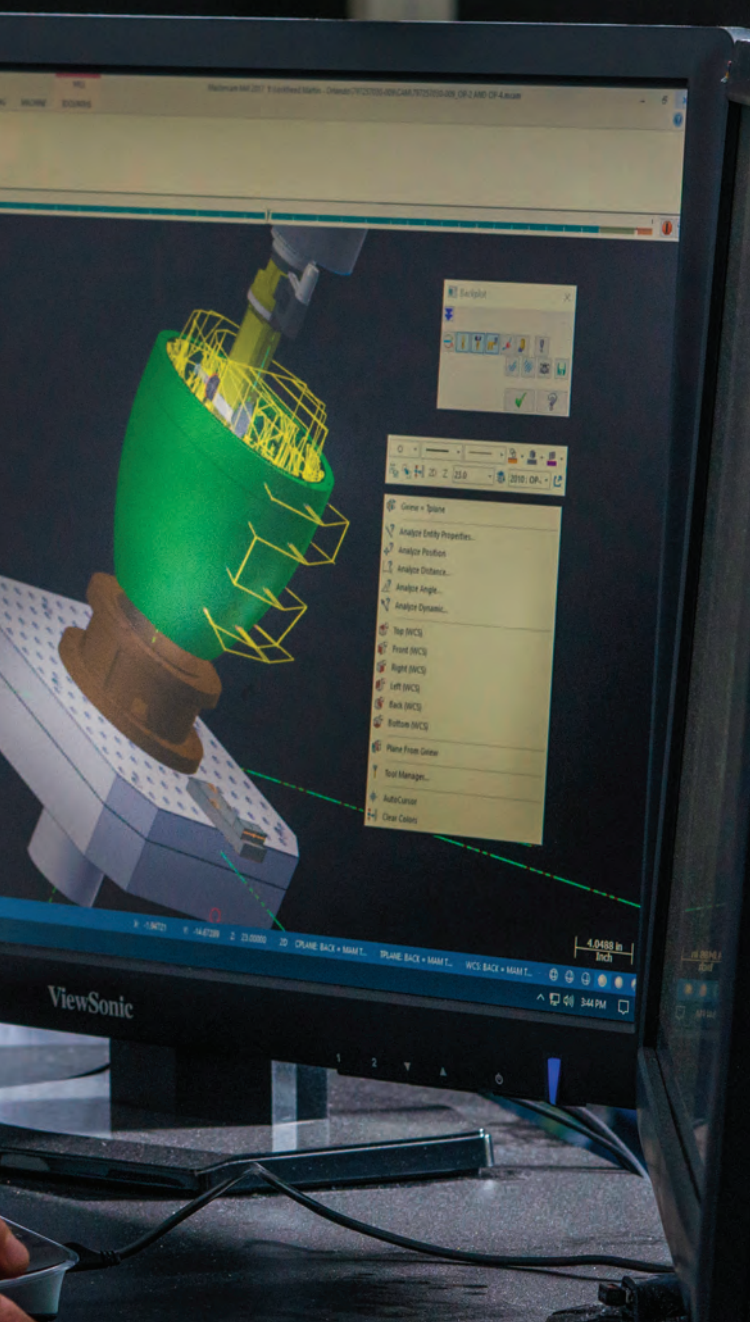

Dirk Ellis founded Cascade Engineering Technologies 30 years ago as a contract metrology shop. The Canby, Oregon based outfit began adding CNC machining services around the turn of the century, but their core competency remains steeped in their metrology expertise.

With just under a hundred employees and 70,000sq. ft. of manufacturing space Cascade Engineering Technologies (CET) is set for continued growth. This Pacific Northwest manufacturer might have got their start checking other shop's parts, but today they are a world-class aerospace manufacturer in their own right. "My dad founded the company back in the 80's with a single Zeiss CMM," tells Cascade's director of engineering Devon Ellis. "As the business grew, we added light manufacturing to support our customers. Today, we have 20 CNC machining centers with a specialty in machining critical investment castings. Our sales pitch is that we are who you want when it comes to manufacturing large, complex, monolithic, thin walled structures because of our metrology focus." Large and thin are relative for sure, but with a 60" work envelope on their larger mills and 78" on the lathe, large is actually pretty large.

CET's north cell is made up of Haas vertical machining centers, including (3) new 5 axis machine. The south cell houses their 4 and 5 axis horizontals. They have twin Makino T-1s, a pair of Matsuura MAM72-100H and their latest acquisition, a Toshiba TUE 150 vertical lathe. A state-of-the-art metrology lab supports all the machining. The lab alone is 4000sq.ft. and houses seven Zeiss CMMs. Cascade is an ISO9001 / AS9100 Rev D registered ITAR facility and everything begins and ends in their quality lab.

Investment castings are a nightmare for most shops not equipped with the tools and experience needed to do the job right. "An investment casting is where you want to make a component out of metal by first making a wax pattern," describes Devon. "You build a shell, burn out the wax, pour metal in it, and inspect and repair the part until it meets the customer's requirements. What's left is a rough shape that requires finish machining. Each casting is a snowflake, the same, but with its own uniqueness. More often than not our customers are essentially consigning to us very high value material that we have to machine." "The value comes from the time it took for the casting house to make the casting," adds Troy Greenberg, CNC programming manager. It could be three months worth of time before the casting gets to us. They need someone to machine it right the first time. There are no do-overs. If you mess it up, you can't just go grab another a piece of metal off the shelf." There is a nuance with each casting that you don't see in traditional machine work. That is where "best fitting" comes in. Casting is not a per-

Top - Cascade Engineering Technologies made their name in metrology. Their quality lab is world class with seven Zeiss CMMs. Cascade leverages probing more than most shops. Before a part even hits the CNC all the probing routine has been verified by Vericut. Bottom Left - Devon Ellis has been with the company since he was playing with Legos under his dad's desk. Last July he was made director of engineering and oversees the engineering department, programming, fixturing, IT, document controls, CMM programming, estimating and quoting. Bottom Right - The shop is split into two work cells. The north cell is filled with Haas vertical machining centers including (3) 5 axis. The south cell has the larger 4 and 5 axis Makino and Matsuura horizontal milling centers along with the Toshiba TUE 150 vertical lathe.

fect science; each casting has a variance that is large in relationship to the machining process assigned to it. "You get five castings of the exact same part, made from the exact same wax tooling and they won't be the same," continues Devon. "There might be a little more material on this face, or it is rotated slightly. You have a non-perfect casting that has to be perfect when you machine it, and perfect when it goes on the airplane. This is where our core competency in metrology comes in. We can see in space through inspection modeling how it fits, and how it will fit after we are done machining it."

Cascade takes in the casting and runs it though an extensive intake process that begins with a trip across one of their 7 Zeiss CMM machines. They inspect the piece of material and gather data on it. From there they are able to do an analysis and determine if it will yield a good part, and if so, how best to get that part. "We have created a methodology that allows us to verify component compliance at the raw material stage, before any chips are cut," explains Devon. "From there, we define the exact path that will get us there. The result = no surprises. We call it "Starting with the end in mind." We essentially have to find the statue of David in the marble. We know it is in there, but how do you physically adjust on the machine to match the perfect part inside the casting. That is where our 30 years of experience in metrology pays off."

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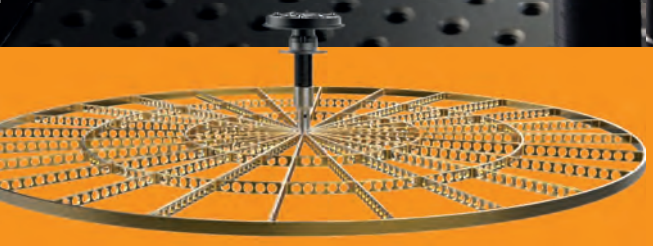

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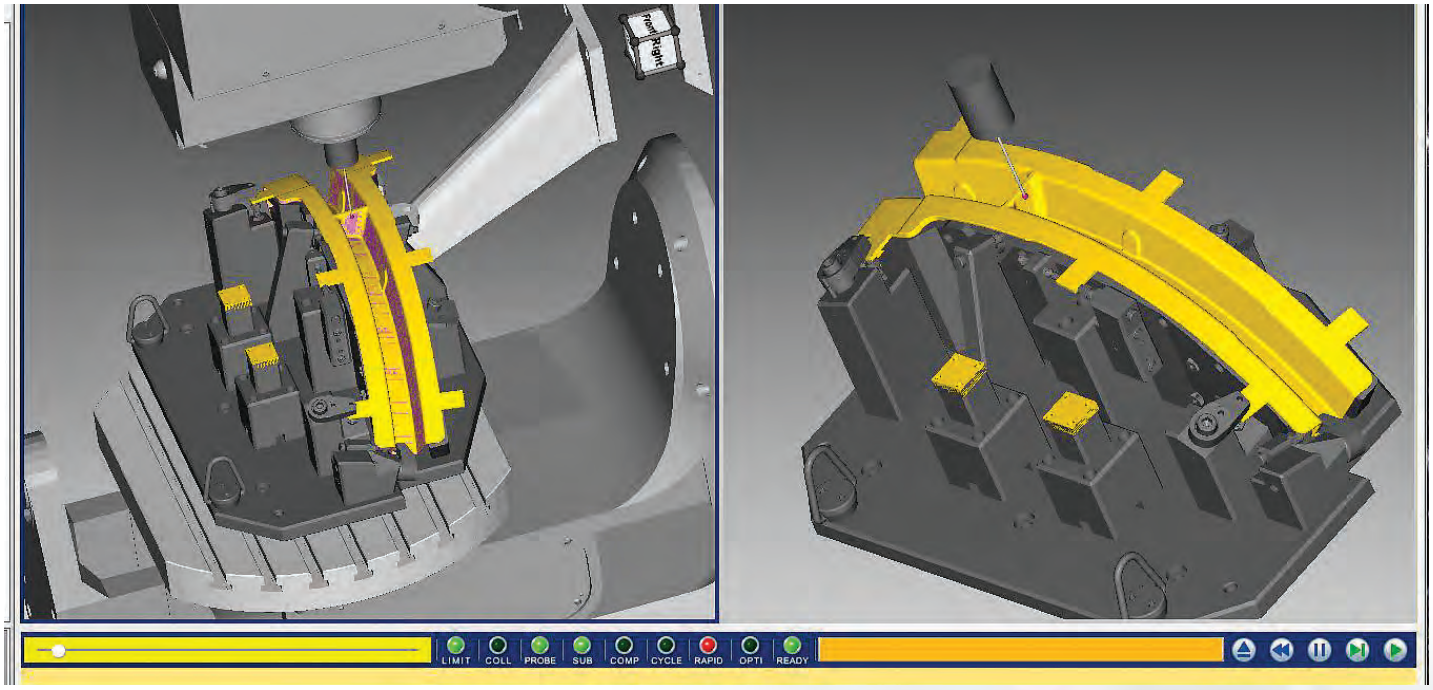
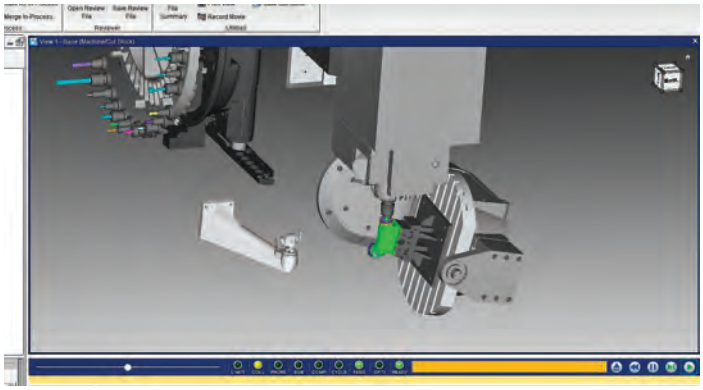
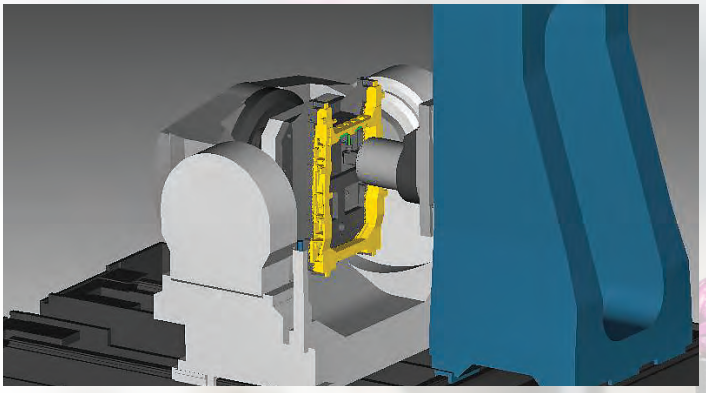






Cascade leverages the power of Vericut as part of their intake protocols on investment castings. They write a probing routine and verify it in Vericut before they tie up time on their CMMs. The probing module is an added feature in Vericut and goes hand in hand with the machining simulations. They simulate the probing, they simulate the machining and in the end they get no surprises. Vericut ensures confidence from start to finish.

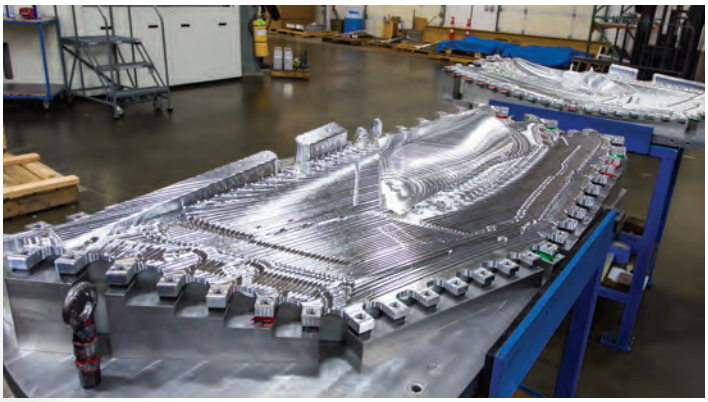
Cascade's programmers write extensive probing routines before, during, and after machining the part. From start to finish they verify what they are doing matches the predicted accuracy from the information they already gathered. They verify all their probing routines in CG-Tech's Vericut software. They simulate the part in Vericut and run the probing routines from there. "We have our simulated part completely probed and verified in Vericut before it even gets on our CNC machines," details Troy. "The entire probing process is run through Vericut same as you do on a machining center." Cascade also utilizes Vericut on their larger 4 and 5 axis machining centers. The probing module is an addition module available through Vericut and something you don't find in every shop. "The programs we run in Vericut are our own," continues Troy. "We tell it what we want to measure, and it does the simulation work. Check here, here, here and these other critical areas. Every probing routine is verified to work before we commit CNC time to the process." Only after the routine is verified do they have the confidence to put it on the CNC. At Cascade probing verification is less about probe crashes (though still important) and more about confirming the logic of how they are going to go after manufacturing the part. "We leverage probing a lot more than most shops," adds Devon. "Some shops might touch off 3 points to find a zero and that is about it, our probing programs are very complex with hundreds if not thousands of measurements. There is direct communication of dimensional data between the metrology lab and the CNC machines. And, all our machining centers are equipped with Renishaw probes, ensuring exact part placement every time."

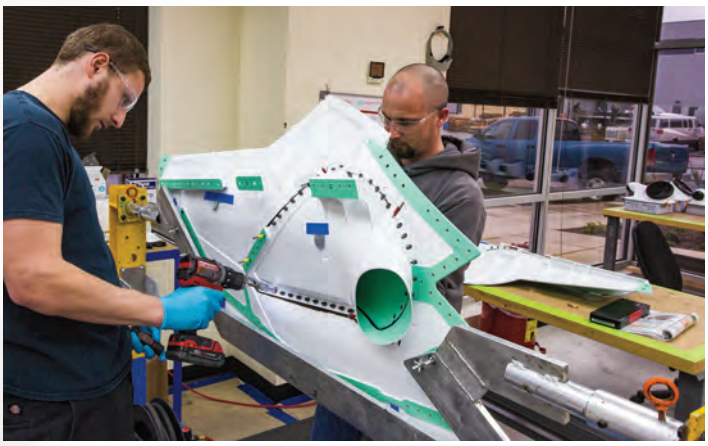
Cascade purchased their first seat of Vericut in 2013 to support a specific program that they felt would elevate their position in the aerospace manufacturing game. "My dad had his eye on this external airflow inlet for years. It was his white whale. He wanted to get this job so badly," tells Devon. "Originally it was an aluminum investment casting, but a design change necessitated the part being changed from a casting to that of a billet hog out. We bid

on it and got the job. Then we had to figure out how to manufacture it. At the time it was the largest, most complex part we had ever done. We really wanted this project to set us apart from other manufacturers. And it accomplished just that. It's a showcase part for us still, one we are very proud of and like to show off. The challenges of manufacturing this air inlet are essentially machining a tin can from a block of billet." The airflow inlet starts out as two pieces of billet weighing 1400lbs. The finished part when assembled together weighs a scant 18lbs. Cascade leaves a lot of chips on the floor, and if they inadvertently had a problem and scrapped one, someone would notice. "You have to machine it a certain way to relieve the stresses in the metal," describes Troy. "At 60" with features as thin as .060 you machine one side and if everything isn't right you flip it over and it can curl up and become a potato chip. Managing thin walls requires a lot of finesse."

