

# CNC WEST

Volume 38 - Issue 2

**THE MAGAZINE FOR WESTERN METAL WORKING MANUFACTURING**

## QUALITY ISSUE

- **DECADES OF QUALITY ON THE FRONT RANGE WITH PETERSON MACHINING**
- **HOW FAR MEASUREMENT HAS COME WITH Q-PLUS LABS**
- **CAL POLY POMONA - JOB READY ON DAY ONE**
- **AN INTRODUCTION TO LIVE TOOLING**

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# CNC West

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*Lola and Mike Knicker are the owners of Q-PLUS Labs in Irvine, CA. Mike founded the company almost 33 years ago and they have been a team ever since.....Pg.42*

### Coming in February/ March 2020

This issue will look at the aerospace and defense industries. These two industries are vital to the west coast, especially the Pacific Northwest and southern California. We will have articles on shops that specialize in these two industries and the machines and methods that make them successful.

*Editorial: Jan 18, 2020*

*Ad Space: Jan 22, 2020*

*Ad Material: Feb 1, 2020*



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# End of an ERA at CNC-West

I bet you read the headline and thought maybe we are closing shop. Sorry but far from it. 2019 was excellent for our print publication and early indications are that 2020 will be too. The headline was about Charlene Strawbridge. Charlene has been with us for over 30 years. She answers the phone, keeps up the mail list and pretty much keeps me in line. I can procrastinate if left to my own devices but over the years Charlene makes sure I return calls, mail out things I am supposed to and rights my ship if it goes off course.

Charlene is a friend of the family who said she would help us out in a pinch over 30 years ago. She was 50 years old and retired. We had a girl quit after a week and asked Charlene if she could help out until we found someone. Since we were a mile from her house and were pretty flexible with her hours she said OK.

Over 30 years later Charlene is still here but winding down. And instead of a mile away we are 16 miles away. And in that horrible southern California traffic it can take Charlene an hour and fifteen minutes to get to work. Usually the drive going home is twenty minutes but I think Charlene has earned the right not to fight that traffic anymore. She was not only a co-worker but a friend and almost like family. She will be missed.

This issue has some interesting stories in it beginning on page 22. Our editor Sean Buur ventured out to Colorado to visit Peterson Machining. The shop recently celebrated 30 years and they have been able to last this long buying quality products and having an excellent QC department lead by their LK Metrology CMM. I am sure you will find the story behind this shop fun to read.

Many people in this industry worry about the future and who will replace our aging workforce. A college in California, Cal Poly Pomona is doing it's part to insure they send qualified people into manufacturing engineering. They have a very successful program and are certainly doing their part.

Our last feature story is about a shop in California that is hard to measure up to. Q-Plus Labs utilizes the best equipment to measure some of the most unique things you will ever read about. From Eddie Van Halen's guitar to a church in Hawaii to Shelby Cobra parts, Q-Plus delivers. This company that does 80% service and 20% product sales makes for an interesting read.

We have other articles about Live Tooling, Mazak Discovery Days and Zeiss software. Also after a couple of issues off, Tim Paul returns with his unique perspective on CAD/CAM/CNC.

We at CNC WEST know we are fortunate to have the means to provide these articles to our readers and that we are still going strong after all of these years. I would like to wish all of our readers the happiest of holidays and a great New Year. Thank you for reading CNC WEST.

Sincerely,

*Shawn Arnold*

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# EXEC HOTLINE

## Raytheon Work in Tucson

Raytheon Missile Systems, Tucson, Arizona, is being awarded a sole source, cost only contract modification which adds more work. Under this modification, the "pacing items only" restriction is removed and the contractor is now authorized to work the full, unchanged, effort to manufacture, assemble, test and deliver 20 Standard Missile-3 Block IIA missiles and related efforts, and four missiles under Foreign Military Sales (FMS) case JA-P-ATB to Japan. The work will be performed in Tucson, Arizona; and Huntsville, Alabama, with an estimated completion date of December 2022.

## L3 Work in San Leandro

L3 Applied Technologies Inc., San Leandro, California, is awarded a contract for a Flash X-Ray machine, a Short-Pulse Gamma Ray machine, and a radiation shielding design and installation and training. The supplies under this contract enhance the Navy's capability to produce and acquire strategic radiation hardened trusted microelectronics. These supplies are in support Naval Surface Warfare Center Crane's Radiation Testing Modernization Program. Work will be performed in San Leandro, California (97%); and Crane, Indiana (3%), and is expected to be complete by December 2022.

## Vigor Work in Portland

Vigor Marine LLC, Portland, Oregon will get work for the USNS Yukon (T-AO 202). Work will include furnish general services, shipboard access and security, clean and gas free tanks, tank deck overhead preservation, aft mooring station overhead preservation, deck preservation, tie down replacement, miscellaneous steel replacement, tank preservation, house preservation, bridge, cargo winch and motor, and winch refurbishment. Contract completion will be Feb. 24, 2020. Work will be performed in Portland, Oregon, and is expected to begin Jan. 6, 2020.

## General Dynamics Gets Work in AZ and Hawaii

General Dynamics Mission Systems, Scottsdale, Arizona, is awarded an indefinite deliv-

ery/ indefinite quantity contract for Mobile User Objective System (MUOS) ground system sustainment. MUOS is a narrowband military satellite communications system that supports a worldwide, multiservice population of users, providing modern netcentric communications capabilities while supporting legacy terminals. Contract funds will not expire at the end of the current fiscal year. Work will be performed in Scottsdale, Arizona (94%); Wahiawa, Hawaii (2%); San Diego, California (1%); Niscemi, Italy (1%); Chesapeake, Virginia (1%); and Geraldton, Australia (1%). Work is expected to be completed by November 2029.

## Aero-Tec Wins Two Contracts

Seattle-based AeroTEC has won two contracts to help two supersonic jet makers develop their new ultra-fast airplane programs.

AeroTEC CEO Lee Human confirmed his new contracts during an interview with the Seattle Business Journal.

"I can confirm to you that we're supporting two separate supersonic airplane programs. It's clearly a very exciting space," Human said.

The customers are believed to be the two leading players in the emerging supersonic sector: Boom Supersonic, the maker of a passenger supersonic jet, and Boeing-backed Aerion, which is making a supersonic business jet.

## Southeast Asian Country Buys AeroVironment's Raven Drones

AeroVironment Inc. has received a contract valued at \$6.4 million from a Southeast Asian military customer for additional Raven unmanned aircraft.

The Simi Valley, CA. drone manufacturer will deliver the Raven aircraft within the next 12 months.

Rick Pedigo, vice president of sales and business development at AeroVironment, called the Raven a mainstay for the military of the unnamed country placing the order.

Continued on page 88.....

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13 Z-5.0358 A-49.5848 B  
15 Z-4.9985 A-50.0835 B  
18 Z-4.9611 A-50.5784 B  
1 Z-4.9236 A-51.0688 B