Cascade's management team knew a lot was riding on the success of this project and wanted every available advantage. They turned to Vericut for a couple of reasons. "This was a high visibility job and we wanted it right the first time," tells Devon. "It is expensive material going onto a really expensive machine. One slip up in programming could cost us hundreds of thousands of dollars. Spindles are not cheap to replace, and you can't replace lost time, it is just lost forever. You don't want to make a call that your machine is down, and the customer can't build planes because of it. With no errors, and no problems in our process, customer confidence is reassured every time we deliver 22 beautiful parts a month." Troy has been a Vericut user since the early 2000's and reaffirms how it has saved his butt many times. "As a programmer you pride yourself on being good at your job, but we all make mistakes. Vericut ensures those mistakes are not costly mistakes. When you start messing with giant machines chewing though large quantities of metal at a high rate of speed you want to know before that button is ever pushed that everything will be just as you planned. That security starts with management buying the seat of Vericut, but every step of the process builds more and more confidence. I know my programmers did their job, and thanks to Vericut the people out running the machines know that too. Vericut isn't cheap, it's priceless. We thank Vericut every time it catches something we missed."

Cascade's 30 years of experience helps them thrive in a mission critical environment. As a tier 1 supplier to the biggest names in aerospace they take pride in the challenges that come with that responsibility and privilege. "The average run of the mill shop doesn't want to deal with the complexities of managing the snowflake," concludes Devon. "Here at Cascade the snowflake brings out the best in us, because we start with the end in mind."





The air inlet starts out as two pieces of billet weighing in at 1400lbs. The assembled finish weight is only 18lbs. With six machining operations and multiple trips to the CMM it has become a showcase part for Cascade. They purchased their first seat of Vericut specifically for this program because of the cost and complexity associated with manufacturing. Devon Ellis, director of engineering describes it as "machining a tin can out of a block of billet."

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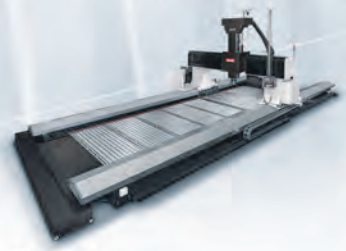

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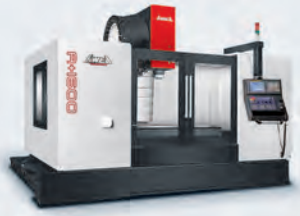

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0-3"	2"	9/16"	2900	PALM-29113	$ 35.70	$ 28.56
0-4"	2-3/8"	5/8"	3300	PALM-29114	$ 46.95	$ 37.56
0-6"	3"	3/4"	4000	PALM-29116	$ 59.20	$ 47.36
0-8"	4"	3/4"	4900	PALM-29118	$ 78.60	$ 62.88
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	1.75"	C40-25EM175-K	$ 53.85	C40-25EM175-KB	$ 69.99
5/16"	1.38"	C40-31EM138-K	$ 53.85	C40-31EM138-KB	$ 69.99
3/8"	1.38"	C40-37EM138-K	$ 49.95	C40-37EM138-KB	$ 69.99
	2.50"	C40-37EM250-K	$ 53.85	C40-37EM250-KB	$ 69.99
1/2"	1.75"	C40-50EM175-K	$ 53.85	C40-50EM175-KB	$ 69.99
	4.00"	C40-50EM400-K	$ 53.85	C40-50EM400-KB	$ 69.46
5/8"	1.75"	C40-62EM175-K	$ 53.85	C40-62EM175-KB	$ 69.99
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	3.00"	C40-75EM300-K	$ 53.85	C40-75EM300-KB	$ 69.99
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ER 20	2.50"	C40-20ER250-K	$ 82.44	C40-20ER250-KB	$ 93.08
ER 25	4.00"	C40-25ER400-K	$ 82.44	C40-25ER400-KB	$ 92.49
ER 32	2.50"	C40-32ER250-K	$ 82.44	C40-32ER250-KB	$ 93.08
ER 32	4.00"	C40-32ER400-K	$ 82.45	C40-32ER400-KB	$ 92.49
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HAAS CAT40	5/8-11	.589	45°	No	C40-4501S	$ 17.72
Fadal CAT40	5/8-11	.740	45°	No	C40-4500S	$ 15.20
Okuma CAT40	5/8-11	.589	60°	No	C40-6000S	$ 17.72
Mazak CAT40	5/8-11	.740	45°	Yes	C40-4500H	$ 15.75
Mori Seiki CAT50	1-8	.905	90°	No	C50-9000S	$ 21.85

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CAT/BT 40	10	TRAY40-10	$ 29.50
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Prices Starting At:	Prices Starting At:	Prices Starting At:
$8.75 each	$9.75 each	$10.25 each
OLD Price: $16.50	OLD Price: $18.00	OLD Price: $18.00

ULTRA PRECISION (0.0002" TIR) COLLETS ALSO AVAILABLE!

ER COLLET TRAYS

SIERRA AMERICAN MULTI-SYSTEMS

- Will not damage accurate locating surfaces, unlike steel stamped trays
- Protect expensive tooling–engineered from strong high impact plastic
- Sliding see through plastic cover
- Up to 40 collets per tray–holds a full set plus special & metric sizes
- Angled seat location to secure collet

MADE IN USA

PROTECT & ORGANIZE YOUR COLLETS!

Collet Series	Tray Cap.	Part Number	Price
ER11	40	SIE-SAER-11-40	$ 37.07
ER16	40	SIE-SAER-16-40	$ 37.07
ER20	40	SIE-SAER-20-40	$ 40.28
ER25	40	SIE-SAER-25-40	$ 40.28
ER32	40	SIE-SAER-32-40	$ 41.56
ER40	28	SIE-SAER-40-28	$ 41.56

Article by *Sean Buur* Photos provided by *Bottle Breacher*

SHARKS INVEST WITH SEAL - SEAL INVESTS IN HURCO

BOTTLE BREACHER

When Eli Crane was given a bottle opener by his brother it opened more than just a beer for this Navy SEAL.

Growing up in Yuma, AZ. Bottle Breacher's CEO and founder Eli Crane never dreamed of being an entrepreneur. He was athletic, played sports and occasionally got into a bit of trouble. Pretty standard stuff for American boys and girls of his generation. That all changed for him in 2001. "I was a senior attending University of Arizona, Tucson when we were attacked on September 11th," tells Eli. "The next week I dropped out of school and joined the Navy. Specifically I hoped to become a Navy SEAL and serve on the front lines." Eli didn't complete SEAL training on his first attempt and spent a few years on a ship growing up a little as a gunner's mate. He got a second shot at SEAL training and graduated with class 256. "220 of us started and only 24 of us finished," explains Eli. "I spent the next nine years as a Navy SEAL, doing the best job in the world."

Eli and his wife Jen started Bottle Breacher five years ago while he was still in the Navy. Eli spent his days training SEALs to take down ships, and his nights in the garage building bottle openers. "Bottle Breacher began as a humble operation and even now we are still very humble," explains Eli. "Jen was running her own boutique online business while I was deployed. She was and still is instrumental in our marketing and online sales programs." Eli would love to claim credit for inventing the bullet bottle opener, but that isn't the case. "My brother was deployed as a Marine in the Philippines and he brought me a bottle opener made from a 50. Cal bullet," tells Eli. "It was just a generic casing, worn, vintage looking, nothing flashy, nothing about it caught your eye, but it was still really cool. I knew right away I could improve on the concept." A breacher on a SEAL team is an operator who is trained to get into a structure they are assaulting. It could be a plane, buildings, ships, rooms, anything. A breacher has the training to get the team in mechanically or explosively. "You have to get into that bottle somehow," laughs Eli. "So you might as well breach it. I wanted to name our product something that represented the culture and my background, but also something that was catchy, be easy to remember, and had a little mystique about it. Not everyone knows what a breacher is, so it opens up to the story. Story as you know is so important to PR and marketing." Just like that Bottle Breacher became a thing for Jen and Eli.

Eli made his first 500 units by hand with a cloth measuring tape, a sharpie, and his Dremel tool. Each opener took 7 minutes just to cut out. The SEAL mentality knew there was a better way; he just needed to find it. "I built my first fixture out of an old broom handle," details Eli. "At the time

Jen and Eli Crane presented to the Sharks on Season 6 of Shark Tank. They left with two sharks investing in Bottle Breacher. They used the $150,000 to invest in a turn key Hurco machining cell. The package came with the Hurco mill, fixtures, pallets, and custom programming of the Bottle Breacher parts. Eli wanted a system that was easy to use and maintain for non machinists. The goal was to be able to cycle parts through it with a minimum amount of effort and with low overhead. They have been super happy that they chose Hurco. Hurco even ordered promotional bottle openers to help celebrate their recent anniversary.

I didn't know about the term lean manufacturing, just that I needed a faster way to measure and cut. The broom handle slid over the casing perfectly allowing me to draw the cut lines in seconds." It was simple, but a huge technology upgrade that helped him with production numbers. The first generation Bottle Breacher was just spray painted with a sticker put on it, but the feedback he got was inspiring. "The initial openers I made had the SEAL Team 3 punisher logo on them," continues Eli. "The light bulb just turned on when I saw the reaction of the team. They ordered a bunch of them for family and friends. SEALs are some of the coolest people on the planet, and companies are always giving them shoes, glasses, jackets because of it. So if they liked the bottle opener, then the masses would love it too."

Understanding all too well that garage production was working ok, but it wasn't great, the Cranes began to research manufacturing solutions that could boost production, reduce costs and yield a better product. As they were trying to grow the company, Eli and Jen were avid watchers of the ABC TV show Shark Tank. "We were watching Shark Tank and the entrepreneur was getting ripped apart for not having any branding directly on his product," tells Eli. "We decided we needed an engraver to brand our products. We didn't want to dip into our small nest egg just to buy a beat up used engraver, so I sold my chopper and bought a brand new one." Sales tripled nearly over night for Bottle Breacher. Not because of the branding, but because now they could offer a fully customizable product. "We went from being limited to happy birthday, to happy birthday Sean and your birthdate on it. We blew up with personalization."

With good sales numbers, a solid business model, and an incredible backstory Jen and Eli got their chance to face the sharks on Season 6 Episode 8 that aired in November 2014. Understanding that bullets and firearms don't play well on network TV in the modern world Eli knew that the likelihood of being picked for the show was slim. He also knew that they had a product that was perfect for TV. "Ultimately the show is about entertainment," explains Eli. "We

Personalization with laser engravers tripled sales numbers almost overnight. No longer were they confined to generic sayings and greetings, but they could offer a fully customized product to customers.

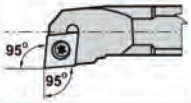
have a cool product, and I was sure America would love to hear our story." They went on the show, gave their pitch, and left with two sharks investing in the company. "Mark Cuban and Kevin O'Leary both were interested in investing with us," touts Eli. "Having two sharks was an essential part of my strategy. In the military redundancy is key. We have the saying "one is none, two is one" I wanted two sharks, and we got that. The biggest thing I hoped to get from the show was a tactical partnership or a mentorship because I didn't know squat. Getting that and 150k was even better. We used that money to invest in a Hurco VM20i milling center and bring our machining processes in house."

As Bottle Breacher began the research process, Hurco machine tools were repeatedly brought up in conversation. Local area shops had great things to say about the brand's durability and ease of use. "We could have saved some money going with a different company, but I wanted a machine that was going to last us a long time," explains Eli. "I am not a machinist, I don't employ any machinists and I didn't want to become a machine shop. What I needed was something that was easy to run and maintain for non-machinists." They bought a turnkey machining cell from D&R Machinery. It came with the Hurco VM20i, pallets, the fixtures to match their machined parts, and all the programming pre- installed. "The goal was to be able to cycle parts through with a minimum amount of effort and with low overhead," continues Eli. "After a short training we were able to jump right in to manufacturing our own parts. The controls are easy to use and we've had no issues. The Hurco has been such a great investment for us. When we add a new product to our catalog all I have to do is make a call. We buy another custom program and set of fixtures and begin the in-house manufacturing process. We machine it, powder coat and do custom laser engraving all in our Tucson headquarters. These days we pretty much only send out the chrome plating and anodizing."

Being a SEAL taught Eli a lot about limits, problem solving and how to think outside the box. Thinking skills are key when you are thrown into an unfamiliar and hostile situation and you've got to make the mission happen. That skillset has been beneficial for him as an entrepreneur. "I went into this business not knowing about manufacturing, or accounting, or even business," chuckles Eli. "But I knew I could build a team around me that did." He's found that successful people share basic traits with Navy SEALs. They are not afraid to get outside their comfort zone. They have the mentality that they will figure it out and work harder than everybody else. And they are confident enough in themselves to find the subject matter experts who can prop them up in their weakest areas.

People don't realize how difficult it is to go from being in the military to the private sector. If you don't want a job in private security, law enforcement or as a fireman your choices are fairly limited. "The public needs to be educated in what our qualifications actually are," explains Eli. "Too often a CEO or a manger looks at you and says oh you were a Navy SEAL, that's super cool let me buy you a beer, but I don't have a position for you." Being a leader, problem solver, cool under pressure, dependable, disciplined, working with a team, teachable, all translate directly to the private sector. SEALs are the best in their business, and they have the skillset to be the best in other business too. "I've become a veteran's advocate, and am trying to teach those CEOs how valuable we are in the work place," concludes Eli. "Our skillset is more than just being a sniper and blowing things up. I hire veterans, and contract out with other veteran owned shops whenever I can. I try every day to pay my success forward. You can serve this country in a lot of ways that don't require a mission and a gun. Being a SEAL was an awesome job. I got to fight real evil in the world. The knowledge I gained was amazing, and the brotherhood and camaraderie are second to none. Looking back I am so blessed and fortunate that I got to be a SEAL, but I can't rest on what I did yesterday or today. I need to keep moving forward, pushing new envelopes and increasing the pace. Bottle Breacher is my current challenge, but isn't going to be my last. If you are going through your life and not thinking about how you can positively impact people I think you are missing out on a lot."

SCLCR BORING BARS



- Industry standard SCLCR type
- Steel shank
- Uses CCMT or CCGT inserts
- Shanks have locating flats
- 3° side & end cutting edge angle

INSERTS ALSO AVAILABLE!

Industry Reference	Uses Inserts	Shank Dia	Min Bore	OAL	Part Number	Price
SI-SCLCR/L6-2	CC_T-21.5_	.375	.468	6	BI-6870-062R	$ 52.04
SI-SCLCR/L8-2		.500	.560	7	BI-6870-082R	$ 52.04
SI-SCLCR/L10-2		.625	.810	8	BI-6870-085R	$ 69.50
SI-SCLCR/L8-3	CC_T-32.5_	.500	.625	7	BI-6870-093R	$ 52.39
SI-SCLCR/L10-3		.625	.812	8	BI-6870-103R	$ 61.07

PART-OFF TOOL SETS

- Buy the kit and save time and money!
- Compatible with industry standard brands
- Sets include tool block, part off blade and (10) CVD coated general purpose carbide inserts, suitable for steels/stainless with 0° lead angle

SAVE 10% OFF MFG'S LIST PRICE!

NEW ITEM!

Blade Size	Blade Ref #	Insert Size	Block Ref #	Part Number	Mfg's LIST	SET Price
1.02" 26mm	26-3	GTN-3	19-5 3/4" shank	BI-6895-903	$ 206.25	$185.63
	26-4	GTN-4		BI-6895-904	$ 209.00	$188.10
	26-5	GTN-5		BI-6895-905	$ 216.15	$194.54
1.26" 32mm	32-3	GTN-3	25-6 1" shank	BI-6895-923	$ 217.80	$196.02
	32-4	GTN-4		BI-6895-924	$ 220.55	$198.50
	32-5	GTN-5		BI-6895-925	$ 228.25	$205.43

CARBIDE TURNING INSERTS

- **AH120**-The **"Super Grade"** for steels, stainless and super alloys!
- **TM** Chipbreaker-Medium cutting of steels and hi-temp alloys
- **SM** Chipbreaker- Medium cutting of mild steels and stainless

COMPLETE LINE AVAILABLE!

Insert No.	Rad.	Grade	Chip-Breaker	Application/ Material	Part Number	BOX QTY EACH
CNMG431	.015	T9125	TM	Steels	TO-3514	$8.51
CNMG432	.031	AH120	TM	Super Alloys	TO-1364	$8.51
DNMG431	.015	AH120	TM	Super Alloys	TO-1709	$11.15
DNMG432	.031	T6130	SM	Stainless	TO-6805431	$11.68
TNMG431	.015	AH120	TM	Super Alloys	TO-2833	$9.24
TNMG432	.031	AH120	TM	Super Alloys	TO-2868	$9.24
WNMG431	.015	T6030	SM	Stainless	TO-6827354	$8.51
WNMG432	.031	AH120	TM	Super Alloys	TO-3338	$8.51

SOLID CARBIDE ENDMILLS

- 4 flute, single end
- TiAlN Coated-for general purpose use on all materials
- Center cutting
- 30° helix, right hand

MONSTER — MADE IN USA

Dia	LOC	Shank Dia	OAL	4 Flute TiAlN Coated	Price Each
1/8"	1/2	1/8	1-1/2	MO-EM001067-4	$ 7.91
3/16	5/8	3/16	2	MO-EM001107-4	$ 10.68
1/4	3/4	1/4	2-1/2	MO-EM001137-4	$ 15.35
5/16	13/16	5/16	2-1/2	MO-EM001153-4	$ 21.84
3/8	1	3/8	2-1/2	MO-EM001177-4	$ 25.39
1/2	1	1/2	3	MO-EM001207-4	$ 40.75
5/8	1-1/4	5/8	3-1/2	MO-EM001226-4	$ 74.00
3/4	1-1/2	3/4	4	MO-EM001244-4	$ 109.50

SAW ARBORS

Saw Not Included

- General purpose arbor
- Low profile caps
- Hardened and ground
- Made in USA

MADE IN USA

Shank	Arbor Hole	Part Number	Price Ea
.500 1/2"	.250	SIE-SA-250	$ 41.52
	.375	SIE-SA-375	$ 43.51
	.500	SIE-SA-500	$ 46.29
.750 3/4"	.625	SIE-SA-625	$ 50.50
	1.000	SIE-SA-1000	$ 58.70
	1.250	SIE-SA-1250	$ 59.28

YG HI-PERFORMANCE ENDMILLS

4 Flute • Variable Helix • Made From C10 Micrograin Carbide

MADE IN USA

V7 Plus

Ideal For Stainless, Mild Steels, Cast Iron & Low/Medium Hard Steels up to 40Hrc

SAVE OVER 40% Off Mfg's List Prices!

Dia	LOC	Shank	OAL	Part Number	Price EA
1/8	3/8	1/8	1-1/2	YG-EMUGMF68901	$ 13.51
1/4	3/4	1/4	2-1/2	YG-EMUGMF68905	$ 23.07
3/8	7/8	3/8	2-1/2	YG-EMUGMF68907	$ 38.02
1/2	1	1/2	3	YG-EMUGMF68909	$ 58.42
5/8	1-1/4	5/8	3-1/2	YG-EMUGMF68911	$ 117.96
3/4	3/4	3/4	3	YG-EMUGMF68048	$ 150.07
1	1-1/2	1	4	YG-EMUGMF68913	$ 272.90

ULTRA-DEX USA COOLANT-THRU INDEXABLE DRILLS

Using 80° WCMT/WCMX Inserts

- 2xD, 2.5xD and 4xD indexable drills
- Spiral flutes to improve chip evacuation
- Coolant-thru access located on both shank and side of drill body
- Insert pockets precisely positioned to keep cutting forces low and evenly distributed
- **80° trigon inserts** offer 3 cutting edges
- Made in USA

MADE IN USA

INSERTS AVAILABLE!

Call For Grade Information!

Insert	Prices Starting At:
WCMT 1.211	$12.04 ea
WCMX 1.81.52	$7.75 ea
WCMX 21.52	$7.75 ea
WCMX 2.522	$7.75 ea

Dia	Shank	LOC	Part Number	Price EA	Uses Insert
0.500	0.625	1.340	UD-0500-2D-063	$138.32	WCMT 1.211
0.625	0.625	2.815	UD-0625-4D-063	$198.68	WCMX 1.81.52
0.750	0.750	1.748	UD-0750-2D-075	$153.40	WCMX 21.52
0.750	0.750	3.698	UD-0750-4D-075	$220.05	WCMX 21.52
1.000	1.000	2.345	UD-1000-2D-100	$168.49	WCMX 2.522
1.000	1.000	4.635	UD-1000-4D-100	$242.68	WCMX 2.522
1.125	1.000	4.760	UD-1125-4D-100	$242.68	WCMX 2.522

MULTI-PURPOSE TAPS

- **TiCN Coated**
- Reduces tap breakage, ensures accurate thread depth
- Eliminates loose threads due to tap overfeeding
- Improves thread quality and chip evacuation
- Allows tapping of many metals including stainless steel & steels

Combo™ YG

40% OFF MFG'S LIST PRICES!

Size	Thrd Limits	SPIRAL FLUTE Part Number	SPIRAL POINT Part Number	Price EA
4-40	H2	YG-TC4-40SFC	YG-TC4-40SPC	$ 12.39
6-32	H3	YG-TC6-32SFC	YG-TC6-32SPC	$ 10.68
8-32	H3	YG-TC8-32SFC	YG-TC8-32SPC	$ 10.68
10-24	H3	YG-TC10-24SFC	YG-TC10-24SPC	$ 10.88
1/4-20	H3	YG-TC1/4-20SFH3	YG-TC1/4-20SPH3	$ 11.79
3/8-16	H3	YG-TC3/8-16SFH3	YG-TC3/8-16SPH3	$ 14.83
1/2-13	H5	YG-TC1/2-13SFC	YG-TC1/2-13SPC	$ 22.97
5/8-11	H5	YG-TC5/8-11SFC	YG-TC5/8-11SPC	$ 38.91
M6X1.0	D5	YG-TCM6X1.0SFC	YG-TCM6X1.0SPC	$ 12.59
M8x1.0	D5	YG-TCM8X1.0SFC	YG-TCM8X1SPC	$ 14.30

EXL DEBURRING WHEELS

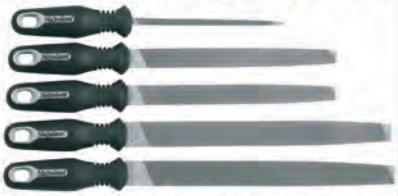
3M Scotch-Brite

- The top choice for high performance and durability
- Finish, debur or polish metals and composites
- SC-Silicon carbide AO-Aluminum oxide
- 6,000 max RPM

OD x W x AH	Density	Mineral Type	Grade	Part Number	Price Each
6" x 1/2" x 1"	8	SC	Fine	3M-09548-6	$ 53.58
	9	SC	Fine	3M-05790-3	$ 53.58
6" x 1" x 1"	8	AO	Medium	3M-13617-2	$ 75.01
	8	SC	Fine	3M-09549-3	$ 75.01
	9	SC	Fine	3M-05132-1	$ 75.01

5 PIECE GENERAL PURPOSE FILE SET

Nicholson®



- Files feature rubber-coated ergonomic handles for better comfort and control
- For home & professional use
- Comes with rugged and compact pouch for easy and secure storage

Includes:
(1) 6" Slim Taper File
(1) 8" Mill Bastard File
(1) 8" Flat Bastard File
(1) 10" Half-Round Bastard File
(1) 10" Mill Bastard File

5 Piece GP File Set
Part # ORS-22040HNN
Mfg. List: $79.35

$49.98 set

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- Heavy duty capacitor motors
- Extended wheel-to-wheel clearance
- Large, adjustable tool rests
- Adjustable eye shields and spark guards
- Single port dust collection system on selected models
- OSHA compliant

PEDESTAL GRINDER STAND:
Part #: PALM-70101
$139.00 each

Wheel Dia	Shaft Dia	Description	Part Number	Price
6"	1/2"	1/3HP, 115/230V *	PALM-82061	$129.00
6"	1/2"	1/3HP, 115/230V	PALM-82062	$149.00
8"	5/8"	3/4HP, 115/230V	PALM-82081	$257.00

*no dust collection

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Includes Mango II Handle & 10 Blades!

SHAVIV USA by varqus
Leading Deburring Solutions

SAVE UP TO 40% OFF!
Off Mfg's List Price!

- All Bonus Packs include Mango II handle, B or E holder and 10 cobalt blades
- For Extra Close Or Long Reach Work
- Complete line available

Series	Blade Type	Description	Part Number	Price
B	B10S+	For Extra-Close Work	SHAVIV-29255	$ 17.62
	B10S*	Long Reach	SHAVIV-29256	$ 18.44
E	E100S+	For Extra-Close Work	SHAVIV-29251	$ 17.62
	E100S*	Long Reach	SHAVIV-29254	$ 23.07

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Metrology Casting Material • Clone Any Part Quickly & Accurately!

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- Simply spread over master w/fingers
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Just knead equal-sized portions of catalyst and base putty, spread over master, wait 8-10 minutes... That's it!

Create Virtually Perfect Replicas!

Size	Part Number	Price
220 ml	FXB-16129	$78.00
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Castrol Variocut™ C Moly Dee is a high performance tapping fluid that improves threading accuracy, extends tool life, improves surface finishes and increases production. Recommended for use on most metals, including aluminum, titanium and steel. Especially effective on difficult to machine metals such as stainless steel and aerospace alloys.

Size	Part Number	Price Ea
16 oz	CAST-MOLYDEE16	$ 37.00
1 Gal	CAST-MOLYDEE	$ 150.00

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FULL LINE AVAILABLE!

POWERCHIP 2000 Coolant
-Heavy Duty, Synthetic
-High Performance Machining
-Safe for most metals

5 Gal Pail **$160.55** Each
Part # RUST-76305

Ultracut 375R Semi-Synthetic
-Controls rancidity
-Easy care
-Ideal for carbon,steel & stainless

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You're in good company.

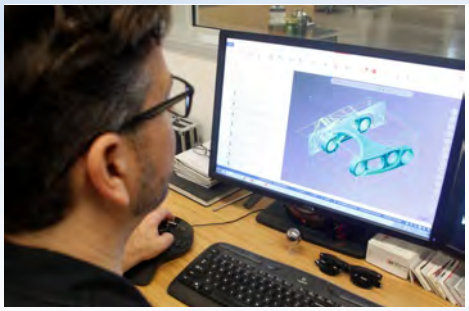
- For use in dry work areas
- Anti-fatigue
- Recycled urethane composite
- 5/8" thick
- Good rebound
- 1 Year Warranty

Is It Time To Replace Your Mats?

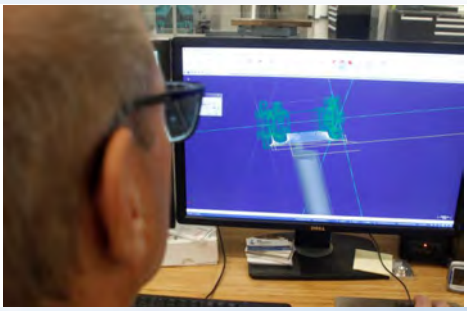
Size	Color	Part Number	Mfg List	Our Price!
2' x 3'	Black	WW-49758-2-3BK	$ 44.24	$39.82
	Blk/Yellow	WW-49758-2-3BY	$ 50.44	$45.40
3' x 5'	Black	WW-49758-3-5BK	$107.74	$96.97
	Blk/Yellow	WW-49758-3-5BY	$116.12	$104.51

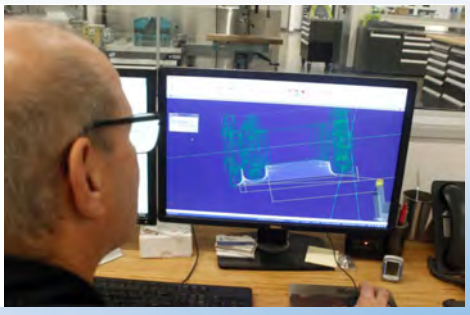
Bicycle Manufacturer Relies on CAD/CAM Software to Roll Prototypes to Production

Supplied by CNC Software



Dynamic OptiRough milling toolpath used to efficiently rough material from the bearing bores and surfaces sides of the suspension link.





Dynamic Rough lathe toolpath used to rough in the outer shape of the mountain bike hub using a Kennametal button turning tool

Specialized Bicycle Components, Inc. designs and manufactures high-end road, mountain, and general-purpose bikes for a worldwide customer base. Founded in 1974 by cycling enthusiast Mike Sinyard, the company is a true trailblazer in its industry — Specialized Bicycle designed and manufactured the first production mountain bike in 1981. It has been rolling out innovations ever since.

Daniel Lister is the research & development shop manager at the Morgan Hill, CA, facility. Here, Lister and his dedicated team spearhead R&D and prototyping efforts. Projects range from molds for carbon fiber to high-end road and mountain bike components such as suspensions, hubs, motors, and suspension links. The department works closely with the Specialized Bicycle design engineering team to rapidly produce testable prototypes within tight design cycles. To meet their goal of bringing innovation to production more quickly, team members rely on the capabilities of their Mastercam® CAD/CAM software and an expanded CNC machining and EDM operation.

"We do all prototyping for literally any bike that comes through our design division," said Lister. "It could be a new road bike that would be potentially ridden by one of our racers in the Tour de France or it could be a mountain bike for one of the riders in the World Cup downhill circuit."

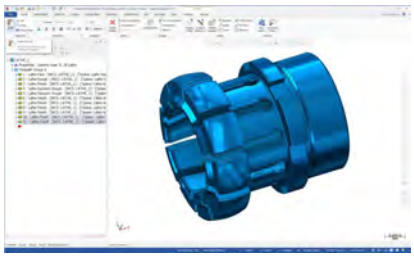
A team of seven employees, including three CNC programmers, makes full, rideable prototypes from a variety of materials, including aluminum, steel, titanium, and exotic alloys. All tooling for carbon fiber molds is made in-house. The shop often produces molds for wheels in their Roval Wheel line, frame molds for road and mountain bikes, and sections of carbon fiber frames.

"We're using Mastercam to fully prototype just about any part that comes through in a regular design cycle," said Lister. "So, we can work on projects that are coming out in the next three months or marked for production in the next three to five years."

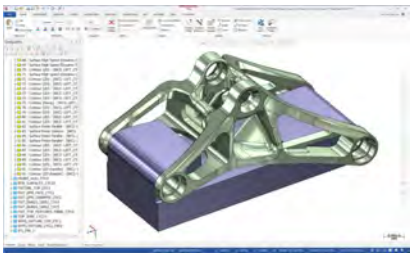
When Lister joined Specialized Bicycles in 2013, the 1200-square-foot R&D shop had one CNC mill and a variety of manual machines. Within three years, three CNC machines and two more seats of Mastercam were added. Within five years, the Specialized Bicycle research & development group moved into a new 8500-square-foot facility complete with CNC lathes, mills, EDMs, and numerous offshoot areas for welding, grinding, and processing.

"We use Mastercam in a pretty holistic way," said Lister. "It's the most versatile CAD/CAM program that I've used. On the design side, we'll import the part and check all features and tooling that we're going to use. We then create and verify all toolpaths before we put stock into the machine."

When adhering to short design cycles, Specialized Bicycle designers look to Mastercam Solids for efficient, flexible solid modeling. The software lets the team import, create,



High-speed Dynamic toolpaths were programmed into Mastercam 2019 Lathe to machine a collet.



Dynamic OptiRough toolpaths provide high-speed roughing on the shock link for the Demo 8 bike.

Mastercam 2019 Mill was used to program high-speed Dynamic toolpaths for the Stumpjumper link.

and program solids in the same user-friendly interface and access Mastercam's programming tools. When the prototyping shop receives models from designers, it is not always efficient to go back into the full native 3D model, modify the design in CAD, and then download it into Mastercam. The software allows programmers to mix and match wireframe, solid, and surface modeling techniques. For example, surface or wireframe elements can be added to a solid while solid components may be added to a complex surface model.