14 Z-4.8861 A-51.5539 B28.4544 F686.13 N29 X-.3059 Y.6084 Z-4.8861 A-51.5539 B28.4544 F6  
18 Z-4.8486 A-52.0331 B27.3917 F710.23 N30 X-.1599 Y.6058 Z-4.8486 A-52.0331 B27.3917 F7  
13 Z-4.811 A-52.5057 B26.2988 F734.35 N31 X-.0138 Y.6033 Z-4.811 A-52.5057 B26.2988 F73  
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1 Z-3.9378 A-63.2448 B0.4324 F1946.53 N54 X-.0090 Y.5459 Z-4.0138 A-63.2448 B0.4324 F120  
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1 Z-2.6078 A-79.5898 B-38.9321 F3837.23 N89 X-.0342 Y.4584 Z-4.0138 A-79.5898 B-38.9321 F190  
1 Z-2.5698 A-80.0568 B-40.0568 F3891.25 N90 X-.0298 Y.4559 Z-4.0138 A-80.0568 B-40.0568 F192  
1 Z-2.5318 A-80.5238 B-41.1815 F3945.27 N91 X-.0354 Y.4534 Z-4.0138 A-80.5238 B-41.1815 F194  
1 Z-2.4938 A-80.9908 B-42.3062 F3999.29 N92 X-.0310 Y.4509 Z-4.0138 A-80.9908 B-42.3062 F196  
1 Z-2.4558 A-81.4578 B-43.4309 F4053.31 N93 X-.0366 Y.4484 Z-4.0138 A-81.4578 B-43.4309 F198  
1 Z-2.4178 A-81.9248 B-44.5556 F4107.33 N94 X-.0322 Y.4459 Z-4.0138 A-81.9248 B-44.5556 F200  
1 Z-2.3798 A-82.3918 B-45.6803 F4161.35 N95 X-.0378 Y.4434 Z-4.0138 A-82.3918 B-45.6803 F202  
1 Z-2.3418 A-82.8588 B-46.8050 F4215.37 N96 X-.0334 Y.4409 Z-4.0138 A-82.8588 B-46.8050 F204  
1 Z-2.3038 A-83.3258 B-47.9297 F4269.39 N97 X-.0390 Y.4384 Z-4.0138 A-83.3258 B-47.9297 F206  
1 Z-2.2658 A-83.7928 B-49.0544 F4323.41 N98 X-.0346 Y.4359 Z-4.0138 A-83.7928 B-49.0544 F208  
1 Z-2.2278 A-84.2598 B-50.1791 F4377.43 N99 X-.0402 Y.4334 Z-4.0138 A-84.2598 B-50.1791 F210  
1 Z-2.1898 A-84.7268 B-51.3038 F4431.45 N00 X-.0358 Y.4309 Z-4.0138 A-84.7268 B-51.3038 F212  
1 Z-2.1518 A-85.1938 B-52.4285 F4485.47 N01 X-.0414 Y.4284 Z-4.0138 A-85.1938 B-52.4285 F214  
1 Z-2.1138 A-85.6608 B-53.5532 F4539.49 N02 X-.0370 Y.4259 Z-4.0138 A-85.6608 B-53.5532 F216  
1 Z-2.0758 A-86.1278 B-54.6779 F4593.51 N03 X-.0426 Y.4234 Z-4.0138 A-86.1278 B-54.6779 F218  
1 Z-2.0378 A-86.5948 B-55.8026 F4647.53 N04 X-.0382 Y.4209 Z-4.0138 A-86.5948 B-55.8026 F220  
1 Z-2.0000 A-87.0618 B-56.9273 F4701.55 N05 X-.0438 Y.4184 Z-4.0138 A-87.0618 B-56.9273 F222  
1 Z-1.9620 A-87.5288 B-58.0520 F4755.57 N06 X-.0394 Y.4159 Z-4.0138 A-87.5288 B-58.0520 F224  
1 Z-1.9240 A-87.9958 B-59.1767 F4809.59 N07 X-.0450 Y.4134 Z-4.0138 A-87.9958 B-59.1767 F226  
1 Z-1.8860 A-88.4628 B-60.3014 F4863.61 N08 X-.0406 Y.4109 Z-4.0138 A-88.4628 B-60.3014 F228  
1 Z-1.8480 A-88.9298 B-61.4261 F4917.63 N09 X-.0462 Y.4084 Z-4.0138 A-88.9298 B-61.4261 F230  
1 Z-1.8100 A-89.3968 B-62.5508 F4971.65 N10 X-.0418 Y.4059 Z-4.0138 A-89.3968 B-62.5508 F232  
1 Z-1.7720 A-89.8638 B-63.6755 F5025.67 N11 X-.0474 Y.4034 Z-4.0138 A-89.8638 B-63.6755 F234  
1 Z-1.7340 A-90.3308 B-64.8002 F5079.69 N12 X-.0430 Y.4009 Z-4.0138 A-90.3308 B-64.8002 F236  
1 Z-1.6960 A-90.7978 B-65.9249 F5133.71 N13 X-.0486 Y.3984 Z-4.0138 A-90.7978 B-65.9249 F238  
1 Z-1.6580 A-91.2648 B-67.0496 F5187.73 N14 X-.0442 Y.3959 Z-4.0138 A-91.2648 B-67.0496 F240  
1 Z-1.6200 A-91.7318 B-68.1743 F5241.75 N15 X-.0498 Y.3934 Z-4.0138 A-91.7318 B-68.1743 F242  
1 Z-1.5820 A-92.1988 B-69.2990 F5295.77 N16 X-.0454 Y.3909 Z-4.0138 A-92.1988 B-69.2990 F244  
1 Z-1.5440 A-92.6658 B-70.4237 F5349.79 N17 X-.0510 Y.3884 Z-4.0138 A-92.6658 B-70.4237 F246  
1 Z-1.5060 A-93.1328 B-71.5484 F5403.81 N18 X-.0466 Y.3859 Z-4.0138 A-93.1328 B-71.5484 F248  
1 Z-1.4680 A-93.5998 B-72.6731 F5457.83 N19 X-.0522 Y.3834 Z-4.0138 A-93.5998 B-72.6731 F250  
1 Z-1.4300 A-94.0668 B-73.7978 F5511.85 N20 X-.0478 Y.3809 Z-4.0138 A-94.0668 B-73.7978 F252  
1 Z-1.3920 A-94.5338 B-74.9225 F5565.87 N21 X-.0534 Y.3784 Z-4.0138 A-94.5338 B-74.9225 F254  
1 Z-1.3540 A-94.9998 B-76.0472 F5619.89 N22 X-.0490 Y.3759 Z-4.0138 A-94.9998 B-76.0472 F256  
1 Z-1.3160 A-95.4668 B-77.1719 F5673.91 N23 X-.0546 Y.3734 Z-4.0138 A-95.4668 B-77.1719 F258  
1 Z-1.2780 A-95.9338 B-78.2966 F5727.93 N24 X-.0502 Y.3709 Z-4.0138 A-95.9338 B-78.2966 F260  
1 Z-1.2400 A-96.4008 B-79.4213 F5781.95 N25 X-.0558 Y.3684 Z-4.0138 A-96.4008 B-79.4213 F262  
1 Z-1.2020 A-96.8678 B-80.5460 F5835.97 N26 X-.0514 Y.3659 Z-4.0138 A-96.8678 B-80.5460 F264  
1 Z-1.1640 A-97.3348 B-81.6707 F5889.99 N27 X-.0570 Y.3634 Z-4.0138 A-97.3348 B-81.6707 F266  
1 Z-1.1260 A-97.8018 B-82.7954 F5944.01 N28 X-.0526 Y.3609 Z-4.0138 A-97.8018 B-82.7954 F268  
1 Z-1.0880 A-98.2688 B-83.9201 F5998.03 N29 X-.0582 Y.3584 Z-4.0138 A-98.2688 B-83.9201 F270  
1 Z-1.0500 A-98.7358 B-85.0448 F6052.05 N30 X-.0538 Y.3559 Z-4.0138 A-98.7358 B-85.0448 F272  
1 Z-1.0120 A-99.2028 B-86.1695 F6106.07 N31 X-.0594 Y.3534 Z-4.0138 A-99.2028 B-86.1695 F274  
1 Z-0.9740 A-99.6698 B-87.2942 F6160.09 N32 X-.0550 Y.3509 Z-4.0138 A-99.6698 B-87.2942 F276  