"We can bring a design into Mastercam and utilize the CAD package to adjust the wireframe, change geometry, or use Solids to create new fixtures," said Lister. "We're saving a lot of time in our ability to tweak models and geometry on the fly in a prototyping environment."

Lister relies on the program's flexibility to help boost design efficiency. Solids features include powerful, streamlined solid modeling; user-friendly revolve, sweep, extrude, and loft commands; and maximum design potential through the use of sheet solids. He adds that, when building a prototype, the creative freedom Mastercam Solids provides is a major benefit.

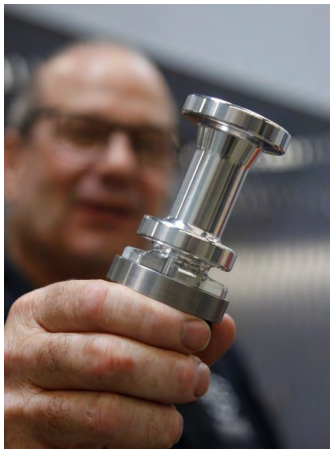
"The speed at which I can adjust or modify a part for manufacture, or design a fixture, really makes it powerful software for us in a prototyping environment. When collaborating with designers, we utilize full simulation to see deviations from models. We use just about every aspect of the program to help us out."

One of the most challenging parts that the prototyping team produced was a thin-walled bicycle shell component that required 3- and 4-axis operations. The walls were less than 1 millimeter in thickness. Using Solids, Lister created a series of fixtures in which the first stage of the part was machined. Next, the part was sunk down into a mating fixture and backfilled with wax. This allowed Lister to perform second and third machining operations while the part was suspended in wax; the only fixturing at this point was the wax fixture. Lister created 3- and 4- axis toolpaths to perform complex internal surfacing and to build fixturing. The final piece had a wall thickness of .040 inches and the bounding box size was 3.5 cubic inches.

"I was able to build the wax fixturing and fully assemble it, see what was going to happen by using Verify, and have it come together seamlessly to get the finalized parts," he said. "We could see the part floating in the wax. I melted off the wax, scooped it up, and we had beautiful thin-walled parts

Stumpjumper rear suspension link in various stages of production

The bicycle wheel hub being machined



Bradford Craig holds the completed wheel hub

From Left: Ford Murphy, Daniel Lister, Bradford Craig and Andy Schiffer

with no chatter. They were easily fixtured. It was a standout project for us—it received a lot of recognition."

Verify is a CAM software feature that prevents tool collisions. It lets programmers check for gouges, view the finished shapes of parts, and visualize how to include fixtures in the Verify simulation screen. Productivity increases and problems are addressed before parts are ever cut. Programmers can verify on a separate thread while continuing to program, saving valuable production time.

"If we don't use Verify, we usually get ourselves into trouble," said Lister "We use it on every single part that comes through."

Dynamic Motion technology is another software feature that is making an impact on Specialized Bicycle's machining operation. During the production of new carbon fiber molds, high-speed Dynamic Motion toolpaths from previous molds are used as templates for roughing mold cavities.

"That's the only way we do it — with Dynamic Motion toolpaths," said Lister. "We rough the cavities, do our semi-finishing and full-finishing cycles with the ball and bull end mills, and then dial in all of our insert and slider locations."

Machining these pieces is particularly tricky because inserts and sliders must be matched perfectly with surface features on mold halves. 4-axis machining creates tapered surface finishes, and post-processing operations, whether polishing or hand-work, are kept to a minimum. The team uses Verify to see exactly what will come out of the machines.

Lister adds that Dynamic milling is the biggest change in Specialized Bicycle's prototyping process during the past five years. Since adopting this technology, the company increased cutting efficiencies. Because Dynamic Motion technology utilizes the entire flute length of a cutting tool, air cutting is reduced or eliminated and tool life is extended. With less machine vibration, machine wear is decreased and constant chip loading is ensured.

For the folks at Specialized Bicycle, their CAD/CAM software helps bolster team collaboration. For example, the team can create templates that may be referenced when new parts arrive. Programmers can scrub toolpaths, craft new geometries, and see how a previous programmer set up a part. Team collaboration over templates and machining processes is a time-saving strategy. Customizing in the software is a solid investment, said Lister.

"I like to tell my guys, 'Set up this toolpath with its defaults in a certain way so that next time that you use it, it's exactly the way that you expect it to be.' The versatility and the speed at which we can execute these prototypes is why we enjoy using the software."

When team members encounter the occasional hiccup during the machining cycle, they contact their local Mastercam Reseller, Sierra CAD/CAM, Inc. (Browns Valley, CA), for advice. "It can be complex or just a bug or tweak that needs to be made and Jack (Tiffany) or Dan (McGourty) will say, 'It looks like you missed this and this — here is a better way to do it,'" said Lister. "Or they'll say, "Wait, that could be a bug. I'll send this one off.'"

New hires, including one programmer seeking to learn a new surfacing routine, are sent to Sierra's headquarters for training. Lister hopes to get the entire team out to Browns Valley for more training soon.

As Specialized Bicycle Components continues to blaze trails as a cycling industry pioneer, its Research and Development team will rely on Mastercam CAD/CAM software to bring its latest creations to production. With the benefits of modeling software, verification tools, and Dynamic Motion high speed machining, the path to production will be a smooth one.

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Hardware for equipment such as CNC machines is at an all-time high demand. Manufacturing integrator Shop Floor Automations reports that manufacturers want to make their current equipment last longer and increase utilization without a huge monetary investment.

Here are the Top 4 common solutions customers are seeking to improve manufacturing productivity at an economic price:

1. Control of program storage for better drip-feeding – While DNC software systems are not the answer for every manufacturing company, hardware can easily fill this need. Low volume job shops that run the same programs for long periods of time can benefit from a portable DNC box. The device helps save time from needing to walk back and forth from PC to CNC. Drip-feeding is reliable when it's from a USB stick with pre-approved programs on it. This process ensures the wrong program is not being run at machines.

2. Modernizing floppy drives or RS232 ports – Floppy disks have been outdated technology for years. Trying to find them new or refurbished is a waste of time. Using USB sticks is a more convenient and reliable replacement. It is important that manufacturers understand floppy disk emulators do not allow for larger programs to be run – it is purely a means to be able to use current technology on the shop floor. USB hardware, however, can allow operators to run larger programs.

3. Replacing cabling systems – Cables on the shop floor are becoming more high maintenance. Costs are going up, whether buying from a vendor, losing time by assuming Cat5 cables will do the job, or attempting to make them in-house. This doesn't even touch the insurance costs and potential hazards of hanging cables high up and having to tend to them. Adopting a wireless shop floor system will eliminate all these issues that your rats' nest of cabling in the ceiling causes to your daily manufacturing routine.

4. Enabling modern protocols for legacy equipment – Assumptions that your legacy equipment is restricted from joining the IIoT revolution are false. You can grab data from nearly any age, make and model of equipment in order to increase job capacity. The SRC provided by DataXchange or the MDC adapter from Predator Software allows you to use protocols such as MTConnect to view basic utilization information from your equipment.

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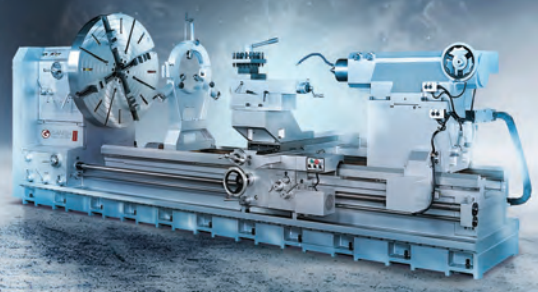

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Dealer, Rep and Manufacturer Work Together to Help Gardena, CA Company

L-R, Mark Kokaram, Rigo Guzman, Gerald Fazis

N.C. Engineering in Gardena, CA. is a family owned business that has been providing high precision quality components to varying industries since 1972. Serving the Military/Aerospace, Commercial Aerospace, Satellite, Semi-Conductor and Micro-Electronics, Medical Devices, Robotics & Automotive Industries to include after market segments. Recently Mitee-Bite helped them quickly solve a machining challenge.

Mark Kokaram from PM Industrial who sells Mitee-Bite contacted California Mitee-Bite rep Dave Hauk from Kenbil Engineering. Dave reached out to the GM of Mitee-Bite Products, David Bishop, on a Saturday and they provided a recommendation based on a couple of short conversations over the weekend. Mark relayed the info to Gerald and put the wheels in motion. The part was a 400 pound of 6061 measuring 8” x 19.6” x 26.2” being machined on a DMG MORI NHX5000 having spindle travel very close to the overall size of the workpiece. They determined by using the Mitee-Bite TalonGrip™ they could grip on .060” and use a 2” face mill allowing full access to entire part. The concern was gripping on such a tiny amount of material and being able to remove material at a fast pace enough to get the job done. After a little old school testing, confidence was high, high enough to hit the green button!

In the end everyone was very pleased with the quick recommendation, product availability and old-school know-how to make a difficult hot application simple.

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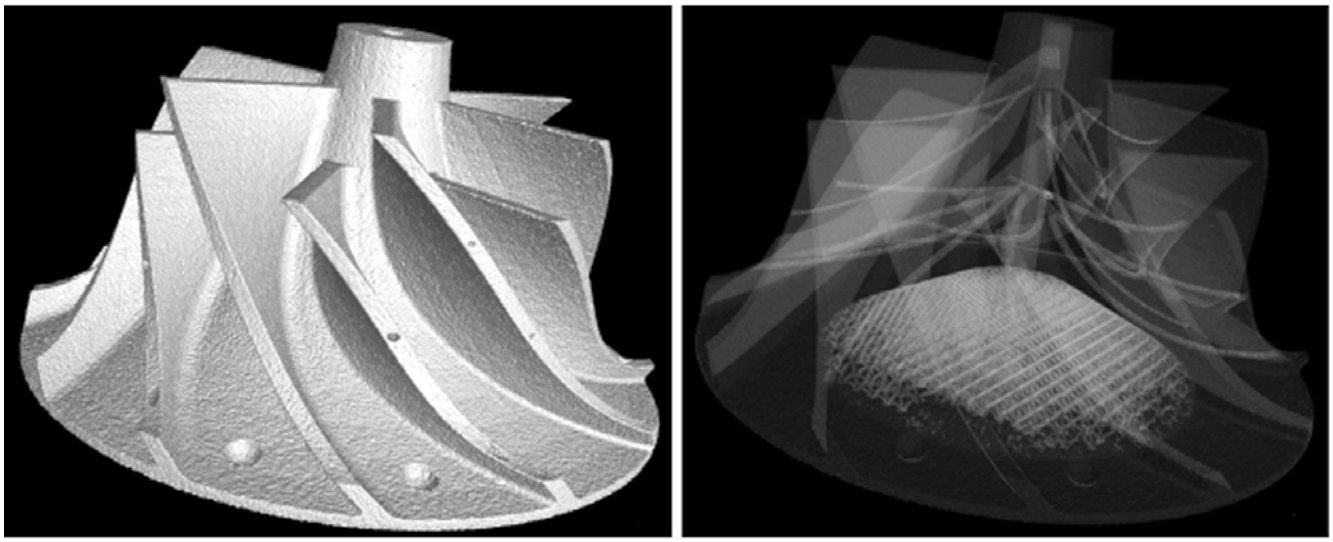
The Future of Automated Measurement

By Peter Morken, Senior Applications Engineer - Nikon Metrology



Automated X-ray computer tomography can diagnose problems with metal 3D-printed parts impossible to achieve by other methods.

What is the future of automated measurement? To be completely honest, as I possess neither the ability to see the future nor a working crystal ball, I don't know. But being part of a business supplying measurement technology to manufacturing industries around the world, as well as user experience in the aerospace sector, I do know to measure is to confirm not only the dimensional quality of a manufactured part, but of the process that made it. Where divining the future of automated measurement is concerned, what we can do is look at the benefits of existing solutions and posit a pathway forward.

Compare going for a doctor's examination to the measurement function in production. The first reaction may be denial – "I'm too busy to take time for the doctor," as compared to "I don't want to delay my production schedule." Add that a doctor's visit can be expensive, which can certainly be analogous to modern metrology equipment. Fear is certainly a factor – being diagnosed with a condition or discovering your parts are out of compliance. Both conditions here can certainly be dangerous to the health and well-being of your business and personal life.

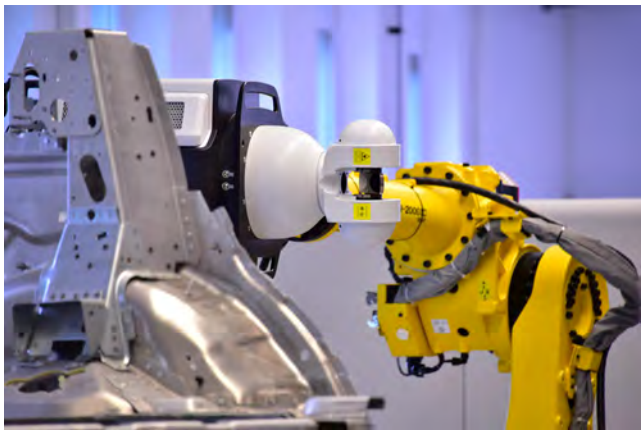
My experience in a recent colonoscopy confirms all of the above. There was very little I liked about it, from scheduling the appointment to all the fasting and preparation for the test. Yet, despite all my whining, I'm very glad I did it, not only because things checked out for the positive. It is simply that knowing is better than hoping.

Envisioning the Future

Where automation is concerned, we can employ a simple definition of automation being the use of a machine or machines doing something better or faster than a human worker. Consider a vision of the future from the 1960's prime-time cartoon The Jetson's. There was everything from flying cars and smart watches to robot maids and dog-walking treadmills. There also was an episode where George contracted "button-itis" from repeatedly pushing the same button at work – a predictor of carpal tunnel syndrome from unergonomic keyboarding. An automated future can have its hazards.

There are also outstanding benefits. If I may offer another personal medical example, the experience of my wife being on blood thinners would involve regular trips to the lab for a blood draw and a return trip home to await the results and adjust meds as need be. Too much medication would mean too much blood thinning; too little is not enough for protection against blood clots. The development of reliable blood meters means now, in the comfort of our own home, she can test her blood with a finger prick, get the results in seconds, and upload the results to her doctor's office with a smartphone app.

It is instructive to ponder just how many microchips are part of our daily experience. Consider your smartphone, laptop or tablet, smart watch or digital clock, your automobile, or any medical devices such as pacemakers or insulin pumps.



Compared to laser scanners, Laser Radar does not need probes on the parts being measured, meaning it can be used in-line and not offline.

Microchip manufacturing is rife with opportunities for automated measurement. A seed crystal of silicon is grown into an ingot, then trimmed, dimensionally ground, flat ground, sliced, edge-rounded, lapped, etched, and polished. Up to 6,000 chips can be placed on a single 6-inch square of silicon, and the pathways can be as thin as 1/5000th of a human hair.

Microchip inspection can include checking these pathways for continuity. Microchip inspection is also a great example where it is impossible for humans to conduct without automation. Specialized equipment such as X-ray computed tomography (CT) machines also offer a way to examine internal structures without destroying a part in the process. Robotic material handling and machine loading and unloading is one example of automating the inspection process.

For parts of larger volumes, such as automobile bodies in white (BIW) or airplane fuselages, Laser Radar offers another automated inspection option. First of all, the Laser Radar measures three-dimensionally by measuring range using proprietary technology. Combined with vertical and horizontal angles we are able to measure objects in 3D. You can also think of it as a hybrid between a programmable CMM taking single points with high precision and a scanner taking up to 500 points per seconds or more.

The first attribute is being non-contact. We literally bounce a focused infrared light beam off a surface to measure range. By contrast, laser trackers, which have been around awhile, require a cooperative retroreflector typically housed in a spherical mount called an SMR (spherically mounted retroreflector). This mirror corner-cube retroreflector must be hand carried or held in place by some mechanical or magnetic means.

The second attribute is automation. Since we don't require someone or something to move a sensor, we can automatically direct the system to measure pre-determined or previously measured features. There are existing Laser Radar applications that function in a "lights-out" or unattended manner. We do require a line of sight to the features, so various instrument positions may be required. But this can also be automated by using a robot or other positioning system to move the Laser Radar to any required viewing location.

Automating not only loading and unloading but between various means of measuring is an emerging metrology application.

Alignment to the object is typically maintained with tooling balls.

As a result, it is possible to completely orchestrate a measurement task by automating Laser Radar positioning and grouping viewable features for each position. We have conducted tests Laser Radar completed in six minutes what it took a coordinate measuring machine with horizontal arm 40 minutes to measure.

Recipe for Forming the Future

The following is offered as a set of guidelines for thinking about automating measurement.

1. Measure where it's needed according to the customer's vision and requirements.
2. Select your hardware partners according to component size and volume, the requirements for contact or non-contact, and to what degree automating the process adds value.
3. Select software that supports your metrology solution, ability to automate, and clarity of the resulting reports.
4. Select integration partners by their familiarity with your industry and production requirements and their ability to coordinate and provide complete solutions.

To recap, necessity will always be the mother of invention. To risk providing another medical analogy, focus on your pain points. Better yet, focus on solutions that avoid creating the pain points. Try not to limit your thinking to conventional and familiar technologies and processes. At the same time, don't let barriers get in the way. In production, as in life, to measure is to know, and knowing is better than hoping.

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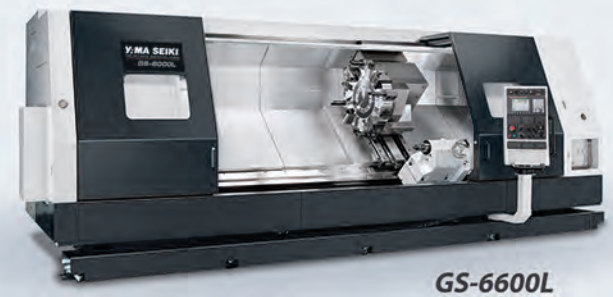

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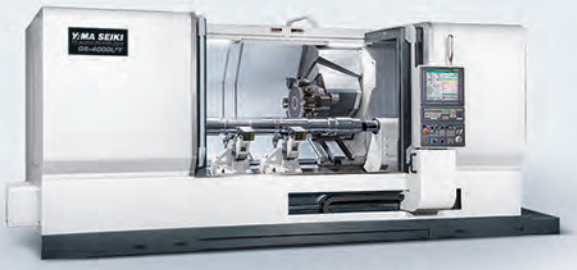

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CAD/CAM/CNC Perspective

By: Tim Paul
Tim.Paul@Autodesk.com

3D Toolpaths, tying it all together...

In the last two issues, I explored the details of 3D machining toolpaths. I covered some of the fundamentals that changed my 3D machining game, including tessellated surfaces, boundary conditions, the effects of smoothing on point distribution, knowing your priorities, and the way I break surface geometry into different categories based on how toolpaths interact with those geometries. In this issue we will wrap up the 3D toolpath discussion.

I often overuse the phrase "the devil is in the details" because I can't think of an industry that it applies to more, and 3D machining is especially full of important details. This article will focus on some of the finishing details in tooling outside of the CAM software that play an equally important role in producing consistently high quality finishes on 3D surfaces.

Tooling:

When finish machining 3D surfaces I generally follow these steps:

1: Optimize my setup to create the best cutting conditions possible.

2: Select the proper tool for the material and geometry being cut.

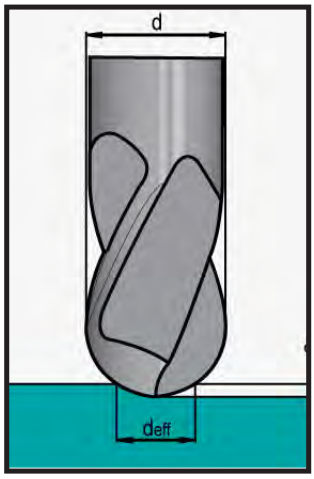
3: Select appropriate roughing processes before finishing.

Optimize setup to create the best cutting conditions possible:

Ball nose end mills are ideal for machining 3D surfaces. However, when machining flat or shallow surfaces that are perpendicular to the tool a zero SFM (Surface Feed per Minute) condition occurs. A zero SMF condition means that the surface speed of the cutting edge of the tool get closer and closer to zero as it gets closer and closer to the center of the tool when it is effectively zero. A zero SFM condition does two main things. 1: It creates inconsistent surface finishes on shallow or flat surfaces when the center of the tool is engaged with the surface. The flat or shallow surfaces will often have smear marks where the tool essentially pushed the material out of the way instead of cutting it . These marks are often dull and occur on shallow areas. 2: Tool life is reduced when cutting in a zero SFM condition. The part material dictates what mechanism will reduce the life of the tool. Soft materials such as Aluminum will weld material to the cutting edge while harder materials will break down the cutting edges.

Whenever possible, I try aligning the part in the machine to reduce or eliminate the possibility of zero SFM conditions. One of the many benefits of multi-axis machines is their ability to easily align the surfaces being machined to optimize the cutting conditions. One of the many benefits of 5-axis simultaneous machining is the ability to specify the tool vector or specific engagement of the tool. Often a simple 3+2 positioning move will create an ideal cutting condition for a variety of surfaces. Angling a surface to be 15 degrees off perpendicularity to the spindle creates a much better cutting condition.

Whether you can angle the surface to eliminate the zero SFM condition or not, it's important to optimize the surface speed for the conditions. There are plenty of good references for the specifics of calculating the Effective Cutting Diameter and adjusted velocity for a ball mill while considering the incline angle/tilt and the ADOC (Axial Depth Of Cut), so I'll skip the formulas and diagrams in this article. Many cutting companies have detailed this, one quick source can be found in the tech area of the Helical Tools website. The core of what you need to account for, unless you are cutting at full radius of the ball, is the ECD (Effective Cutting Diameter). Examples: At zero degrees of tilt, a ¼" ball end mill cutting an ADOC (Axial Depth Of Cut) of .010" has an ECD of .098". The same ¼" tool at the same .010" ADOC with a 15 degree forward tilt has an ECD of .154". Once you've calculated your ECD you need to then calculate an adjusted RPM to match an ideal cutting speed to the EDC. You will likely need to increase your RPM, often an increase to the maximum spindle RPM is needed to get as close to the calculated ideal SFM as possible. I think of it as simple as calculating the SFM to the size of the tool that is actually cutting.

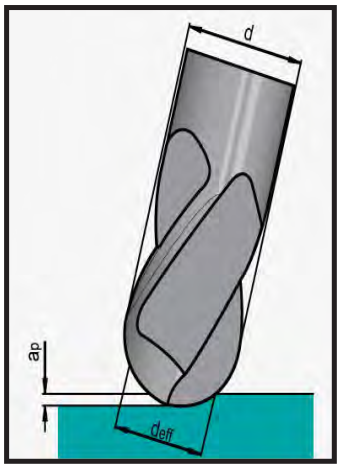


Select the proper tool for the material and the geometry being cut:

Appropriate tooling is one of the more important variables to control when machining consistent 3D surfaces. There is a lot more to tooling than just the cutting tool. I think of tooling as the cutting tool, tool holder, work holding, and even small auxiliary details such as the coolant.

Many tooling basics apply to selecting an appropriate tool for machining 3D surfaces the same way

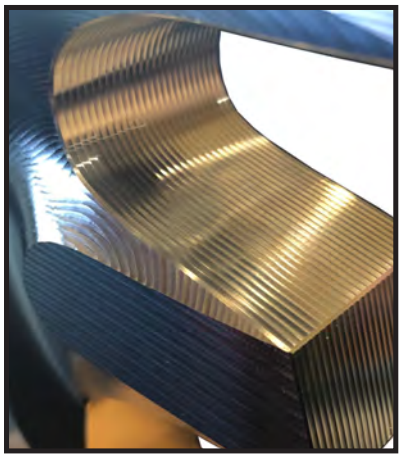
they do for machining prismatic parts where you are more concerned about side cutting walls and end cutting floors. Good basics such as using the shortest tool possible and holding it with a tool holder that is rigid with as little TIR (Total Indicated Runout) as possible all apply as they would with prismatic part machining.



One key difference in cutting conditions between machining 3D Surfaces and prismatic parts is the previously mentioned zero SFM condition. Some cutting tool companies make the best of this situation by applying an elliptical gash on the ball end improving the shear of the cutting edge which produces better cutting conditions and surface finishes.

Tool coatings are an important detail to getting good tool life. TiN, TiCN, AlTiN, TiAlN, chrome nitrides, zirconium nitrides, and DLC (diamond-like coatings) are some of the many choices available. Coatings have different positive and negative characteristics that help for different cutting conditions, such as thermal stability at different temperatures. It is best to follow your tool companies' guidelines to quickly find a suitable solution. I will quickly touch on coatings for cutting aluminum.

When cutting aluminum, one of the main reasons the tool fails is due to edge build up where the aluminum material adheres to the cutting edge of the tool. The built-up material degrades the cutting edge of the tool, lowering the shear cutting forces and increasing the heat generated which in turn accelerates the material build up and compounds the problem. TiN, TiCN, AlTiN, TiAlN are just a few conventional PVD (Physical Vapor Deposition) coatings. The PVD application process makes these coatings poor for cutting aluminum for two reasons: the surface roughness of the coating and the chemical reactivity between the aluminum and the coating. The peaks and valleys created from the PVD process are rougher than the material of the tool, which causes the aluminum material to rapidly collect in the valleys. Additionally, coatings such as TiAlN contain aluminum, which easily bond to the cutting material of the same material.



Often a raw polished carbide cutting tool is enough to produce great results and achieve acceptable tool life. Many tool companies offer micro polished edge preparation which offers superior finishes than the standard edge preparation. Edge preparation and sharpness can quickly lead to a conversation of sub-micron grade vs course grain carbide and which grade is more prone to aluminum build up. The quick summary of this conversation is that sub-micron grain carbide is accepted as a better material as it's very hard and maintains a sharper cutting edge. However, there are numerous studies showing aluminum is more prone to chemically bond to the Cobalt material than it is to sub-micron grade carbide. The same studies show that course grade carbide tools may be ideal in that they contain the right balance of cobalt to provide adequate edge strength to produce a good edge, while minimizing the cobalt content that promotes aluminum build up.

DLC (diamond-like coatings) are becoming more popular as a somewhat expensive solution to producing great finishes with good tool life. The incredibly smooth and hard surface produced during the diamond coating process is chemically inert and significantly improves tool life and surface quality when cutting aluminum.

Select appropriate roughing processes before finishing:

As we've touched on earlier in this article, a key to producing good, consistent 3D surfaces is to present a consistent cutting condition to the tool as much as possible. One important detail is to cut a consistent amount of material throughout the finishing toolpath. To present a consistent amount of material to the tool, the roughing, and possibly semi-finishing toolpaths need to be applied thoughtfully. I will often use a 3D Adaptive toolpath in Fusion 360 with a flat or bull nose end mill and then follow that with a rest machining 3D Adaptive toolpath using a ball mill. Sometimes it also makes sense to use a 3D finishing toolpath with a coarse step over and stock to leave to produce a very consistent layer of material to finish machine.

Wrapping up the series:

In this series we scratched the surface of the extensive topic of 3D machining. It takes experience, thoughtfulness, good resources, and some trial and error to master this aspect of machining. As with anything in our trade, the better I understand the technical details of each intricacy, the better I can predict what is needed to be successful and the better I can think through and react to challenges as they arise. I can't stress enough how important it is to have a strong network of resources to work through challenges for CAM software, machine tools, coolant, cutting tools etc. etc. My network has been a key factor in the success I've had in this trade, large and small. I hope you found this series useful.

Industry News

Jergens inc. Appoints Matt Schron as New General Manager

Jergens announces that Matt Schron will succeed Bob Rubenstahl as the next general manager. As the new GM, Mr. Schron will have responsibility for Jergens – Workholding Solutions, Lifting Solutions and Specialty Fasteners businesses.

Since 2007, Matt has been the general manager for Jergens Industrial Supply (JIS), the company's dedicated, large-scale technical distributor of metalworking products that represents more than 300 top manufacturers in the United States. In his 18-year career at Jergens, Matt has also worked in three of the four division for Jergens, including numerous positions in marketing, product management and sales.

"We are all very enthusiastic about Matt taking on this lead position", says Bob Rubenstahl, the company's previous general manager (upon announcing his retirement after nearly seven years in the position). "Matt is very well-qualified and experienced and will no doubt continue the spirit of innovation in product development as well as providing solutions for our customers", Rubenstahl continued.

Platinum Tooling: A New Beginning for Preben Hansen

When asked what motivated him to start the company, Hansen said that it was a natural progression and that "As we added additional machine tool accessory lines to our offering, it made sense to have a name that encompassed more than just Heimatec." He added "In our industry, it is common to have one importer representing multiple product lines." Hansen was very pleased with the transition from Heimatec Inc., to Platinum Tooling. "As always, our main concern is the customer; their understanding of our

continued presence and new image in the marketplace was essential to our success." Furthermore, he was grateful for the acceptance of their customers during this transition period.

Regarding future changes at Platinum Tooling, Hansen isn't going to change his main goal: making sure customer needs are met. He explained "As always, I will continue to look for new products to complement our current product offering in an effort to satisfy the growing needs of our customers. Since the transition to Platinum Tooling, we have done our best to assure our customers that we will continue to promote and support the Heimatec tooling lines as we did in the past." Hansen clarified by saying "Heimatec tooling will always be our core business. We have several other complimentary lines including Tecnicrafts collets & guide bushings for the Swiss market, Henninger spindle speed increasers for machining centers, AMF marking tools, cleaners, and radio sensors plus Suzuki IB spindle speeders for Swiss machines."

As for custom tooling, Hansen assures customers that Platinum Tooling will continue offering this service. "Our current manufacturers are all excellent at engineering solutions for special applications."

Absolute Machine Tools Announces 100% Sale of Company to Employee Stock Ownership Plan

Absolute Machine Tools announces that the company has been sold and is now owned by an Employee Stock Ownership Trust (ESOP), effective immediately. In the transaction owners Steve & Courtney Ortner sold 100% of their ownership interest to a newly created ESOP, allowing current and future employees to gain a beneficial ownership interest in the company without any personal monetary investment.

The ESOP was developed to give back to Absolute Machine Tools' employees and recognize that they are the drivers of the company's success. Steve Ortner commented, "All of Absolute's employees are valued. Courtney and I could not have done it without their hard work and dedication, and as part of my legacy, I wanted to ensure their personal success." Steve Ortner will continue to be the company's president and chief executive officer, managing sales and the company's day to day operations. The formation of Absolute's ESOP is intended to preserve outstanding customer service through increased productivity and

sense of ownership, eliminate income tax obligations to federal and state governments allowing for reinvestment of cash back into the company for future growth opportunities.

As part of the new structure, the Ortner's formed several new departmental strategic planning committees and a board of directors. These two internal entities will help to influence future financial and growth decisions for the company. Absolute's employees will not only benefit from the acquisition of ownership, but it also serves as an influential retirement program.

JIS, Division of Jergens, Inc. Recognized as Manufacturing Leadership Awards 2019 Winner

JIS announced that it has been recognized as a Manufacturing Leadership Awards winner for its outstanding achievement in Industrial Internet of Things.

The winning Automated Ordering Technology JIS EXPRESS enabled JIS to provide customers with the ability to save time and money when managing their inventory onsite. JIS EXPRESS is an inventory management solution that allows their customers to manage their inventory in a new, unique way. When a customer's employee presses the button, it connects directly into their ERP system, EPICOR's Prophet 21. Since they've launched the solution, they have been doubling the amount of buttons they have in the field, the amount of orders they are receiving and their sales volume every 2 months. The openness of P21 and the ability to connect instantly into their Epicor system is what has made this solution come full circle.

JIS will be recognized at the 15th Annual Manufacturing Leadership Awards Gala, which is to be held on the last day of the Manufacturing Leadership Summit, June 10-12, 2019 at the Hyatt Regency Huntington Beach Resort and Spa in Huntington Beach, CA.

Nominations for the 2020 Manufacturing Leadership Awards will open in September 2019.

Industry News

Murata Machinery Adds North American Sales Manager for Fabrication Products

Jeff Tyl has over 15 years of sales management experience with the last 12 years of his career managing fabrication opportunities for OEMs and structural steel projects in the Southeastern U.S. Tyl comes to Murata Machinery with experience selling and managing fabricated components for various markets ranging from laser shops to railcar manufacturers. He holds a business degree from UNC Greensboro where he is currently pursuing a master's degree in international business.

"We are thrilled to have Jeff lead our fabrication team. His versatile background and passion for the industry will undoubtedly bring value to our customers and growth to our market share," stated Jeff Kalmbach, general manager, Machine Tools Division.