1 Z-0.9360 A-100.1368 B-88.4189 F6214.11 N33 X-.0606 Y.3484 Z-4.0138 A-100.1368 B-88.4189 F278  
1 Z-0.8980 A-100.6038 B-89.5436 F6268.13 N34 X-.0562 Y.3459 Z-4.0138 A-100.6038 B-89.5436 F280  
1 Z-0.8600 A-101.0708 B-90.6683 F6322.15 N35 X-.0618 Y.3434 Z-4.0138 A-101.0708 B-90.6683 F282  
1 Z-0.8220 A-101.5378 B-91.7930 F6376.17 N36 X-.0574 Y.3409 Z-4.0138 A-101.5378 B-91.7930 F284  
1 Z-0.7840 A-102.0048 B-92.9177 F6430.19 N37 X-.0630 Y.3384 Z-4.0138 A-102.0048 B-92.9177 F286  
1 Z-0.7460 A-102.4718 B-94.0424 F6484.21 N38 X-.0586 Y.3359 Z-4.0138 A-102.4718 B-94.0424 F288  
1 Z-0.7080 A-102.9388 B-95.1671 F6538.23 N39 X-.0642 Y.3334 Z-4.0138 A-102.9388 B-95.1671 F290  
1 Z-0.6700 A-103.4058 B-96.2918 F6592.25 N40 X-.0600 Y.3309 Z-4.0138 A-103.4058 B-96.2918 F292  
1 Z-0.6320 A-103.8728 B-97.4165 F6646.27 N41 X-.0656 Y.3284 Z-4.0138 A-103.8728 B-97.4165 F294  
1 Z-0.5940 A-104.3398 B-98.5412 F6700.29 N42 X-.0612 Y.3259 Z-4.0138 A-104.3398 B-98.5412 F296  
1 Z-0.5560 A-104.8068 B-99.6659 F6754.31 N43 X-.0668 Y.3234 Z-4.0138 A-104.8068 B-99.6659 F298  
1 Z-0.5180 A-105.2738 B-100.7906 F6808.33 N44 X-.0624 Y.3209 Z-4.0138 A-105.2738 B-100.7906 F300  
1 Z-0.4800 A-105.7408 B-101.9153 F6862.35 N45 X-.0680 Y.3184 Z-4.0138 A-105.7408 B-101.9153 F302  
1 Z-0.4420 A-106.2078 B-103.0400 F6916.37 N46 X-.0636 Y.3159 Z-4.0138 A-106.2078 B-103.0400 F304  
1 Z-0.4040 A-106.6748 B-104.1647 F6970.39 N47 X-.0692 Y.3134 Z-4.0138 A-106.6748 B-104.1647 F306  
1 Z-0.3660 A-107.1418 B-105.2894 F7024.41 N48 X-.0648 Y.3109 Z-4.0138 A-107.1418 B-105.2894 F308  
1 Z-0.3280 A-107.6088 B-106.4141 F7078.43 N49 X-.0704 Y.3084 Z-4.0138 A-107.6088 B-106.4141 F310  
1 Z-0.2900 A-108.0758 B-107.5388 F7132.45 N50 X-.0660 Y.3059 Z-4.0138 A-108.0758 B-107.5388 F312  
1 Z-0.2520 A-108.5428 B-108.6635 F7186.47 N51 X-.0716 Y.3034 Z-4.0138 A-108.5428 B-108.6635 F314  
1 Z-0.2140 A-109.0098 B-109.7882 F7240.49 N52 X-.0672 Y.3009 Z-4.0138 A-109.0098 B-109.7882 F316  
1 Z-0.1760 A-109.4768 B-110.9129 F7294.51 N53 X-.0728 Y.2984 Z-4.0138 A-109.4768 B-110.9129 F318  
1 Z-0.1380 A-110.0000 B-112.0376 F7348.53 N54 X-.0684 Y.2959 Z-4.0138 A-110.0000 B-112.0376 F320  
1 Z-0.1000 A-110.5232 B-113.1623 F7402.55 N55 X-.0740 Y.2934 Z-4.0138 A-110.5232 B-113.1623 F322  
1 Z-0.0620 A-111.0464 B-114.2870 F7456.57 N56 X-.0696 Y.2909 Z-4.0138 A-111.0464 B-114.2870 F324  
1 Z-0.0240 A-111.5696 B-115.4117 F7510.59 N57 X-.0752 Y.2884 Z-4.0138 A-111.5696 B-115.4117 F326  
1 Z-0.0000 A-112.0928 B-116.5364 F7564.61 N58 X-.0708 Y.2859 Z-4.0138 A-112.0928 B-116.5364 F328  
1 Z-0.0000 A-112.6160 B-117.6611 F7618.63 N59 X-.0764 Y.2834 Z-4.0138 A-112.6160 B-117.6611 F330  
1 Z-0.0000 A-113.1392 B-118.7858 F7672.65 N60 X-.0720 Y.2809 Z-4.0138 A-113.1392 B-118.7858 F332  
1 Z-0.0000 A-113.6624 B-119.9105 F7726.67 N61 X-.0776 Y.2784 Z-4.0138 A-113.6624 B-119.9105 F334  
1 Z-0.0000 A-114.1856 B-121.0352 F7780.69 N62 X-.0732 Y.2759 Z-4.0138 A-114.1856 B-121.0352 F336  
1 Z-0.0000 A-114.7088 B-122.1599 F7834.71 N63 X-.0788 Y.2734 Z-4.0138 A-114.7088 B-122.1599 F338  
1 Z-0.0000 A-115.2320 B-123.2846 F7888.73 N64 X-.0744 Y.2709 Z-4.0138 A-115.2320 B-123.2846 F340  
1 Z-0.0000 A-115.7552 B-124.4093 F7942.75 N65 X-.0800 Y.2684 Z-4.0138 A-115.7552 B-124.4093 F342  
1 Z-0.0000 A-116.2784 B-125.5340 F7996.77 N66 X-.0756 Y.2659 Z-4.0138 A-116.2784 B-125.5340 F344  
1 Z-0.0000 A-116.8016 B-126.6587 F8050.79 N67 X-.0812 Y.2634 Z-4.0138 A-116.8016 B-126.6587 F346  
1 Z-0.0000 A-117.3248 B-127.7834 F8104.81 N68 X-.0768 Y.2609 Z-4.0138 A-117.3248 B-127.7834 F348  
1 Z-0.0000 A-117.8480 B-128.9081 F8158.83 N69 X-.0824 Y.2584 Z-4.0138 A-117.8480 B-128.9081 F350  
1 Z-0.0000 A-118.3712 B-130.0328 F8212.85 N70 X-.0780 Y.2559 Z-4.0138 A-118.3712 B-130.0328 F352  
1 Z-0.0000 A-118.8944 B-131.1575 F8266.87 N71 X-.0836 Y.2534 Z-4.0138 A-118.8944 B-131.1575 F354  
1 Z-0.0000 A-119.4176 B-132.2822 F8320.89 N72 X-.0792 Y.2509 Z-4.0138 A-119.4176 B-132.2822 F356  
1 Z-0.0000 A-119.9408 B-133.4069 F8374.91 N73 X-.0848 Y.2484 Z-4.0138 A-119.9408 B-133.4069 F358  
1 Z-0.0000 A-120.4640 B-134.5316 F8428.93 N74 X-.0804 Y.2459 Z-4.0138 A-120.4640 B-134.5316 F360  
1 Z-0.0000 A-120.9872 B-135.6563 F8482.95 N75 X-.0860 Y.2434 Z-4.0138 A-120.9872 B-135.6563 F362  
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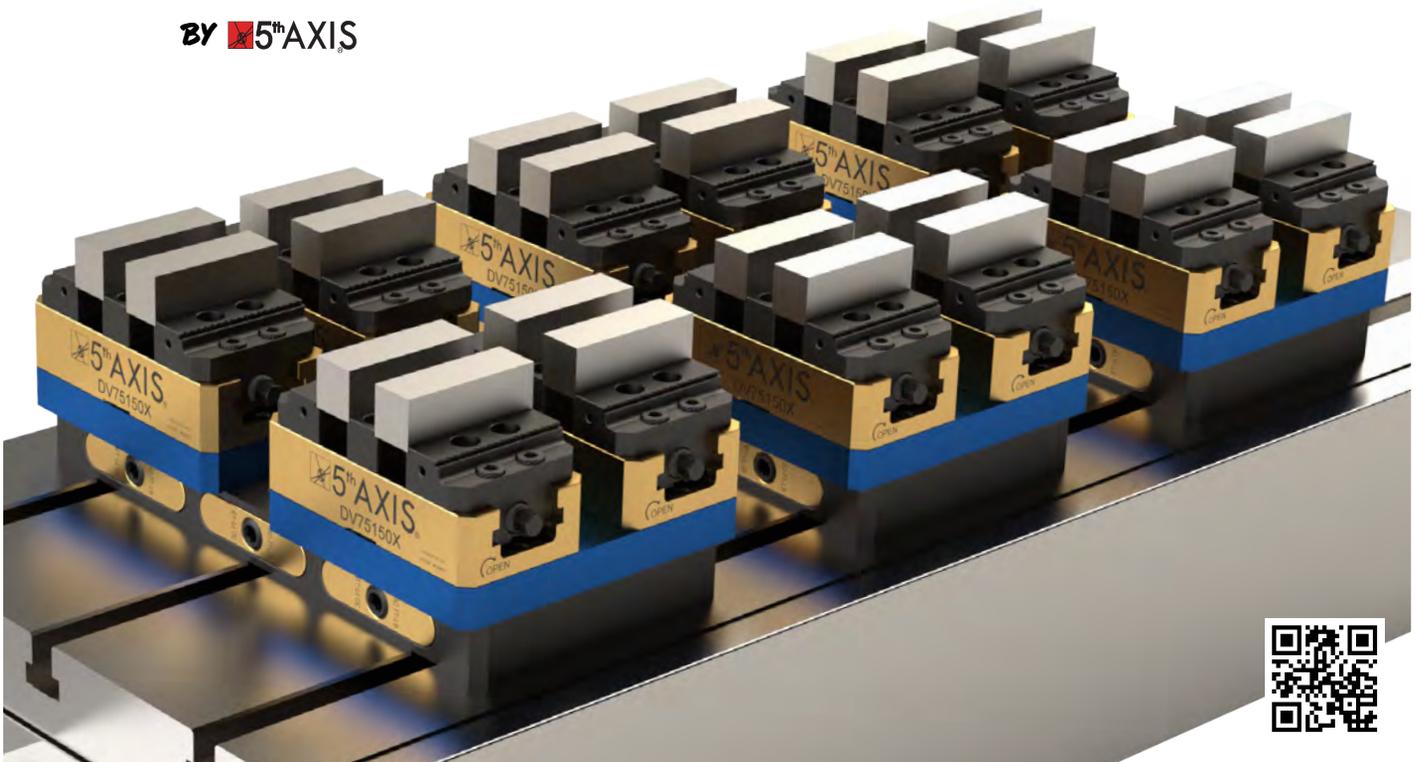
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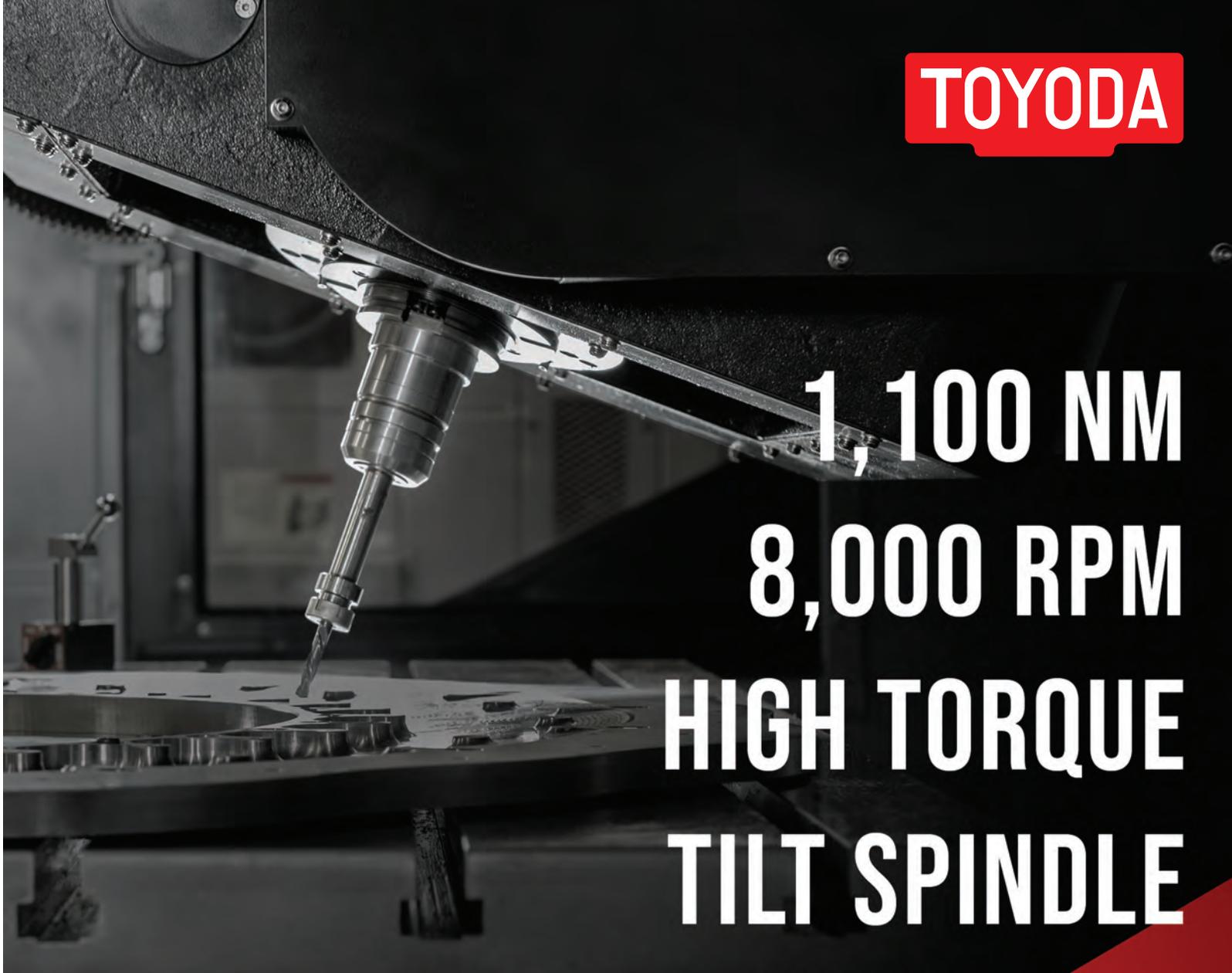
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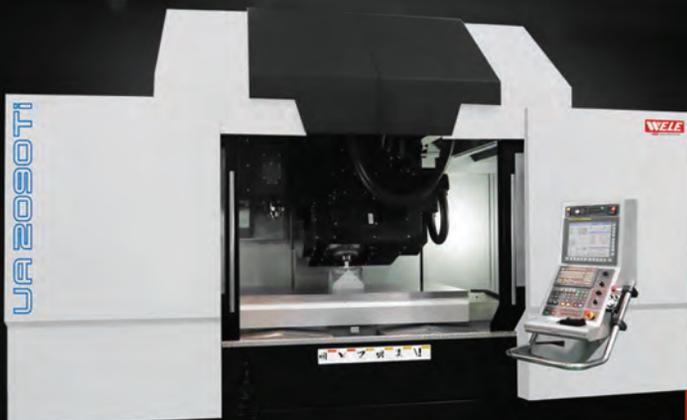
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For Bison, Buck, BTC, Cushman, TMX, PBA & Rohm Chucks