Caron Engineering Hires New Western U. S. Sales Manager

Brian Harrigan is from San Clemente, CA, and has joined the team as a Western U.S. Sales Manager. Harrigan has a degree in business administration from California State University, Northridge. He will be working directly with Caron Engineering integrators, machine tool dealers and end users to grow business in the Western U.S.

He comes to Caron Engineering from a large workholding company where he spent the last seven years helping manufacturers with CNC process optimization, from the workholding perspective.

NIMS Announces New Website

The National Institute of Metalworking Skills (NIMS) announces the launch of its new website – www.nims-skills.org – as the conventional models of training for manufacturing careers are advancing to meet the current needs of manufacturers today. "The courses for apprenticeships and on-the-job training programs are evolving

to be much more reflective of what's happening in shops and factories now and also more flexible for employers," said Montez King, executive director of NIMS. "As a validator of skills, we at NIMS wanted to get ahead of the transformation in training and create a framework and structure on our website to accommodate the changes that will unfold over the next two years."

Applied Automation Technologies and DMG MORI USA Announce Partnership

Applied Automation Technologies, Inc. (AAT) and DMG MORI USA Inc. will offer this innovative technology as a solution within the DMG MORI Qualified Products (DMQP) program.

Having the ability to perform CMM measurement and metrology tasks is an important part of 'Smart Machining' manufacturing processes. CappsNC provides capabilities to quickly develop measurement programs offline and run these programs directly on CNC machine tools in a similar way to a CMM. Measurement results are used to adjust machining process parameters such as calculating precise work offsets, dynamic tool compensations and other data feedback in an automated process together with providing complete part inspection and SPC reports.

AAT's CEO Ray Karadayi states "This is a vital step in the digitalization of the manufacturing process which enables parts to be manufactured with highest level of precision with full confidence directly from the machining center. This partnership is great news for the manufacturing community." As an integrated solution provider, DMG MORI, in combination with their technologically leading machine tools, has been offering high-tech peripherals and innovative accessories of selected suppliers for a long time. DMG MORI is now enhancing their activities and offering innovative complete solutions from one source under the label DMG MORI Qualified Products (DMQP).

Certified DMQP partners have to satisfy the most stringent requirements relating to innovative capacity, technological expertise and quality. Coordinated interfaces, securing con-

nectivity, price maintenance and defined warranty conditions ensure ongoing productivity increases.

Beaumont Machine Relocates, Starts A New Chapter

As company president Ed Beaumont explains, "We needed a fresh start and we were committed to making it happen, on every level, from our physical location to the machine offerings to the markets served and more." And Beaumont Machine has done exactly that.

The company recently announced the opening of its new manufacturing facility in the Cincinnati area, at 4001 Borman Drive, Batavia, Ohio 45103.

Ed Beaumont continues, "I started the company over 25 years ago, had success in the aerospace industry here in Cincinnati and elsewhere. After five years of semi-retirement, I returned to run the company, with three goals in mind. I wanted to relocate the business to a larger facility, expand the machine line to offer more companies the benefits of our unique designs and, lastly, grow our consumables business, a key to long-term relationships with EDM customers, precisely because the wire, guides, electrodes, dielectric resin, filters, rotary unions, seal kits and more are critical components to keep the machines up and running."

As of today, all three goals have been met, resulting in more business for the company and an expansion into new markets such as semiconductor materials processing and land-based power generation, particularly turbine blades.

The consumable sales have ramped up, owing to Beaumont securing reliable partners and having the warehouse capacity to carry expanded inventories.

"Though Beaumont machines are available with Fanuc or Siemens CNC controls," Ed Beaumont explains, "our newest platform with Siemens allows us to create even more shapes with Realtime EDM. We bring them some pretty complex specs and they can always meet the challenges."

The company also provides customers fixture design, training, part programming assistance, engineering, turnkeys and vision system integration.

Industry News

Wetmore Tool and Engineering Sold

Wetmore Tool and Engineering of Chino, California, has been acquired by Dormer Pramet, global manufacturer of cutting tool brands Precision Twist Drill, Dormer, Union Butterfield and Pramet.

Founded over 60 years ago, Wetmore specializes in the supply of precision cutting tools, including handheld skin drilling applications used by several aerospace organizations.

"The company's program of high-quality tooling combined with a customer-focused market approach makes the company an excellent fit both strategically and culturally with Dormer Pramet," says the acquirer.

IMTS Takes #2 Spot In List Of Top Trade Shows

IMTS 2018 – The International Manufacturing Technology Show captured the No. 2 spot on the 2018 Trade Show News Network's (TSNN) Top Trade Shows list. For more than 20 years, the list has ranked the top 250 shows by net square footage.

"It's quite a feat to land on one of the top spots of the 2018 TSNN Top Trade Shows list," says Rachel Wimberly, president of Tarsus Media, Trade Show News Network. "IMTS clearly is a show that has been robust and growing for many years." IMTS 2018 ran from Sept. 10 – 15 at Chicago's McCormick Place. With 1,424,232 net sq. ft. of show floor and 129,415

registrants, IMTS 2018 was the largest show ever.

"The record size and attendance at IMTS 2018 reflect the renewal of manufacturing," said Peter R. Eelman, vice president and CXO at AMT – The Association For Manufacturing Technology. He added, "IMTS 2018 highlighted the explosion of digital technology and highly advanced manu-

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facturing techniques. New ideas and methods dominated the show floor. Combined with a strong economy and industry growth this allowed IMTS to break all of its own previous records."

In addition to record net square footage and registrants, IMTS 2018 featured 2,123 booths and 2,563 exhibiting companies. Notable growth areas at IMTS 2018 included an expanded Additive Manufacturing Pavilion that featured 51 exhibitors and covered 31,550 sq. ft., the strong partnership with HANNOVER MESSE USA and its four co-located shows with 510 exhibitors, and an expanded Smartforce Student Summit that drew 7,000 more visitors than in 2016.

The IMTS 2020 floor plan and space assignment will be released in May 2019.

HAIMER USA Appoints Vice President of Sales

Steven Baier has been promoted to vice president of sales. "Working for a family company with the highest standards in both quality and ethics is what I enjoy most about working at HAIMER USA," said Baier. "Every employee at HAIMER is treated as family. We all have a great team attitude, which allows us to tackle any project with success."

Prior to HAIMER, Baier was the Midwest regional sales manager for 12 years at another company in the industry. From there, Baier joined the HAIMER USA team as the national sales manager.

In his new role, Baier will manage, maintain and expand sales in the U.S. and Canada. At HAIMER USA's North American headquarters in Villa Park, IL, Baier will continue to host and train distributors on HAIMER products and services.

Midaco Corporation Announces VP of Sales

Midaco Corporation has appointed Mike Munao as vice president of sales. Munao initially joined Midaco as a CNC machinist in 1991. He has held positions such as shop foreman and then sales where he has played a key role in the company's growth.

Munao brings machining knowledge to the sales department and has firsthand experience with the evolution of Midaco's pallet changer systems and productivity solutions.

Industry News

Knoche to Lead Verisurf Reseller Success 5-Point Metrology Marketing Support Program

Verisurf Software, Inc. announced Scott Knoche has been appointed as reseller channel sales manager for the U.S. and Canada. Under the new position, Scott will lead efforts to support Verisurf resellers with a multifaceted metrology sales and marketing support program. The effort is aimed at helping authorized dealers be successful identifying customers, developing needs assessments, and delivering comprehensive metrology solutions in support of today's advanced manufacturing requirements.

"Scott has been a part of sales and marketing at Verisurf for the past 16-years, most recently serving as north central regional sales manager, and brings a wealth of experience to this new position. His reputation precedes him with resellers and customers alike, and we look forward to his contributions to this important channel management responsibility," said Ernie Husted, president and CEO of Verisurf. Regional managers, sales and applications engineers, and headquarters staff will continue to provide resellers with sales and administrative support along with added program support, under Scott's direction.

"We are taking a program approach to dealer success, designed to help principals and their sales teams effectively recognize opportunities, provide consultation and make recommendations on automated quality inspection and reporting, scanning and reverse engineering, and tool building," said Scott Knoche, reseller channel sales manager.

The 5-point reseller success program provides critical support and education for each of the metrology applications, in the following areas: Training , sales and marketing materials, customer demonstration, online dealer portal and technical support.

New Products

Flexible Tool Adapter System-Platinum Tooling Technologies

Platinum Tooling Technologies, Inc., now offers its U-tec flexible adapter system on all right-angle heads.

The company plans to include its U-tec adapter system on all angle heads, going forward, according to Preben Hansen, president Platinum Tooling Technologies, Inc.

U-tec is the company's patented flexible tool adapter system that allows a standard ER output live tool to accept various adapters for different applications. This allows users the ability to have quick changeover of tools on almost any lathe or mill, using a single live tool, without having to commit to a quick-change system on the initial purchase. A facemill adapter, for example, can be quickly positioned into the standard holder, without the need for a completely new base being installed.

The U-tec system, according to Hansen, "Represents a real improvement in lathe and mill/turn tooling design. U-tec allows great user flexibility, while a polygonal drive system ensures extremely high-power transmission stability and faster set-up with no loss in performance or accuracy, because the live tool base remains in position and only the adapter and collet get swapped out." He added, "The unique collet nuts on the U-tec system have internal threading for rigid mounting. This new tool adapter system enables the actual cutting tool to be brought into closer proximity to the bearing, thus further improving performance in use. This benefit results from the short and compact tool length design." Internal coolant up to 2,000 PSI (140 bar) is provided as standard.

Every adapter in the U-tec system, complete with any necessary clamping nuts and adapters for arbor, Weldon, CAT 40 and CAT 50, is available in shell mill, face mill, ER extension, side lock, shrink fit, hydraulic and blank styles. U-tec angle heads are compatible with most automatic tool changers, feature 360º manual positioning and include torque arms and a stop block. Torque rated up to 110 ft-lbs.

"The U-tec system is available for all major turning machines on the market," said a company spokesperson

New Products

New 5-Axis Multi-Sensor CMM For Inspecting Complex Components —LK Metrology

LK Metrology, Inc. has introduced a new ALTERA CMM called the SCANtek 5™, that is coupled with Renishaw's REVO-2 scanning system and multi-sensor technology to offer manufacturers a powerful 5-axis solution for inspecting dimensional accuracy and surface finish of components.

The ALTERA SCANtek 5 features

a ceramic construction of the CMM beam and spindle, which combines optimal stiffness-to-weight ratio.

The SCANtek 5 multi-sensor package includes Renishaw's intuitive MODUS software for importing data, controlling the CMM, acquiring results and reporting, including GD&T (geometric dimensioning and tolerancing) labeling. The machine has scanning speed of 500 mm per second.

It is available with a variety of standard measuring volumes. ALTERA M models with repeatability from 1.5 µm are being marketed alongside an ALTERA SL range offering repeatability from 0.7 µm. LK Metrology reports that they are the only global CMM manufacturer to offer a 10-year accuracy guarantee.

With the REVO-2 head synchronized with constant velocity machine motions when scanning, allows changes in component geometry to be followed without introducing dynamic errors.

SCANtek 5 scans without the stylus leaving the surface of the component allowing coordinates of up to 4,000 points to be captured 'on-the-fly' every second. It is also possible to include rapid, single-touch routines into a measuring cycle. Infinite head positioning increases flexibility. Exchanging the REVO-2 scanning probe for one of the vision probes can further increase data collection rates.

In addition, by employing different tip arrangements and knuckle joints,

detailed surface finish analyses can be combined with other CMM measurements in a single operation, the basic output being Ra, RMS and raw data, with an extensive range of additions provided by standard and advanced surface texture options. Even fine bores down to 5 mm in diameter can be inspected.

The MODUS software with its user-configurable interface provides a powerful platform for creation of programs, either by teach mode or from a CAD model imported via the usual graphical exchange formats or directly from CATIA, Siemens NX, Parasolid, PTC Creo or Solidworks®. Wizards in the Windows programming environment employing conversational, graphical and drag-and-drop methodologies give access to a range of macros and standard scanning routines. The native DMIS (Dimensional Measuring Interface Standard) program with drawing geometry, dimensions and tolerance data embedded can be simulated offline to check for potential collisions before the inspection cycle is run.

Chmer Dust Free Graphite Mill-EDM Network

EDM Network and Chmer EDM's 30,000-rpm high-speed Dust Free Graphite Mill can mill graphite electrodes in EDM-compatible oil, applied in an oil shroud or curtain that surrounds the spindle to capture all of the graphite dust from the milling process. All of this dust is then carried to the 30-micron filtration media where it is filtered out of the oil; the oil is then cooled and used again in a continuous process.

In addition to the dust-free graphite milling process, the larger models of this high-speed mill can also machine hardened metals up to Rc 63. The graphite mill is available with either the Chmer CNC or the Siemens 828D control and drives. The machine is offered in either ballscrew drives or Chmer or Siemens linear motor drives.

New Products

New 3D Import with 3D DXF Technology —Hurco

The Hurco MAX5 control is now even more powerful with the new 3D Import feature that includes 3D DXF technology. This control feature allows the user to simply load the file they receive from their customer directly into the Hurco control. "3D Import eliminates extra steps and is a huge time saver," said Mike Cope, product technical specialist for Hurco.

Cope explained the evolution of the 3D Import, which illustrates Hurco's commitment to continuous innovation of conversational programming, which was invented by Hurco in 1976. "When Hurco introduced the DXF Transfer option in 1992, it was a real game changer for the end user because many shops received DWG or DXF drawing files. This made it very easy to transfer the files to the machine and use them to create their programs on the shop floor (right at their Hurco CNC Machine), and also eliminated incorrect data being entered, or 'fat-fingering numbers' as we say in the shop. Today, it is common for shops to receive solid models of the parts that they need to produce, and even paper prints are becoming obsolete".

All previous versions of DXF translators only displayed lines and arcs data and were only useful in 2D since no Z-axis data was translated. 3D Import (the solid model portion) automatically creates the necessary Transform Plane data blocks in conversational programming for 5-sided programs. "As a proponent of 5-sided machining, the automatic creation of Transform Planes is where this control feature really shines," said Cope, who is the author of the book, The Power of FIVE: The Definitive Guide to 5-Axis Machining.

Additionally, the integrated Hurco control powered by WinMax® is equipped with more memory and processing power out of the box: 2.7GHz dual core processor, 4GB RAM memory, a 128GB solid state hard drive, 10,000 block lookahead, and an intuitive graphical user interface that supports multiple machining strategies. The control has many high-end features for NC programming, too.

In addition to the integrated MAX5 control, Hurco's expansive line of CNC machining centers are equipped with the sophisticated motion control system UltiMotion that Hurco invented that determines the optimal trajectory to run the tool, provides consistent programmed feed rates, and reduces cycle time.

EDM Drill for Blade and Vane Turbine Engine Components —Makino

Makino offers a new version of the EDBV3 machine, which is an EDM drilling machine designed for producing cooling film holes in blade and vane turbine engine component details. The EDBV3 utilizes a fully submerged operation to enhance machining speed and accuracy. The submerged operation is a critical element for stable breaking through operations, especially when machining into a hollow internal cavity, and the machine is capable of detecting break through within one second. The EDBV3 will

New Products

also use Makino's new fully digital ES200A generator that provides faster machining speeds with an increase in power of up to 80 Amps, and uses the Hyper-i control that delivers a common interface for all Makino EDM's and contains many helpful advanced functions.

The revised EDBV3 machine design has focused on streamlining production applications and is engineered to improve the machining speed while minimizing the non-value-added motions. The rapid feedrate of the machines X/Y/Z travels of 14.65" x 10.63" x 29.53" has been doubled from 5 meters-per-minute to 10 meters-per-minute, which will reduce the overall tact time for positioning. The machines standard integrated 2-axis rotary table has also been reconfigured so that the workpiece is closer to the center of rotation (reduces positioning distance), and the indexing speed has been improved from 3 RPM to 10 RPM.

The new EDBV3 provides a larger Z-axis stroke that supports electrode tube lengths up to 29.5" and features a fully enclosed work zone with interlocks for increased safety. The ATC (automatic tool change) times have been reduced, as the ATC unit has been raised so that the work tank does not need to more or drain during electrode exchanges.

New High Speed 5-Axis VMC —Matsuura

Making its debut in the United States this year, the MAM72-70V from Matsuura Machinery is a high-speed, large-capacity five-axis VMC.