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

**IN STOCK!  
READY TO SHIP!**

**100% Made In The USA!**



Chuck Size	Groove Width	Tongue Width	Screw Size	Hole Space	Hgt Inch	STEEL SOFT JAWS		ALUMINUM ROUND JAWS		
						Part Number	Set Price	Pie Dia	Part Number	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.



**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
- We make specials!

**IN STOCK & READY TO SHIP!**



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

Model	Chuck Size	Groove Width	Screw Size	Hole Space	Hgt Inch	STEEL		ALUMINUM	
						Part Number	Set Price	Part Number	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
					2	KT-12200F	\$ 72.00	KT-12200AF	\$ 74.05
Kit B12 HS-12	12"	0.709	14MM	1.181	3	KT-12300F	\$ 107.96	KT-12300AF	\$ 90.10
					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" with "P" & add \$4.00 (6"-10")/\$7.00 (12" & above) per set.



**ROUND JAWS**

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!**



Model	Chuck Size	Groove Width	Screw Size	Hole Space	Hgt Inch	ALUMINUM	
						Part Number	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
					2	RKT-12200A	\$ 184.71
Kit B12 HS-12	12"	0.709	14MM	1.181	3	RKT-12300A	\$ 245.72
					2	RKT-12208A	\$ 184.71
					3	RKT-12308A	\$ 278.56

**BASE JAWS**

FOR QUICK JAW CHANGE CHUCKS



- Hardened base jaws for quick jaw change hydraulic chuck
- Straight serrations
- For Metric tongue & groove top jaw mounting
- For SMW-Autoblok® KNCS, Rota THW Plus, Röhm® DURO-T & ATS Systems quick jaw change chucks



Chuck Dia	Chuck Reference	Part Number	Set Price
6"	140/165/175/170	GBK-160-A	\$ 290.00
8"	200/210/215/225	GBK-200-A	\$ 320.00
10"	250/265/275	GBK-250-A	\$ 360.00
12"	315/340	GBK-315-A	\$ 445.00
15"	400	GBK-400-A	\$ 455.00
20"	500	GBK-500-A	\$ 915.00



**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

Chuck Dia	Part Number	Price Each
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

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

**ADJUSTABLE JAW BORING RING**



- 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



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**MODEL 1CC**  
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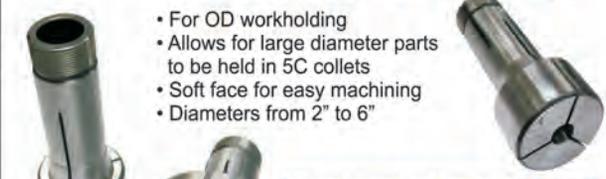
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  - Internal threads for use with threaded collet stops
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- For OD workholding
- Allows for large diameter parts to be held in 5C collets
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- Diameters from 2" to 6"

Head Dia	Part Number	Price EA
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3"	550-003-PH	<b>\$52.42</b>
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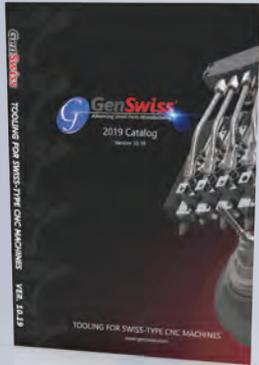
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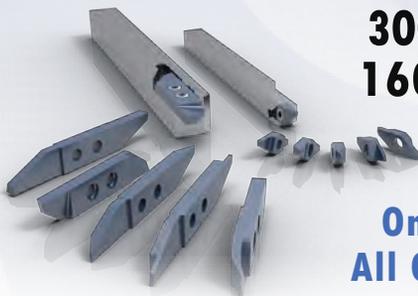


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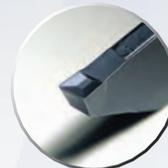
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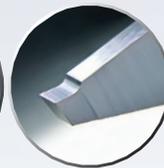
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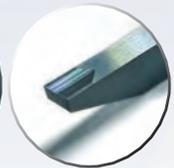
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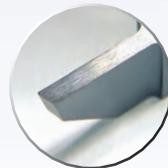
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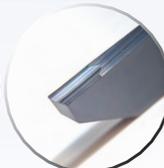
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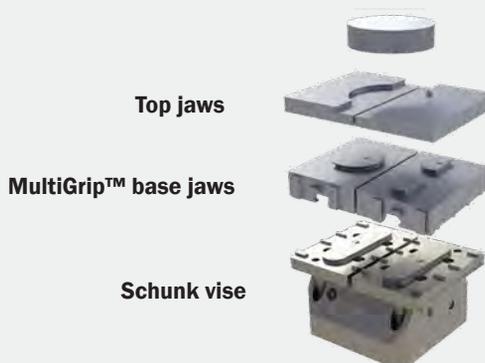
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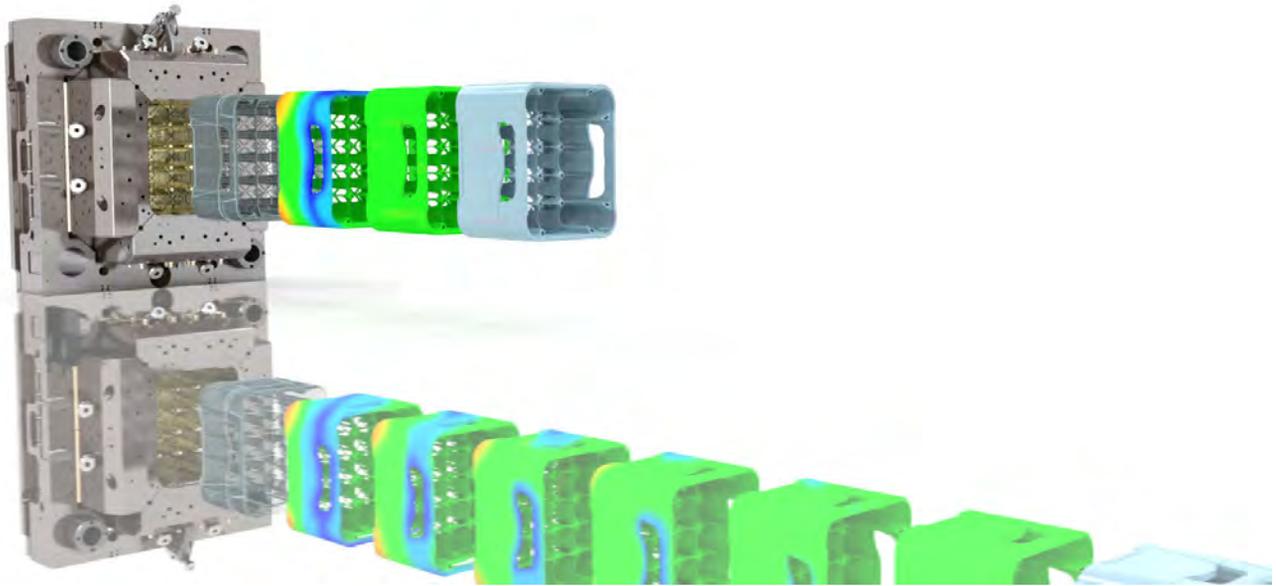
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# New ZEISS Reverse Engineering Software



ZEISS Reverse Engineering (ZRE) software offers a new and innovative option to significantly improve the tool correction process. Time-consuming iterations are replaced with actual measured values and proven algorithmic methods to reduce process time by over 50 percent. ZRE guides users through this software process step by step. To simplify the solution further, customers can source both the data collection hardware and software from ZEISS for a complete, integrated reverse engineering solution.

ZRE makes tool correction more efficient because it reduces time-consuming work. Typically, tool manufacturers rely on simulation software and experienced tool and die makers to design and produce molds for plastics, stamping, die casting and forging industries. Multiple iterations of corrections to the tool are usually required before a finished part is accepted. Each iteration is both time consuming and costly. With ZRE, tool and die makers use actual measured values from the first test pieces and algorithmic proven methods for tool corrections.

ZRE shortens tool correction iterations substantially: first, high-precision actual data is captured from the initial test components. ZRE then compares the point cloud or mesh to the part CAD model. A nominal/actual analysis is

performed to show part deviation and areas out of tolerance. To correct the areas of concern, the software guides the user to invert the deviated points and transforms them to the CAD surfaces of the mold model. Finally, a new surface is created with the corrected points using reverse engineering and the surface refitted to the original mold CAD model. Using this new model, modifications are made to the tool and another test piece is made. This method may be repeated, but success stories have shown that the number of necessary iterations is reduced by more than half. Simulation software and experienced tool and die makers are still valuable assets in tool design, and ZRE extends tool manufacturers the ability to save money and bring products to the market faster.

ZRE also offers the traditional tools of reverse engineering to build CAD models from finished parts using powerful surface reconstruction functions. Added value is provided with evaluation tools to ensure the model is created within expected accuracy parameters.

For the ZEISS solution, users can generate scanned data of a test piece from multiple sources, including computer tomography, optical sensors or a coordinate measuring machine (CMM).

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# PETERSON MACHINING DECADES OF ON THE FRONT



Article & Photos by Sean Buur

# PETERSON MACHINING OF QUALITY ON THE FRONT RANGE

Todd Peterson came to Colorado with a degree in tool and die design and a dream of being a climbing bum for as long as the money held out. Thankfully, he never left, and Peterson Machining is celebrating 30 years of quality on Colorado's front range.

Todd's dad is a mechanical engineer and for as long as he can remember Todd has had a wrench in his hand. He still recalls the first time he ever saw a Bridgeport mill. He was belt high and holding his dad's hand. "I remember being able to walk under the Bridgeport's table," describes Todd Peterson, founder of Peterson Machining. "I was enthralled, and manufacturing just stayed with me all these years." He came west from Iowa to climb mountains and worked at a few local shops before realizing he wanted to start his own shop. "I was a 26 year- old mountain climbing contract machinist who had no money but wanted to start a company. I read an article saying 9 out of 10 small businesses were funded by loans from relatives and I knew what I had to do. My grandparents were Midwest farmers and in 1989 they loaned me \$10,000 to get Peterson Machining up and running here in Boulder, CO."

With a high density of tech companies, and R & D spurred on by the local universities, Peterson Machining made a name for themselves by delivering tight tolerance complex parts. "We machine mostly aluminum and stainless," tells Ronda Peterson, CEO and partner at Peterson Machining. "I've been with the company 18 years and throughout that time we've focused our efforts in aerospace and instrumentation. We had the opportunity to build from prototype to production all the Retul FIT bike system parts. Retul is now owned by Specialized. One advantage comes in being AS9100 certified and manufacturing parts that require this certification."

Like Todd and Ronda, everything in the shop is paired perfectly for redundancy. Only two machine tools don't have a significant other in the entire shop. One of Todd's first CNC machine tools was a Fadal in the the original shop space. Alfred is 26 and Rose at 23 are both 3 axis Fadal machining centers and still holding 10ths (.0001 that is). Petersons look at each machine as an investment and keeps them in top working condition. The 3- axis department also has Clark, a 3 axis pallet system. "Our machines are all named and not just a number," explains Ronda. "It is a little personal touch that also helps with traceability. The Fadal's are our oldest machining centers, and they still deliver great parts for us every day. Starting with the pallet system on Clark and moving on to our 5 axis DMG MORI milling centers you'll see that all our other machines have some sort of automation or increased capabilities. Our Mori Seiki lathes are two spindles, with live tooling and a Y axis. Kentaro is a NL2500 with a gantry robotic arm and 20 station stacker so it is fully automated and can run for a week at a time without us."





Top Left - Peterson Machining's turning department has a pair of Mori Seiki two spindle lathes with live tooling and Y axis. Kentaro is equipped with a gantry robotic arm and a 20 station stacker, allowing for lights out manufacturing. Bottom Left - Clark, 3 Axis palletized Brother CNC is one of only two machine tools in the shop that doesn't have a partner. He is grouped in with a pair of Fadal 3 axis mills. Right - Steve works on MAX, one of two DMG MORI DMU 65 monoBLOCK 5 axis mills. The DMU has a small footprint, but the work envelope is quite large. They have a 60 tool capacity and 18,000 RPM spindles.

Peterson Machining leaped into 5 axis manufacturing in 2010 when they purchased EVE-A, a DMG MORI-DMU 65 monoBLOCK. EVE-A's footprint is actually small for a 5-axis machine that weighs in at 22,000lbs, but the work envelope is quite large. With 60 tools, an 18,000 RPM spindle and onboard touch probe to measure parts in process, it was no wonder that Petersons added an identical machine soon after. "It took us a while before we pulled the trigger on a 5th axis," tells Ronda. "We did our homework and feel the DMG MORI brand is the best of the best, delivering the accuracy and speed we need. We wanted to up our game even more and in January 2018 we ordered our biggest DMG MORI. A DMC 85FD RS6. We named her Theia after a Titan goddess, she was a 14 month build and worth the wait." Theia is a 5-axis palletized mill-turn machining center with a 20,000 RPM spindle, 120 tools and can run a part up to a meter in size. The pallets for turning can run at 800RPM making this a truly versatile machine. It was delivered over the summer and Todd and Steve, their lead machinist are both learning the ins and outs and what she is fully capable of. "Steve is a milling guy and Todd runs the lathe department, but since it is a mill-turn they have to share," jokes Ronda. Peterson Machining is working closely with the

Germans from DMG to fine tune features and options that are unique to this machine. "In simple terms the MPC is crazy intelligent," explains Todd. "It senses everything through the spindle down to flaking a corner off one flute of an end mill. This is as close as I have ever seen to a machine having a "feel" for what's happening. It also has preventative maintenance protocols that track wearing items on the machine itself."

Fourteen months is a long time to wait, but it gave the Petersons time to prepare.

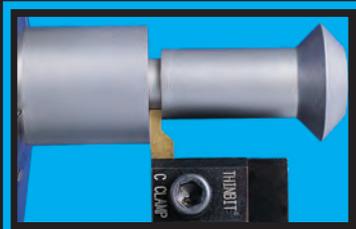
They quickly realized that even with all their redundancy on machine tools they still only had one CMM. Ruby, a Starrett CMM with a Renishaw PH9 DCC automated probing head does a great job, yet she has a standard size table, and nowhere near the work envelope needed to support parts off the new DMG. While the DMC 85FD RS6 was on order they built a new inspection room and added a LK Altera M CMM. The room itself has a barn door so a forklift can be used to load parts on and off the LK CMM table. The large table not only allows for measurement of big parts, but also many parts. It is not uncommon for Todd to have a handful of parts set up for verification all at the same time. The 40x50x60 size gives them a great amount of flexibility.

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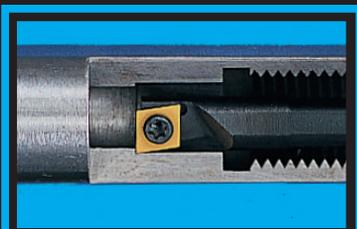
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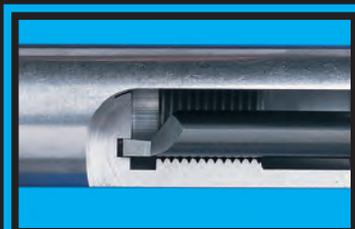
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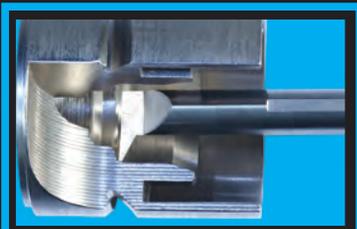
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Ronda and Todd Peterson began investing in 5 axis machining back in 2010. Their newest DMG MORI DMC 85FD RS6 is quite a step up in performance. It is a 5 axis mill-turn, with a 6 pallet pool, 120 tools and a 20,000 RPM spindle.



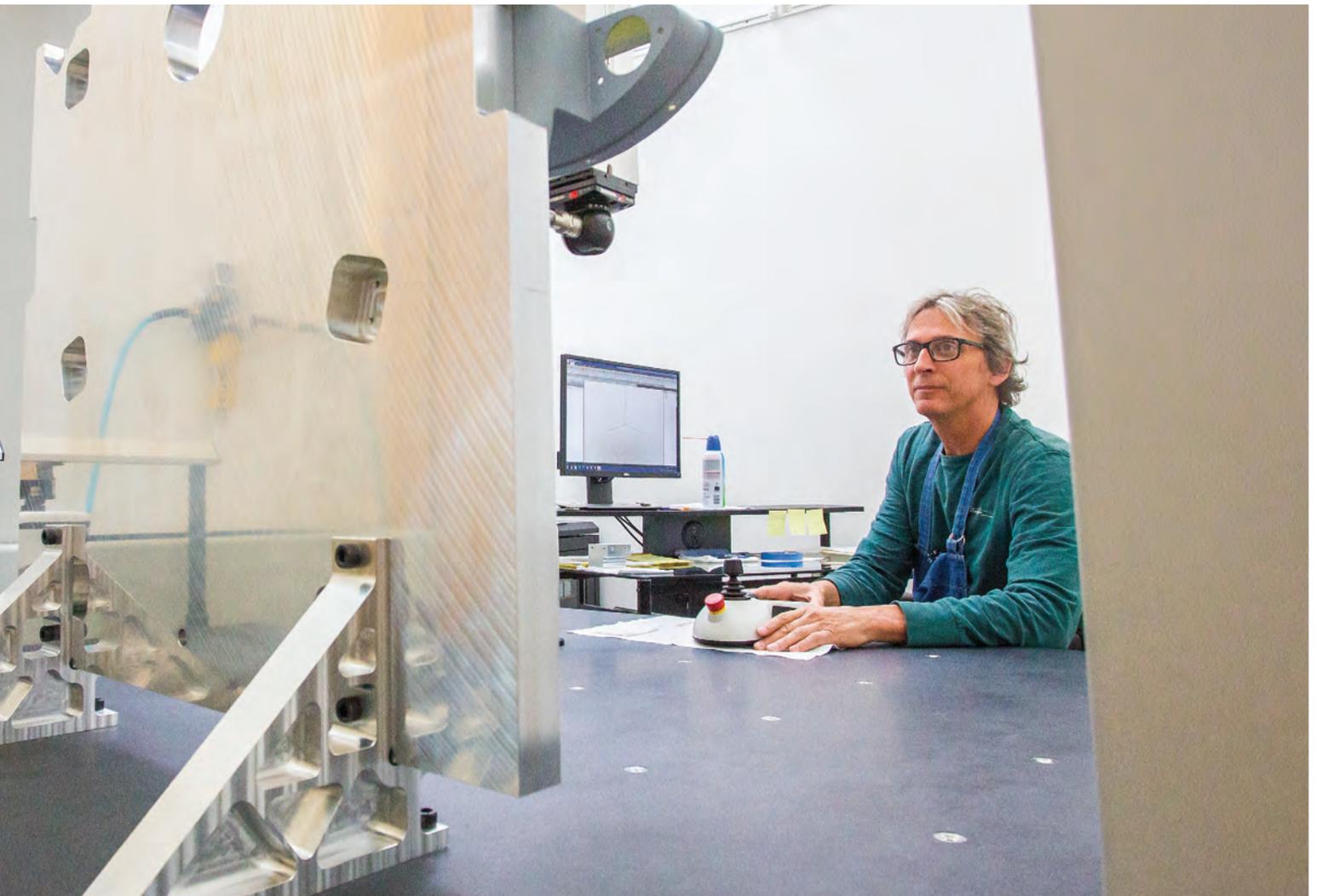
The LK Altera M CMM is appropriately named Vision, because it sees everything. It has 14 different styli, a Renishaw PH10MQ DCC head and also a Nikon scanning system. Todd and Ronda did their research before heading off to IMTS to see in person all the different manufacturer's CMM offerings. Their criteria were pretty simple, it had to be accurate, it had to be large enough to handle a part a meter in size, easy to use software, and most importantly supported by a great service team. "In this business a machine is only as good as the service you receive post sale," tells Todd. "Once you get to a certain level of CMM, they are all similar, so company background and service becomes more of a standout. LK has a long-standing reputation of being fantastic, and Scott Collier of LK Metrology is one of those reasons. Scott came out and toured our shop, saw what we do, and made a recommendation off that. He delivered on everything we wanted and Vision has been a great new asset."

Peterson's manufacturing team are well versed in CMM Manager, it runs on Ruby and also on Vision. "It was important to us to keep using CMM Manager," explains Todd. "For a job shop like us it is perfect. We don't know exactly what it is we are going to inspect on a daily basis, so CMM Manager gives us a lot of flexibility without sacrificing capabilities. Because the CMMs are automated our machinists can come in with a part, call up

the program, and have it run the inspection unattended. We are in a constant state of checking parts, and automation is a big part of our efficiency. LK's relationship with Renishaw was another selling point for us. As early adopters of the automated probe head, and direct collaboration between LK and Renishaw we know that we are getting fast and accurate readings. Speed on larger sized parts becomes more important, especially when you are measuring a lot of points. The difference can be hours faster than a slower machine."

As an AS9100 certified shop validating accuracy is a part of the process. Having properly calibrated CMMs are key. For Todd and Ronda, having the same person calibrate both the LK and the Starrett was important to them. "Alex, from LK takes care of both our machines so they are always in top working condition," explains Ronda. "LK CMMs come with an industry leading 10- year warranty, but the Starrett is older, and not their brand, and yet they still support us by calibrating it along with their own product. It is that kind of support that is really appreciated and valued."

Peterson Machining has nine employees, a shop dog, and over 8,000 sq.ft. of space, not exactly the Everest of specs, but pretty typical for a smaller job shop in the area.



Todd checks an assembly on the LK Altera M CMM. Peterson Machining manufactured all the machined parts on the Assembly. Back from the composite house their customer sent it back to Peterson for final verification. Because of the large capacity, Renishaw PH10 head, and selection of probes and Nikon scanner, Peterson Machining is able to expand their contract inspection services. No one on the front range they know of has the size and sophistication of the LK Altera CMM.

The quality and technology they house though blows everyone else off the mountain. Todd and Ronda are not afraid to go full send when investing in the business's future. By partnering with companies like DMG MORI and LK Metrology, Peterson Machining knows they will take the best line, get over the crux, and summit first in quality.



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<b>Max Swing</b>	62.9"	78.7"	57"	92.5"
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<b>Table Diameter</b>	49"	70.8"	49"	78"
<b>Spindle Motor (30min / cont.)</b>	50/60 HP	50/60 HP	50/60 HP	50/60 HP
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The Industrial and Manufacturing Engineering program at Cal Poly Pomona supports 600 total students in two undergraduate and two master's degrees. They train and educate students to become first day professional engineers. In addition to having a mandatory senior project conducted in industry most courses have corresponding labs and projects. Their undergraduate programs contain math and science courses for preparations, courses in engineering design and manufacturing processes to familiarize students with many common production processes, CAD-CAM, data gathering and statistical analysis, to be ready to perform quality control and reliability analysis and finally perform engineering design for incorporating and designing processes, including robotics and automation.