"The MAM72-70V is designed to handle a greater workpiece size than Matsuura's existing models, offers faster response times and delivers higher productivity," says David Hudson, vice president of sales and marketing. The machine features a maximum workpiece capacity of 700 × 500 mm (diameter × height), with a load capacity of 500 kg per pallet. These dimensions represent an 11 percent increase in part capacity, a 43 percent increase in weight and a 38 percent increase in envelope volume compared to the MAM72-63V.

A newly developed fourth/fifth-axis table, equipped with a roller gear drive for the fourth axis and direct-drive motor for the fifth axis, achieves rapid traverse rates of 50 rpm and 100 rpm, respectively.

Improvements to the MAM72 structure promote ergonomic operation and easier access for setup and maintenance. The distance from the machine front (oil pan edge) to the pallet center is now 620 mm.

The MAM72-70V is described as "IoT-ready," offering measurable remote and real-time monitoring of the machine's status, condition and performance.

High-Accuracy CMM Line Expands —ZEISS

Suitable for measuring small, intricate parts, the MICURA coordinate measuring machine (CMM) line from ZEISS Industrial Metrology - with active scanning and submicron accuracy - now includes a model with an even larger measuring range. The MICURA CMM can handle bigger parts with a 40% larger measuring range of 500 mm x 700 mm x 500 mm and has a

New Products

machine-mounted controller, saving floor space.

ZEISS MICURA comes with the VAST XT gold or the VAST XTR gold active scanning sensor. "The speed and precision make it a valuable inspection solution for medical devices and implants, optics and electronics," said a company spokesperson. The VAST XT gold sensor enables high-speed scanning featuring up to 200 measuring points per second. Angled features are best suited for the VAST XTR gold sensor. Its integrated swivel joint enables the stylus system to turn as far as possible in 15° increments and thus always positions the stylus in the direction of the feature being measured. This saves time because fewer stylus systems and modifications are required, and it minimizes the need for a rotary table.

ZEISS MICURA is available with user-friendly CALYPSO metrology software that works with all ZEISS systems. This includes an extensive and expanding portfolio of CMMs, optical systems, computed tomography machines and more.

NC Servo Motor Driven Ram Turret Punch Press —Murata Machinery USA

Murata Machinery USA Inc. offers its CNC servo motor driven ram turret punch press series: the Motorum M2044TS/M2048TS. These punch presses are within Murata's series of 22-ton machines.

The ram drive of M2044TS/M2048TS series has incorporated CFRP in the part of toggle mechanism connected directly to the servo motor, making it lighter in weight and more rigid. In addition, a reduction of motor heat saves energy in cooling and the recovery of electric energy when braking.

The servo motor drive mechanism is designed to deliver precise RAM control. Combined with Muratec application, M2044TS/M2048TS enables Ram Operation Patterns suitable for wide range of processes, including high-speed punching and forming operations.

New Products

Groove Milling Line Eliminates Secondary Lathe Operations —Thinbit

Manufactured by Kaiser Tool Co., Thinbit's Mill A Groove line is designed for trepanning on a CNC milling machine. According to the company, advantages of using this line of groove mills include an improved surface finish, groove diameters that are concentric to spindle rotation, the elimination of secondary lathe operations for face grooving, increased tool strength because of its greater cross-sectional area, and the ability to order custom inserts to match a given groove form.

The insert is designed so that the groove can be symmetrical or asymmetrical. Step grooves, convex and concave radius grooves, chamfered edges, angles, and special profiles can be made with a single insert. When machining in 6061 aluminum, the tool can cut a groove of 0.125" × 0.200" × 4.98" in 18 sec., according to the company.

The toolholders are designed to work in combination with boring heads and are available in common sizes with straight and 90-degree orientations. Inserts are available ranging from 0.004" to 0.150" in increments of 0.001"; major diameters start at 0.300". Inserts are available in sub-micron grain carbide grades for ferrous and nonferrous materials and high- speed steel (HSS) for composites and plastics. Inserts can be coated with TiN, TiCN, TiAIN or diamond film coatings. PCD and CBN tipping options are available for improved performance in hard or abrasive materials.

New Products

Model 8065 CNC Control-Fagor Automation

Fagor Automation has developed the 8065 CNC with features necessary for high speed and surface finish quality while maintaining accuracy. The CNC is seen as a complement to aerospace machine shops and those requiring extreme accuracy.

Each 8065 is offered with a 10", 15", 19" or 21" high-resolution LCD TFT color or touch screen. Also included is Ethernet, USB and built-in touch sensitive mouse pad. The 8065 can control up to 28 axes and four separate spindles with four different execution channels with auto-tuning system setup capability. In addition, the CNC includes block processing speeds of less than 0.5 ms while analyzing the tool path with high-speed block look-ahead at nanometric resolution. Combined with the Fagor Adaptive Real-time Feed & Speed control (ARFS), the CNC analyzes machining conditions such as spindle load, servo power and tool tip temperature and adapts both the axis feed rate and the spindle speed accordingly. The results include reduction in cycle times, better part finish, extended spindle and servomotor life, and improved tool utilization, the company says.

Equipped with the aerospace-specific HSSA (High Speed Surface Accuracy) machining system, the CNC is said to provide reduced mechanical stress on the machine for smoother movement and the potential of higher feed rates. In addition, the On-Board Bode Diagram tool enables measurement of the machine's frequency response for filtering the machine vibrations incurred by the various operating conditions and environment.

NCSimul Simulation Software-Hexagon Manufacturing Intellegence

The NCSimul simulation software from Hexagon Manufacturing Intelligence is said to be especially useful to aerospace manufacturers because of its "digital twin" process that meets customer demands for higher produc-

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tion rates and product quality.

This software works with ISO NC machining codes to simulate, verify and optimize machining programs based on specific parts, tooling and machine tool characteristics. According to the company, 3D graphics prevent crashes while complex algorithms and embedded process-based knowledge enable optimization of cutting conditions. Use of the software is said to reduce time spent debugging programs, eliminate risk of spindle collision, tool breakage and scrap, and improve cycle times, process efficiencies and machine utilization.

T he software provides machining verification in three steps: it investigates and corrects coding errors, simulates to detect collisions and correct motion errors, and validates the machining results. It also monitors production transfers, tool management and machine status. Use of this software helps manufacturers meet delivery schedules, maintain aerospace-level product quality and reduce preparation times by as much as 70 percent, the company says.

Visual EstiTrack ERP Ultimate Solution-Henning Industrial Software

Henning Industrial Software adds to its ERP shop management system with the Visual EstiTrack ERP Ultimate solution. This system has been rewritten using Microsoft's .NET and SQL server technologies.

One feature enables users to mark parts that require aerospace, heat and/or ITAR control to ensure proper handling compliance. The company's Scheduling Board uses a drag-and-drop touch screen interface that enables users to schedule shop order operations within and between work centers. This tool is designed to be deployed on large touch-screen monitors on the shop floor and is integrated in the ERP software to enable personnel to prioritize operations, view/set statuses, move operations from one work center to another and enable employees to clock in and out of the shop order operations.

New Products

New NIMS Inspection Solution —Verisurf

Verisurf Software announced its NIMS Precision Part Inspection (PPI) Solution, a turn-key quality inspection and reporting solution in support of the National Institute of Metalworking Skills (NIMS), certification testing process. The measurement, inspection and reporting solution allows instructors to check students test parts right in the classroom, lab or shop in minutes, and includes all software, hardware and programming.

The new Verisurf solution is the result of a nationwide pilot program conducted in 2018 designed to develop and validate a process and toolset to improve the ability of NIMS Certified instructors to inspect and report on NIMS Level 1 (L1) Mill and Lathe testing parts. The pilot program proved to reduce the time required to verify machined test parts submitted by students from weeks or even months to minutes.

The Verisurf NIMS PPI Solution is based on the concept of keeping the quality verification of machined test parts within the class room and in the control of NIMS Certified instructors. The Verisurf Solution also takes into consideration deployment in an education environment, ideal measurement performance matched to the NIMS part tolerances, safety, small footprint, reliability, single phase power and no need for compressed air.

The Verisurf NIMS PPI Solution includes comprehensive online training hosted by Immerse2Learn, a platform widely used by educators and industrial trainers alike to develop skilled workers in fields such as engineering, manufacturing, and automation.

Until now, schools offering NIMS Certification training were required to send out all their student's machined test parts to be inspected and evaluated by a NIMS sanctioned Met-Tec review committee. The process often takes one month or more, holding up the students final NIMS Certification.

New Products

New Mini End Mill Series —Seco

The new Seco Tools JM100 Mini end mill series are part of the wide and continuously expanding Jabro® range of solid-carbide end mills. In micro-machining operations with zero visibility of workpiece and cutting tool, Seco reports the JM100 Mini delivers longer tool life, stability and guaranteed surface quality thanks to its extremely precise geometries, virtually zero runout, advanced coatings and tight radius tolerances.

Targeted to achieve precise surface finishes on mold and die components and able to machine tool steel as hard as 48-65 Rc, the JM100 Mini helps shops minimize secondary benchwork that can increase part processing time. It also ensures smooth and consistent surface finishes. The company reports that tight radius tolerances of ±0.005µ on the tool reduce runout virtually to zero.

The JM100 Mini is available in tool diameters from 0.008" to 0.118", corner radii ranging from 0.002" to 0.012" RE = ±0.005 and overhang lengths from 1.5* DC to 20* DC, with two and three-flute versions

New Double-Column Bridge Design 5-Axis Machine- —Hurco

The Hurco BX40Ui 5-Axis CNC double-column machining center, with trunnion table mounted along the Y-axis and ladder structure and double-column design provides extreme rigidity and outstanding support to the head casting. With an 18k motorized spindle and oversized linear guide rollers, the BX40Ui is perfect for a wide range of applications. Additionally, the bridge structure is isolated from part weight and operates in a stable and predictable manner. Exceptional cutting feed rates are achieved with patented high-speed motion technology called UltiMotion that simultaneously reduces cycle times by up to 30% or more and delivers outstanding surface finish quality.

The BX40Ui differs from other bridge-type 5-Axis CNC machines due to the integrated Hurco control powered by WinMax® control software and UltiMotion®. The control supports multiple programming methods: conversational for 5-sided

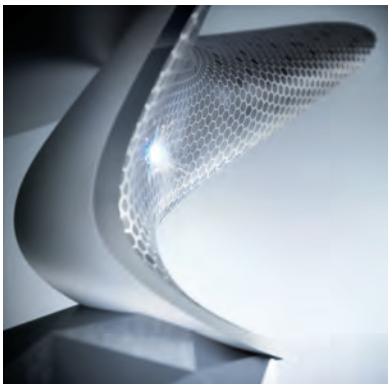
New Products

programming with no CAM system needed; NC for simultaneous 5-axis; and a Hurco-specific feature called NC/Conversational Merge that optimizes efficiency even further. The newest control feature called 3D Import is especially advantageous for Hurco 5-axis machines because the control software creates Transform Planes automatically for easy 5-sided conversational programming that eliminates data entry requirements.

UltiMotion is the sophisticated motion control system invented by Hurco that determines the optimal trajectory to run the tool, provides consistent programmed feed rates and reduces cycle time. Hurco reports with UltiMotion, cornering velocity is 2.5 times faster than conventional motion and machine jerk is reduced by half. UltiMotion includes up to 10,000 blocks of dynamic look ahead and is smart enough to adapt as required by the tool path. Hurco reports it improves upon CAM output by providing better handling of the machine mechanics and dynamics. All Hurco CNC machining centers are equipped with UltiMotion.

New Laser S Series Boosts Surface Texturing Quality —GF Machining Solutions

The new AgieCharmilles LASER S series from GF Machining Solutions



is an all-in-one texturing solution that applies designs to challenging surfaces while it controls cost per part, cuts lead and machining times and significantly improves quality. Benchmarking tests show that in a single setup, the LASER

New Products

S series not only reduces the risk of human error, it also slashes fine surface-texturing time for a wider range of parts and applications.

As part of the digital transformation in manufacturing, the AgieCharmilles LASER S series provides a fully digital solution to the limitations of conventional and manual surface texturing methods to reduce quality deviations without additional machining processes. On the tenth anniversary of the introduction of the AgieCharmilles LASER family, the new AgieCharmilles LASER S makes difficult-to-realize designs easy to generate for more creative freedom and faster time to market, especially in industries such as automotive, information and communications technology (ICT) and packaging.

New LC 201 Single-Section Linear Encoder —Heidenhain

Long machine tool axes are increasingly being equipped with linear drives, and Heidenhain's new LC 201 absolute linear scale was introduced to specifically meet those drive position feedback needs. This new scale is a single-section METALLUR tape encoder which is ideal for use in linear motor applications that may be require to reach high acceleration levels within the linear drive systems.

SmartCAMcnc Offers New Software Subscription Options

SmartCAMcnc has announced a new software subscription option that cuts acquisition costs for CAM software.

In response to changing market demand, SmartCAMcnc is adding an

New Products

annual subscription option to their existing 'perpetual-use licenses'. For many years, the CAD and CAM industries have seen accelerated growth in "subscription-only software' offerings, which is a major departure from the decades-old 'buy a software use license with maintenance contract" method. Because both approaches have their place in the market. SmartCAMcnc now offers a choice.

"SmartCAM customers now have more flexibility in their software configuration and deployment, and can benefit from the lower acquisition costs" said Gregg Olson, founder and president of SmartCAMcnc. "All subscription offerings include the high-quality SmartCAM software and technical support customers have enjoyed for over 30 years," Olson went on to say.

Large Field of View Metrology System —Quality Vision International

QVI (Quality Vision International) offers its new Fusion 350 large field of view multisensor metrology system. QVI Fusion systems are measurement tools that combine a large field of view (LFOV) optical system with available touch probe, laser and micro-sensors to produce a family of productive metrology systems.

New Products

The Fusion 350 is designed to characterize large parts or groups of small parts that primarily require 2-D measurement. "The heart of Fusion's capability lies in its large field optical system, which allows high accuracy imaging of a wide area - up to 100 mm. QVI's exclusive image analysis software tools can instantly process and identify all features and dimensions within the FOV, with no need for a pre-programmed measurement routine. If a measurement routine has been prepared, Fusion's AutoID feature allows placement of any previously programmed part or multiple parts anywhere on the stage, even without fixturing, and Fusion will identify the parts and automatically measure them," said a QVI spokesperson.

Fusion 350 is suitable for high speed measurement of 2-D parts. With its large 450 mm x 450 mm measuring area and flexible dual magnification optics, it can accommodate large parts or groups of smaller parts, and measure both large and small feature sizes. AutoID and Feature Extraction identify and measure single or multiple parts instantly.

All fusion models are equipped with QVI ZONE3 Express CAD-based 3-D metrology software. "ZONE3 features a clear, simple user interface and its kinematic model simulates the machine, part, fixtures and measuring sensors, updated in real time. Built-in productivity maximizing tools, integrated GD&T functionality and visual validation of measurement intent offer speed and power to the measurement process," said the spokesperson.

Coordinate Measuring Machine with Latest Scanning Technology —Zeiss

Zeiss Industrial Quality Solutions has announced its new Spectrum bridge-type coordinate measuring machine (CMM) line. "Using the latest Zeiss software, scanning sensor and

machine technology, these economical systems are designed to easily handle everyday measurement applications," said a company spokesperson.

"The Zeiss Spectrum CMM comes with Calypso measurement software," added the spokesperson. "The CAD-functionality in CALYPSO accepts native product manufacturing information (PMI) models created in Solidworks, Creo, CATIA and Siemens NX.

Zeiss PiWeb reporting plus software is also available, enabling customized measurement reporting, allowing Spectrum owners to deliver measurement reports in formats their customer's need. PiWeb also monitors trends in key measurement results, making that information available faster so manufacturing process adjustments can be made earlier.

For specific inspection jobs, Zeiss Spectrum CMM can be configured accordingly. With the RDS-C5 articulating probe holder and VAST XXT multi-point scanning sensor, it can measure angled features in difficult-to-reach locations. The RDS/XXT offers +/- 180° rotation in X, Y and Z, reaching 5,184 angular positions and is best suited for general prismatic measurement applications.

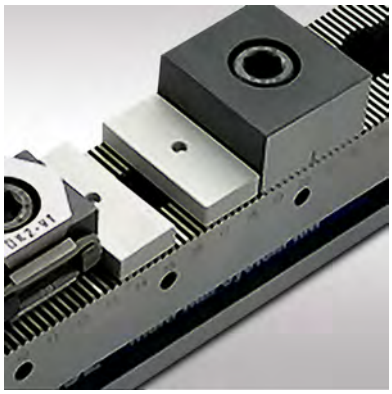
The CMM's are available in measuring volumes from 500 mm x 500 mm x 600 mm to 700 mm x 1000 mm x 600 mm. The Zeiss C99L intelligent scanning controller is mounted on the CMM. Wrap-around air bearings are used on ceramic guideways to provide rigidity and stability at maximum speeds and accelerations. The guideways are resistant to corrosion, wear and temperature. Measurement uncertainty specifications are based on an integrated system design that is calibrated to ISO10360 standards.