At Cal Poly Pomona, becoming a manufacturing engineer is more than just learning theories. It is about applying those models and equations into experimentations and projects. "We train students to be complete engineers," tells Cal Poly Pomona's Dr. Kamran Abedini, Professor and Department Chair. "Manufacturing engineers need to know what to expect from manufacturing machinery, why the machine does what it does, and how to design processes so that you get the most reliable operation and the highest quality part. The whole idea of being a manufacturing engineer is to use clever ideas of applying science. Simply put, if they know what the machines actually do, they can do better things with it. We had a tour with an industry representative from a bottling company. He saw our plastics extruding machine and said "I will hire any of your students who have touched this machine." Well every one of the students had in fact done more than just touch the machine. Our faculty and our labs elevate us over similar programs at other universities said Dr. Abedini. For us the idea is not to just present a machine to students, but to have them work with it to gain an understanding of what the machine operators goes through. They can speak the language to better communicate, and by speaking the language they can also better create."

Every student and every member of the faculty touted the hands-on experience in the labs as their favorite part of being part of the industrial manufacturing engineering program at Cal Poly Pomona. It is no wonder when labs include: manufacturing lab, manufacturing processes lab, automation lab, simulation lab, projects lab, welding and even their own foundry. The entire first floor of the new engineering building, building 17 is mostly made up of labs. Some large, and some small, but all have specific student goals in mind. The manufacturing lab alone is better equipped than most job shops in the area. Many universities are lucky to have a single CNC machine for demonstrative purposes only, and not for students to use, that is far from the case at Cal Poly Pomona. Along with manual machines, the recently renovated manufacturing lab has 10 new HAAS Mini Mills, four HAAS CNC lathes (TL-1), and one each older models of



HAAS TM-1P and TL-1 lathe of in addition to 16 Haas training stations. "All the CNC machine tools are being updated with cameras and viewing screens," explains assistant professor, and alumnus of the manufacturing engineering program Dr. Dika Handayani. "With cameras mounted inside the machines it will allow better viewing by all the students as we demonstrate operations of the machine tool. Lurking over student's shoulders is intimidating and they always assume they are doing something wrong, even when they are not. Once all the camera/viewing systems are installed we can easily monitor the entire class as we walk around without being as intrusive."

A short trip down the hall you find the automation lab. It too is in a near constant state of being upgraded with technology. Inside are a dozen Siemens PLC trainers, robots, and a small-scale automation factory. The MFE 4501 course

# CAL POLY POMONA MANUFACTURING ENGINEERING READY ON DAY ONE



Article & Photos by Sean Buur

Top - Cal Poly Pomona's Industrial and Manufacturing Engineering program has a diverse student population. They are over the national average of enrolled female engineering students and have two female professors.

Right - Dr. Kamran Abedini, Professor and Department Chair  
Dr. Nicole Wagner, Assistant Professor  
Dr. Dika Handayani, Assistant Professor  
Mr. Andrew Gustillo, Laboratory Technician  
Dr. Victor Okhuysen, Professor





Top - Cal Poly Pomona's Automation Lab has 12 Siemens PLC trainers, robots and a small scale Industry 4.0 conveyor system. Right - The lab is replacing older robotics with new Epson SCARA robots with an onboard vision camera system.



titled "Introduction to Integrated Manufacturing and Automation" course description is - Mechanization/automation/mechatronics. Problems and methods of mechanization. Material handling systems. Robotics. Elements of automation - sensors, analyzers, actuators, and drives. Control strategies - industrial control, discrete time/event driven systems, feed-back systems, and optimal control strategies. Robotic systems. NC machines. Automated inspection and identification techniques. Computer process control. Transfer lines. The newly acquired robots are the FESTO Robotino autonomous robot and Epson robot arms (T3-401S).

"Here in the automation lab we introduce students to Industry 4.0 through robotics and other programmable devices," explains assistant professor Dr. Nicole Wagner. "From the Siemens touch screen simulators students control robot movements, motors, and sensors. As you see we have a small-scale automation conveyor system in place. Students program the systems to have robots lift and move parts, gates open and close and motors are timed and triggered with sensors." The lab just acquired three Epson T compact

SCARA robots and an unmanned robotic vehicle that are being integrated in to the curriculum. "We are replacing the older robotic systems with brand new systems that will be used for many years to come," continues Dr. Wagner. "Our Epson SCARA robots have a full range of motion and a vision camera system that can see the part and take a photo. Besides verification of placement the image can be used for a variety of other aspects like part measurement."

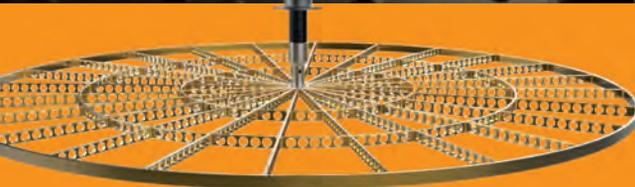
Cal Poly Pomona is one of only 20 Foundry Education Foundation (FEF) certified schools in the US that have their own foundry. It is a standout feature for those enrolled in Cal Poly Pomona's Industrial and Manufacturing Engineering program. There are specific foundry-based courses where students take a mold of the shape they want to make, melt the metal, pour the metal, and then later on machine that metal in the manufacturing lab on the CNC machine tools. "It all starts here with green sand," details Professor Victor Okhuysen. "It is called green because it has moisture in it like



Left - Dr. Nicole Wagner gives a quick safety refresher on operating the Hass Mini Mills before starting on the day's lab work. Right - Dr. Dika Handayani (second from left) instructs students on the Haas TL lathe how to set their tool before turning the wheels of their project.



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**Will** - Senior transfer student from mechanical engineering and a six year Army veteran on the GI Bill talks with professor Okhuysen. "There is a big difference coming here from my previous university. Having switched to a manufacturing engineering major has opened up a new set of labs for me. I chose Cal Poly Pomona specifically for this program. I learn by doing and I know that when I graduate and get a job some of that nervousness will go away because I actually have hands on experience to fall back on. Hope to open my own business once I graduate, but will probably gain experience working for others before I commit to that."



**Michael** - President Manufacturing Student Club 3rd year. "Cal Poly Pomona was my dream school. I learned in high school that I liked manufacturing when I took a rapid prototyping class and discovered that engineering was awesome. I love designing and building stuff. I like how we are so hands on with everything we do. As a visual learner I don't learn as much just being lectured to, I get way more out of seeing and touching and doing. I know when I graduate that I want to be in manufacturing, but I am still figuring out which process I like best. I love that we have a foundry, casting is my favorite thing right now."



**Danny** - 4th year student. "I've always been interested in how things work, and I like how hands on this is. When you are a freshman you can cast your own project and machine it. That is awesome. We learn on manual machines and on to the CNC and G code. It is a lot of fun to learn here. I can see myself working in different fields after graduation, I don't have a specific targeted career path. I'm already being offered internships and not worried about finding a career once I graduate. This program has a lot of prestige and the local industries keep an eye on potential employees as we progressive's through the program."

a green tree branch. It is mixed with clay and water which work as a binder. Most of our casts are made from aluminum like the truck projects you've already seen, but we also have steel capabilities when needed. The idea is that students get to see the progression of manufacturing from sand to finished part. We also teach them a little about fixtures and that they are not all just chucks and vises. We have pattern making capabilities for the advanced class where students must meet certain tolerances that have been engineered into the molds. The casting process is always discounted as being easy, but as you can see by the some of the truck bodies in the lab it is a lot harder do correctly than it looks."

Time in the foundry is very valuable and because of student safety it is not an open lab. Student clubs can reserve time with instructors, but other than that you must be enrolled in a lab to utilize all it has to offer. "We encourage all our students to get involved with on campus clubs," adds Dr. Handayani. "It is a way to enhance their education with added experience. The Manufacturing Student Club competes in casting competitions throughout the country with the skills they've acquired in our manufacturing engineering program. We take them to industry sponsored events hosted by the American Foundry Society and the California Metals Coalition. They love being a part of the IME program and representing it."

Having a program this extensive is costly to maintain. As department chair Dr. Kamran Abedini knows all too well how important university support is at keeping programs funded. "Operations are very expensive," describes Dr. Abedini. "Safety is a top priority so we have vast areas of real estate that are only occupied by a handful of students at a time. I can fit three times more students in a classroom than I can in a lab, but the lab is a critical part of the student's education. The university knows how costly this program is, but they support us 100% because of our results, because of the quality of education that our students receive."

An exit survey is given at commencement to all graduating students at the end of the academic year. It has two main questions on it. Do you have a job offer, and if so how much is your expected salary. In terms of employability and salary, the Industrial Manufacturing Engineering program is consistently rated one of the highest. "People talk about manufacturing leaving the country," concludes Dr. Abedini. "That might be true in some areas, but manufacturing engineering is staying here. When our students graduate, they are true engineers who have fully realized system of manufacturing and production. They are job ready on day one. So much so that past alumni come to cherry pick students before graduation because they don't want to work with graduates from other university programs. They know the value of their education, and that when we say you are an engineer, we mean it."



- 1. - Students make a mold of their desired shape.
- 2. - Students cast the raw shape out of aluminum.
- 3. - The truck project utilizes skills learned in the classroom, foundry, and on a mill and lathe.
- 4. - Cal Poly Pomona is one of only 20 FEF certified schools in the US. They are very proud of their foundry and the associated courses. Students love this aspect of the Industrial Manufacturing Engineering program.
- 5. - A variety of student projects ranging from cast broncos to plastic flying disks
- 6. - Michael and Danny are all suited up and ready to pour the molten metal into the casting cylinder.



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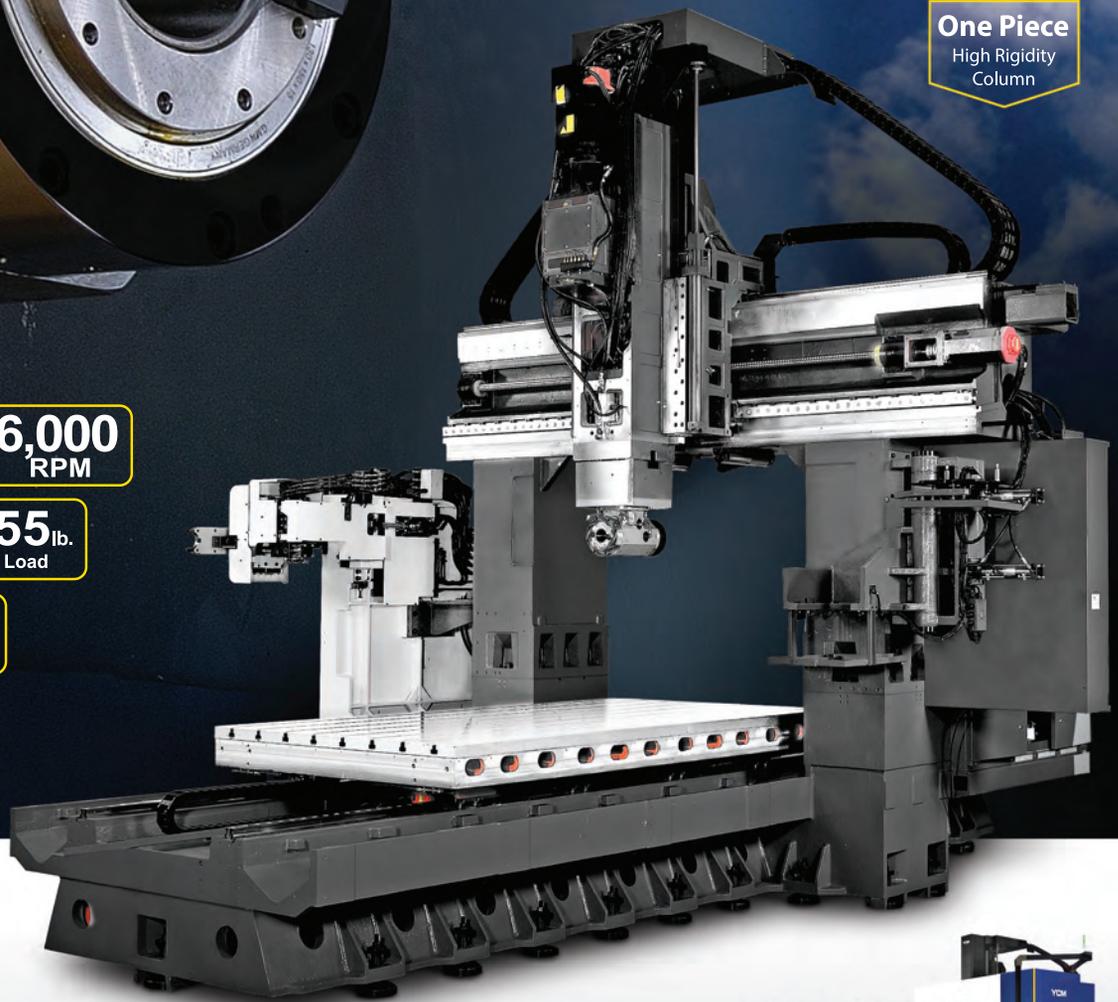
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# Q-PLUS LABS