Additions to OK Vise® Low Profile Edge Clamps —Jergens

Jergens Inc. announces three key additions to the company's range of OK Vise® compact, low-profile edge clamps. Among them are Multi-Rail (MR), Knife Grip and Hydraulic Kits.

Multi-Rail is the new general-purpose, multi-configurable, modular workholding system capable of hold-

New Products



ing challenging workpieces, small and large, and often multiple in the same location. Multi-Rail is also compatible to mount to the Jergens QLS Grid System, a lightweight 2-pc aluminum column that opens up further machining opportunities including connections with both Fixture Pro® and Ball Lock®.

Knife Grip are also compact, low-profile edge clamps that improve production and provide solutions for difficult applications. What's unique about OK Vise® Knife Grip are the jaws that feature serrated teeth to penetrate into softer materials and prevent part movement due to the load imposed by machining forces.

Hydraulic actuation kits pair the OK Vise® clamping system with the advantages of hydraulic workholding. Repeatable clamping forces and improved ergonomics are two key benefits for high-production applications. OK Vise® clamps are small in size yet provide excellent clamping force, up to 150 kN.

New Custom Rotary Table Workholding —Kurt

The Kurt newly designed Rotary Table Workholding System is designed using the Kurt DX6® CrossOver® Hydraulic vise with a trunnion mounted onto a 4th axis rotary table. The system uses double-acting hydraulics, which is desirable for automated part loading and unloading via a robotic system. Additionally, the system can be used for manual part loading and unloading.

New Products

The Kurt Rotary Table Workholding System is ideally suited for three axis vertical machining centers and provides three side access to the part to be machined. With the addition of the Kurt system more complex machining and contouring work can be accomplished

The vise is manufactured to the ideal flatness, parallelism and strength for critical high precision machining. The vise's high clamping force keep workpieces rigid as they are machined on each side.

The DX6® CrossOver® Hydraulic vise features a ¼" jaw stroke. The vise body also provides chip evacuation straight through the body at sides and end of vise to prevent chip build-up.

Additional features of the Rotary Table Workholding System include: Complete integration of workholding, rotary table and mounting base. DX6® CrossOver® Hydraulic vise includes a GrooveLock® jaw plate and workstop are included for convenient part positioning. The DX6 CrossOver® Hydraulic vise has a larger and stronger bearing pack that increases durability and has longer life. New brush seal design for easier removal or replacement in the nut. 80,000psi ductile iron body, nut and movable jaw, a semi-hard steel screw and a hardened vise bed and jaw plates.

New QUADRA-CHEK 2000 For Reliable 2-D Measurement —HEIDENHAIN

HEIDENHAIN Corporation introduced the new QUADRA-CHEK 2000 evaluation unit for use with everyday measuring and metrology tasks in parts inspection applications. Measuring point acquisition with the QUADRA-CHEK (QC) 2000 is quick, easy and

New Products

accurate when utilizing crosshairs or when used with optical edge detection on profile projectors, measuring microscopes and/or 2-D measuring machines with up to three axes.

For complex and repetitive measuring tasks, the QC 2000 user can automatically record a measuring program and run it at any time. This digital readout keeps track of the presets, sequence of measurements, tolerances and data-output commands. When the recorded measuring program is executed again, the QC 2000 displays visual instructions relating to the features to be probed, thereby providing direct and repeatable guidance for the user.

The QC 2000's "Measure Magic" function makes measurement especially easy. This function uses the acquired measuring points to automatically select the matching geometry, enabling a high level of repeatability and significantly reducing measurement uncertainty.

All measurement results from the QUADRA-CHEK 2000 are graphically displayed on the unit's high resolution 7-inch color touchscreen. The integrated measurement report function makes it easy to create a report directly upon completion, and its intuitive operation makes it easy to document these results in the form of measurement reports including as a PDF or CSV file. These measurement reports contain the measurement and tolerance results as well as additional information.

Based on the same software platform used in HEIDENHAIN's QUADRA-CHEK 3000 unit, this new evaluation unit rounds off the QUADRA-CHEK product family.

Pacific NW Machine Tool Show Preview

Everything for EDM —Booth #944

EDM Performance Accessories is your complete one stop shop for all your EDM wire, EDM sinker, small hole EDM and waterjet needs. All supplies, consumables, tooling, filtration and machinery, etc.

Powerful Workholding With a Light Touch —Booth #807

Blue Photon® will demonstrate the advantages of their photo-activated adhesive workholding system at Northwest Machine Tool Expo 2019 this May in Portland.

Blue Photon's workholding products are a manufacturer's solution to hold parts for tight-tolerance machining and inspection. Complex-shaped, hard-to-hold parts, and delicate materials like ceramic and laminated composites are keenly suited to the technology which supplies up to 605 lbs of tensile holding power. Any part that is at risk for distortion from traditional clamping, or that pose complications in fixture design are easily and simply held with Blue Photon's patented grippers and BlueGrip™ workholding adhesive.

Spinetti Machinery to Feature Swiss Machines and Tooling and More —Booth #741

Spinetti Machinery provides the highest quality machine tool technology combined with a commitment to a superior level of support and

value added services. Featured will be Citizen-Cincom Swiss style lathes, Citizen-Miyano lathes, laser marking machines, Genevieve Swiss tooling and accessories, and MiJet Parts cleaning units.

Ellison to Display Latest Technology —-Booth #721

Ellison Technologies is one of the largest machine tool distributors in the U.S., representing 65% of the metal cutting market. With offices in the Pacific Northwest Ellison provides its customers with superior engineering solutions, service and parts support, robotic automation and machine financing. Ellison Technologies will feature the latest technology from its premier builder partners including Doosan Machine Tools America, GF Machining Solutions, Tsugami/Rem Sales, and Bumotec.

Wide Array of Tooling and Accessories on Display- —Booth #849

A&I Marketing is an independent manufacturer's representative for the Northwest – Washington, Oregon, Idaho, Montana in USA and BC and Alberta in Canada. They will have the following in their booth, Actek Mfg & Engineering, BIG KAISER Precision Tooling, M.A. Ford Mfg., Mitee Bite, Rego-Fix Tool, and Royal Products.

Leading National Distributor of Tooling to Display —Booth #965

US Shop Tools is a national distributor of chuck jaws, lathe tooling, CNC and manual lathe chucks, collet pads, mill tooling, milling toolholders, collets-16C/3J/ER/TG/DA, cutting tools, carbide inserts, drills, taps, reamers, indexable drills, measuring tools, abrasives, vises and vise jaws, coolant and machinery and shop supplies

Pacific NW Machine Tool Show Preview

Selway Machine Tool to Have Big Booth with Wide Array of Products —Booth #932

Selway Machine Tool Company has been supporting the Pacific Northwest manufacturing community since 1963. Offerings include CNC machining centers, CAD/CAM software, 3D printers, robotic automation, service and application support. They carry a full line of quality brands featuring, but not limited to, Matsuura, Eurotech, Toyoda, Hwacheon, Mitutoyo, C.R. Onsrud, HP, MakerBot, and Autodesk software.

Western Region's Favorite Metalworking Magazine —Booth #907

CNC WEST will once again be at the Pacific Northwest machine tool show. They will be handing out copies of the April/May edition. Attendees can give their business card to get on the mail list and receive the popular every other month magazine. CNC WEST features ONLY western region case studies along with new product releases, the popular Hotline section plus ads from the companies that sell the top metalworking equipment and accessories in the industry.

Solid Carbide End Mills —Booth #914

CERATIZIT Sacramento (formerly PROMAX Tools) is a manufacturer of premium high performance solid carbide end mills. Tools are manufactured from premium carbide with special geometries, edge prep and high end coatings. These tools have strong cutting edges with chatter resisting features that run smoother and cooler with increased tool life.

See Royal Products in the A & I Booth —Booth #849

For more than 65 years, Royal Products has been designing and building precision metalworking accessories. line consists of hundreds of high-performance tooling and workholding products that are easy to install.

Featured Products include chucks, collets and fixtures and industrial supplies.

HAIMER German Tool Holders —Booth #749

From the basics of face-mill arbors and ER collet chucks, all the way up to high precision collet and shrink fit chucks, HAIMER has the tools necessary to satisfy and exceed your machining center needs. Their product portfolio, which also holds shrink machines, balancing machines, 3D-sensors, and cutting tools, addresses the machining process from spindle to part, giving the customer a complete machining solution.

Zeiss Machines to be Shown —Booth #1108

Western Metrology Sales LLC is the exclusive distributor of Zeiss industrial metrology equipment in Oregon and Washington. They offer products including: CMMs, non-contact scanning, optical, and surface and form. Additionally, they provide metrology support, training, and services.

...Hotline Continued From Page 8

Northern California Company Wins Contract

L3 Applied Technologies Inc. (L3 ATI), San Leandro, California, was awarded a contract for modeling and experimentation of laser interaction with plasma. L3 ATI will investigate, model, and execute proof-of-principle and scaled ground-test demonstrations to assess the ability of a laser to enhance and impart effects on plasma. The work will be performed in San Leandro, California. The period of performance for the base period is eight months, from March 2019 through November 2019.

General Atomics Poway CA Work

General Atomics Aeronautical Systems Inc., Poway, California, has been awarded a contract action for the France MQ-9 Block 1 Weapons integration effort. This contract provides for the production and integration of weapons kits onto the French Air Force MQ-9 Block 1 aircraft. Work will be performed in Poway, California, and is expected to be complete by Sept. 30, 2020.

Trust Automation Expands Operations in San Luis Obispo, California

Trust Automation Inc., a supplier of automation and cyber defense systems for industrial and military applications, is moving to a larger facility at 125 Venture Drive, San Luis Obispo, California.

According to company officials, at 96,000 square feet, the new facility more than doubles the amount of space Trust has for its U.S.- based engineering, manufacturing and business operations. The company's current facility is 44,000 square feet.

Trust will use the extra space to expand its established semiconductor, defense and industrial businesses. The new facility also includes additional room for the company's recently announced Trust Intelligence Systems division, which focuses on cyber defense devices for legacy IoT networks.

Trust's new facility was formerly occupied by Lockheed Martin and includes dedicated areas for engineering, research-and-development, quality control and manufacturing.

Tucson Raytheon Wins $63.3 Million DARPA Contract

Raytheon Company won a $63.3 million DARPA contract to further develop the Tactical Boost Glide hypersonic weapons program. The joint DARPA and U.S. Air Force effort includes a critical design review, a key step in fielding the technology.

For a tactical-range boost glide weapon to achieve hypersonic speeds – velocities greater than Mach 5 – "a rocket accelerates its payload to high speeds. The payload then separates from the rocket and glides unpowered to its destination," according to the DARPA website.

Boeing Donates $3 Million to Embry-Riddle Aeronautical University

Boeing recently awarded a $3 million grant to Embry-Riddle Aeronautical University that has campuses in Florida and Arizona to accelerate pilot training and aviation maintenance programs.

Boeing's investment will create a permanent endowment to fund annual scholarships for flight training, maintenance training and certification costs related to the pilot training and aviation maintenance programs. Scholarship dollars will be made available to all students – with a focus on increasing the number of women, military veteran and minority students enrolled in both programs.

Speaking at the 18th Annual U.S. Chamber of Commerce Aviation Summit, Boeing Chairman, President and CEO Dennis Muilenburg emphasized the need for increased collaboration within the global aerospace industry to address the growing demand for commercial pilots and technicians.

"It's essential that industry and higher education work together to increase the pipeline of aerospace talent. Our partnership with Embry-Riddle demonstrates Boeing's commitment to the continued growth and diversification of the global aerospace industry," said Muilenburg.

According to Boeing's 2018 Pilot & Technician Outlook, the industry will need 790,000 new civil aviation pilots and 754,000 new maintenance technicians to fly and maintain the world fleet over the next 20 years. The forecast is inclusive of the commercial aviation, business aviation and civil helicopter industries.

Continued on page 98.....

...Hotline Continued From Page 96

Sparks Nevada Company Gets Work

Sierra Nevada Corp., Sparks, Nevada, has been awarded a $23,702,941 cost-plus-fixed-fee modification to previously awarded contract for the permanent installation of the MC-130J Airborne Mission Networking (AbMN) Program. This modification provides for the procurement of additional hardware and labor necessary to support the AbMN program through flight test. Work will be performed in Sparks, Nevada, and is expected to be complete by Nov. 16, 2021.

Northrop Grumman Gets $245M Order for Roadside Bomb Jammers

The U.S. Navy said March 22 that it exercised an option worth $245 million to buy more signal jammers known as JCREW.

Northrop Grumman Corp. builds the electronics, which U.S. troops use to foil roadside bombs. Work will be done in San Diego and will run through January 2021. The deal includes $2.2 million worth of foreign military sales to the government of Australia, the Navy announcement said.

Cal State LA Receives Grant for Innovation and Design Center

Cal State LA has been awarded a grant to establish an Innovation and Design Center that will foster a learning community focused on design and manufacturing.

With a $325,000 grant from the W. M. Keck Foundation, the center will provide project-based learning for more than 1,000 undergraduate students annually in the College of Engineering, Computer Science and Technology (ECST).

"This grant from the Keck Foundation will enable the college to develop collaborative, experiential learning opportunities for our students, the next generation of technical professionals who will lead, serve and transform the greater Los Angeles area," said ECST Dean Emily Allen.

The goal of the three-year grant project is to prepare students for success in STEM fields.

The Innovation and Design Center will provide students with training workshops on the design process, computer-aided drafting software, advanced manufacturing techniques and microcontroller programming.

With support from Cal State LA faculty, some students will be able to create a gyroscope or gearbox for a rotating design class project, while others will design and fabricate entries for intercollegiate engineering competitions.

Capstone Turbines Gets Unique Order

Capstone Turbine Corp. has received orders for its micoturbines from two California cannabis growing operations.

The unidentified companies are in Northern and Southern California. Five C65 units made by the Van Nuys manufacturer are destined for the northern part of the state where they will product 325 kilowatts of power. Four C65 units will power the Southern California cannabis operation with 260 kilowatts.

Chief Executive Darren Jamison said the two orders represent a growing niche for the company.

"These orders mark the second and third grow operations that have turned to Capstone's microturbines within the past few months in California alone," Jamison said in a statement.

GA Tests System That Could Propel Underwater Vehicles

General Atomics' Electromagnetic Systems unit in Torrey Pines, CA reported in early March that it successfully demonstrated an aluminum power system for an unmanned underwater vehicle.

The first end-to-end demonstration of the power system, or ALPS, was in a test tank in San Diego. The system provided hydrogen and oxygen to a Teledyne Energy Systems fuel cell, which provided electricity to propel the vehicle.

"This demonstration marks a major milestone for us, illustrating for the first time that ALPS can be successfully integrated to supply hydrogen and oxygen to fuel cells to generate electrical power and drive an underwater vehicle," said Scott Forney, president of GA-EMS, in a statement distributed by the company.

"ALPS is a unique, high energy density system intended to provide up to 10 times the energy output of similar battery volume. It has unlimited shelf life, safe handling and high energy density.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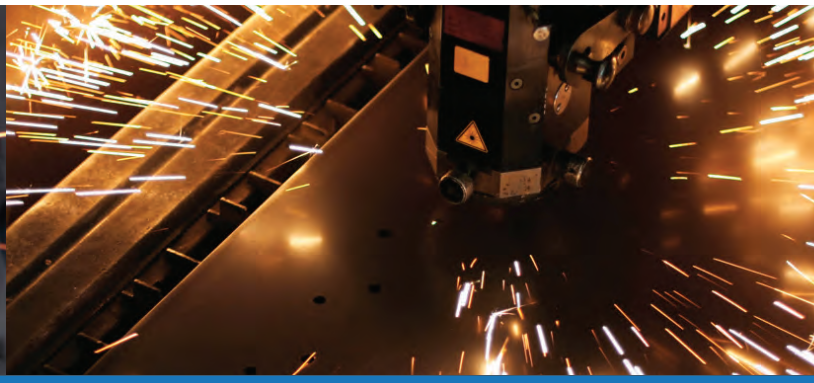

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