## HOW FAR MEASUREMENT HAS COME

Article by Sean Buur  
Photos Contributed by Q Plus Labs & Sean Buur

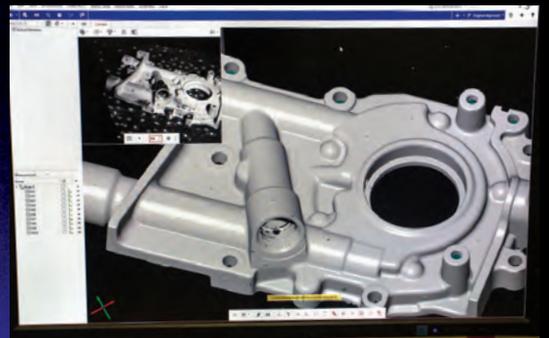
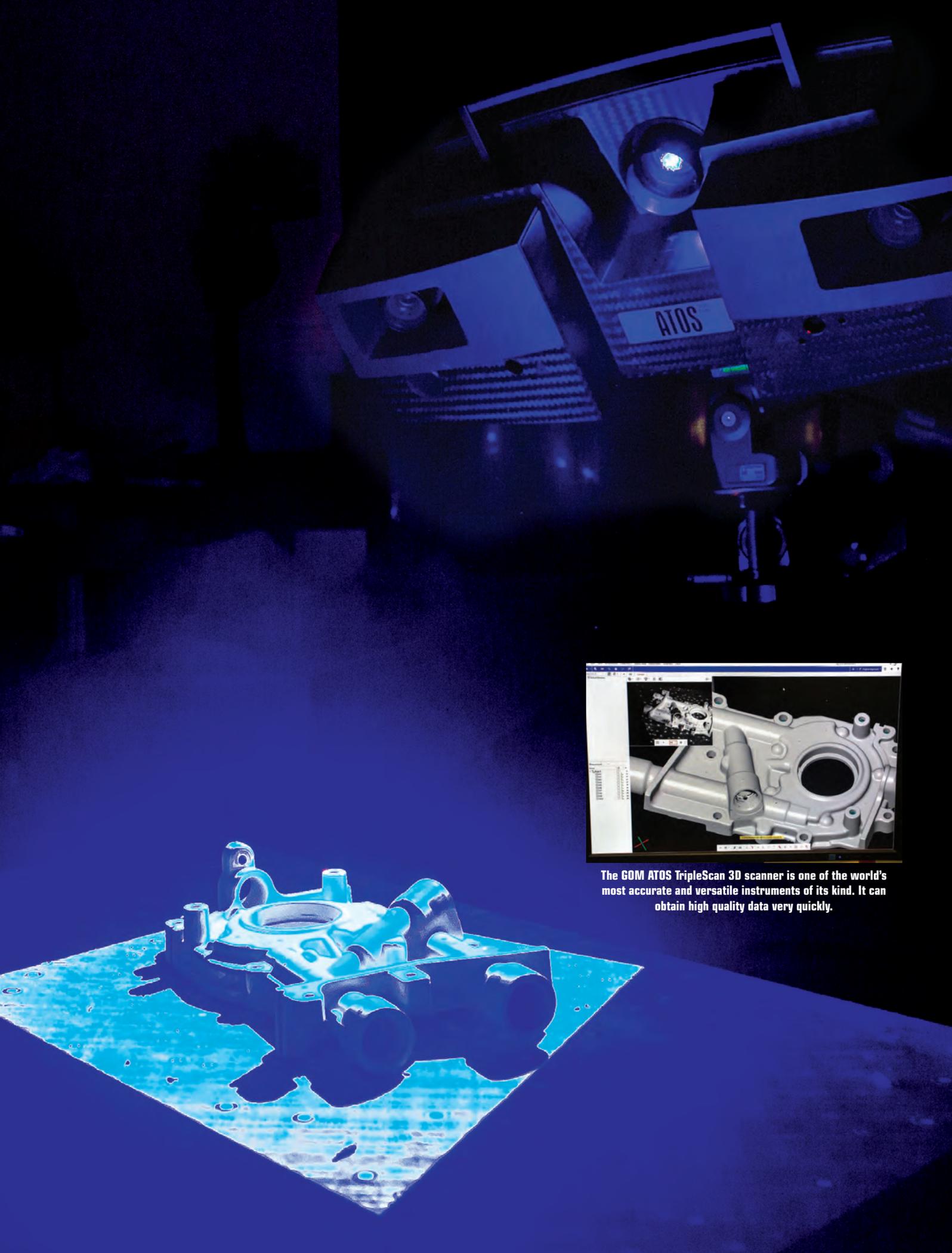


Lola and Mike Knicker are the owners of Q-PLUS Labs in Irvine, CA. Mike founded the company almost 33 years ago and they have been a team ever since.

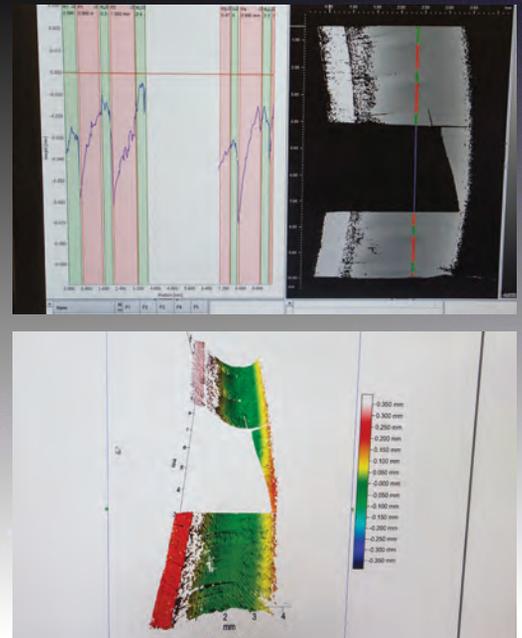
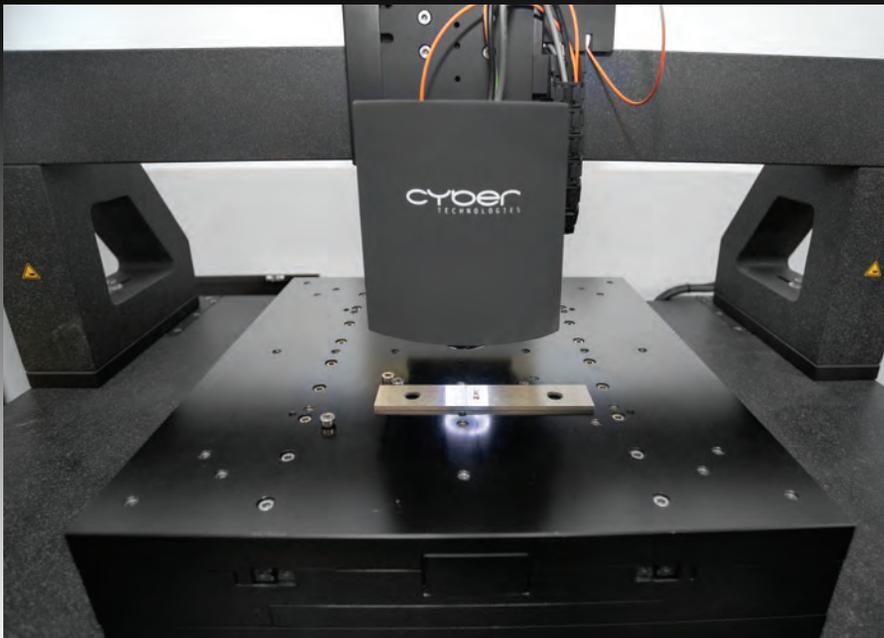
Q-PLUS Labs sets the bar in dimensional metrology. They measure the bar, provide a full report on the bar, and raise the bar. Mike Knicker, president and founder of Q-PLUS Labs has spent 40 years in metrology and has built his reputation on unparalleled service and commitment to quality. Any company that requires extreme discretion on very technical items knows Q-PLUS Labs is the place to go. Fortune 500 companies, large manufacturers, automotive, medical, aerospace, there is not an industry that they are not involved in. Customers like JPL, Johnson & Johnson, US Army, 3M, Fender Guitars, Nike, St. Jude Medical, and Boeing, all place their trust in Q-PLUS Labs' team of specialists.

Q-PLUS Labs has a unique business model balancing an 80/20 split between metrology service and product sales. As customer demand became greater and greater, expanding into product sales was a natural progression. "The last thing we expected to do was set up a product

sales department that was anything less than impartial," explains Mike. "Product sales aren't typically like that. It is about being persuasive. That model doesn't work for us because we've built our reputation as a lab around being impartial. We expanded into product sales because our customers asked us to. They said 'you are doing our programming, our training, our inspection, our validation, our calibration, how come we can't buy a machine from you?' After the 100th time hearing that, I figured maybe metrology product sales could support our services." It was under the condition that they would be 100% equipment neutral. Since they offer almost every brand under the sun, it makes them plausibly impartial. Q-PLUS Labs only uses and sells machines they believe in. Their aim is to have a customer for a very long time regardless of it being sales or service. "We use the products we sell, giving us the ability to custom-tailor the right product to meet the customer's needs," adds Corey Herde, Director of Marketing at Q-PLUS Labs. "Zeiss, Starrett, Renishaw,



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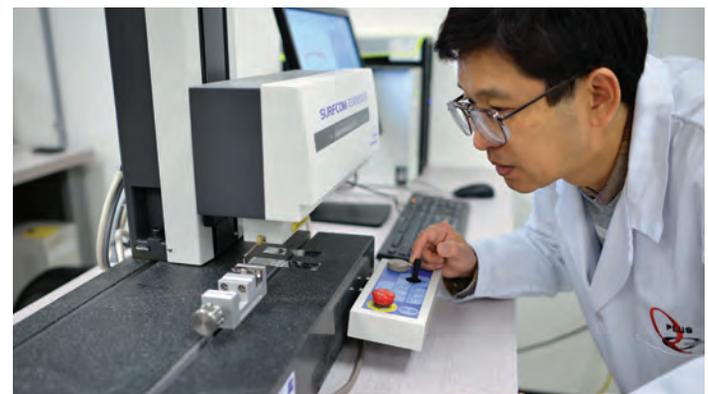
**The Cyber Technologies chromatic confocal 3D nano-scanner is used to obtain part geometry where CMMs and vision systems struggle. The data is so dense and accurate, it can be used to determine surface roughness. It can handle any kind of surface.**

and Faro are not just brands to us, but extended family.” Mike has a lifetime of experience working together with the best in the industry. They want the best solution for you. Mike makes a huge effort to treat everyone from small mom and pop machine shops to huge corporations the way he, as a business owner, wants to be treated. He optimizes budgets and delivers the best solution and at a fair price. “Being service-based first gives us the ability that helps us fine tune our product sales.”

You can walk in the door of their Irvine, Ca. headquarters and buy a range of CMM’s and many other dimensional metrology products, but where Q-PLUS Labs really shines is in the customization. Q-PLUS Labs combines hardware and software to match up with the way they would/do inspect the part. “We build it and set everything up here,” details Mike. “We test it, perfect it, and then transfer that technology to the customer as a package deal. We go into their shop and train their people then continue to service the system for years to come. It’s an

honor, but a big responsibility. Customers take all the risk out of their investment by having us prove it out first. It isn’t worth a ding to our reputation delivering anything less than our best.” Q-PLUS Labs always recommends the customer utilize the manufacturer’s training as a starting point to familiarize themselves with the technology. They consider what they provide to be advanced supplemental training when you really need to elevate your game and get the most out of your machine and the software.

Being able to service everyone is everything at Q-PLUS Labs. They have the ability to scan anything from a large area with LiDAR technology down to a microscopic level. It is this vast range that sets them apart as one of the most credentialed labs in the country. Unique items customers have sent to Q-PLUS Labs to scan or 3D model include: a church on the north shore of Hawaii, plant roots for a Harvard scientist, Eddie Van Halen’s guitar, Shelby Cobra parts, and they even helped analyze stress fractures on airline wreckage debris. In the short time Corey has been



**Left – A dimensional metrologist runs a program that was written off line to verify a large part on the Zeiss Accura CMM. If it is a one-off then Q-PLUS Labs will typically manually check it. It doesn’t make sense to write a program for a single part, but their magic number to justify some level of automation is only two. They can write a program on the first part and run it on the second part and it will still take less time than manually inspecting two parts. Right – A small part is checked for form and surface roughness simultaneously using a Zeiss Surfcom.**



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**Lab Manager John Michaels Lyons has been with Q-PLUS Labs for more than 20 years. The Starrett brand of metrology equipment has been with Q-PLUS for even longer. Together, state of the art equipment and hardworking like-minded professionals uphold the company tag line of “For Your Product’s Perfection.”**

with Q-PLUS Labs, he has seen items he never thought he would encounter when joining a dimensional metrology company. “I’ve already seen some amazing parts scanned,” tells Corey. “The ones that stand out for me are watching the technician 3D scan the inside of a panel van and a real Star Trek Disruptor prop. The van makes sense as a practical application, but the gun was a customer’s passion project. You never know what is going to come through the door each day.”

Mike’s lab can best be described as Jay Leno’s garage, but with dimensional metrology equipment. Mike touts that the best aspect of having every tool under the sun is that if one isn’t getting it done for you, there are others that will. “It is amazing how far measurement has come,” touts Mike. “We used to do it old school with blue and scribe of castings and forgings. It was slow, not that accurate, and very expensive. Now we can do that 1000 times better, 100 times faster, and have a nice digital record.” Back in the day a customer would have to send back the part if they needed additional measurements. Now, Q-PLUS Labs can call up the file on their server and have that information at their fingertips within seconds. With a virtual part, it can be measured by a virtual CMM. “Our current best resolution is half a nanometer,” boasts Mike. “For reference, a human blood cell is approximately 7 microns in diameter, which is 7,000 nanometers. So, imagine 1/14,000 of a blood cell.” As you get into Nanotechnology, everything is getting smaller and smaller. Typically, metrology needs to be 10 times more accurate than the tolerance of what it is measuring. You don’t want your measurement step to consume too much of your part

tolerance. If not specified otherwise, Q-PLUS Labs’ in-house standard is to not consume more than 10% of the part tolerance. 10 to 1 is typically the most stringent standard, but it’s not uncommon for customers to get measurement results back that are at 100 to 1. “Many times we measure at 100 to 1 because we can,” half-jokes Mike. “If we can do it at no additional cost, why not be more accurate?”

The lobby display case has everything in it from a simple toothbrush to a cold side turbocharger blade that spins at 125,000 RPM. Customers from every industry rely on the arsenal of metrology equipment Q-PLUS Labs has at their disposal in their 13,000 sq.ft. of lab space. “Technology has always been a big part of what we do,” explains Mike. “In the early years Lola (Mike’s wife and business partner) and I invested every penny we didn’t need to pay our mortgage and feed the kids into getting the latest and greatest. My first CMM is still out in the shop floor and works just as good today as it was when I first got it thanks to air bearings. As soon as we could, we invested in a CNC robotic CMM so we could measure faster. We have CMMs, vision systems, multi-sensor systems, 3D scanners and a ton of other stuff. We have half of a Noah’s ark of dimensional measurement equipment out there. We have at least one of nearly everything, and in some cases more than one.”

Customers send parts to Q-PLUS Labs for a variety of reasons, but two of those are; first article inspections and because they don’t have the equipment needed to do the job. “First article inspections that require a 3rd party verification is a specialty of ours,” tells Corey. “As a neu-

tral party with the highest levels of accreditation, parts are sent to us for inspection and certification.” Customers have the ability to produce highly complex parts that have tight tolerances but don’t always have the right tool to verify it. Their current quality lab might support 90% of what they manufacturer, but that 10% might be out of their realm of capability. Instead of spending a lot of money on measurement equipment that would hardly get used, they go to Q-PLUS Labs. Large and small companies alike take advantage of Q-PLUS Labs amenities. “It is strange to some that organizations like JPL would need our services,” explains Mike. “Everyone knows what they are capable of, and their staff and facilities are above reproach. Metrology seems like a natural complement to manufacturing and engineering, but it is a science all its own. To have someone on staff full time with our level of expertise and equipment to do the job is expensive.” “It’s like having a samurai warrior, but you only use him once a year,” adds Corey. “Sure, it is nice to employ a samurai, but having a dormant warrior, it isn’t the best use of his talents.”

Q-PLUS Labs is ITAR, AS9100, ISO9001, ISO1345, and ISO17025 accredited and keeps your data safe with the latest NIST 800 protocols and enterprise-class servers. “After 40 years in the business, I’ve learned requirements never loosen,” shrugs Mike. “You can fight it or

become early adopters and get out ahead of it. Lots of customers today insist on the ISO17025 accreditation and earning that high level of accreditation was a beneficial experience for us.” Mike jokes that Q-PLUS Labs is like an emergency room for parts. We have to be good; we have to be fast, and many times we are the last word. We are the checkers, and no one else is checking them. We have to be spot on, and Mike’s self-regulation is often higher than what is required. “We have internal processes to check the checkers,” concludes Mike. “Our tag line is “For Your Product’s Perfection.” That is a tall order; we are only human but good systems and discipline make it possible. Ninety-nine percent sounds good on a college paper, but it doesn’t look so good when you equate it to one out of a hundred babies being dropped on their heads at birth. We need to stay our own worst critic and deliver the best possible unbiased results.”

For the longest time, Mike chased what he calls the “Holy grail of measurement,” that one machine that could do it all. Over time he realized there never will be a single machine for every measurement. The closest you will ever get is a collection of excellent machines operated by super smart people who know how to use them. If there is a better way to measure something Mike and his team of hard-working, like-minded professionals will find it.



Q-PLUS Labs are an authorized Faro reseller. They use the advanced scanning system in the field as well as in the lab. Geoff Sorenson is verifying a contour on an aerostructure part with the Faro scan arm. It’s 7-axis articulation and multiple sensors make quick work of tight-toleranced geometry.



## 6" MACHINE VISE

- 6" vise, full 9" opening
- Narrow body style allows for more vises on the machine
- Recessed pocket for easier lifting
- Thru-body chip evacuation
- Same bed height as D688
- 4 bolt stationary design fastens from the top



### KURT DX6

6" Vise w/9" Opening

Mfg's List: \$655.00

**\$619.00** each

Part # KURT-DX6



## ALUMINUM

## 10 PACK VISE JAWS



- Fits KURT & standard machine vises
- Machinable aluminum- customize jaws for your application
- Buy the 10 pack and save BIG!
- Made in USA

**FREE SHIPPING!**

Prices Starting At Only \$13.27 per pair!

**SAVE UP TO 15%!**

Length	Height	Width	Part Number	Reg. Price	PROMO!
6"	2"	3/4"	VJ-601-10	155.20	<b>132.70</b>
6"	2"	1"	VJ-602-10	172.30	<b>147.32</b>
6"	2"	1-1/4"	VJ-603-10	203.80	<b>174.25</b>



## LAMBRICHUSA DRILL CHUCKS



**SAVE OVER 30% OFF**  
Mfg's List Prices

**Ball Bearing**

Ball-Bearing Drill Chuck With Key For Production Drilling Equipment

- Ball bearing construction to reduce friction in tightening mechanism and provide better grip
- All components hardened and ground
- One-piece ger ring and fluted sleeve eliminate tooth breakage
- Finely crafted in Spain

Jacobs Equiv	Cap.	Mount	Part Number	Mfg List	SALE!
8-1/2N	1/64-5/16"	2JT	LAM-L40070B	\$123.72	<b>\$86.60</b>
11N	1/32-3/8"	2JT	LAM-L40071B	\$132.13	<b>\$92.49</b>
14N	1/32-1/2"	3JT	LAM-L40072B	\$192.22	<b>\$134.55</b>
16N	1/32-5/8"	3JT	LAM-L40073B	\$216.26	<b>\$151.38</b>
18N	1/32-3/4"	4JT	LAM-L40074B	\$324.41	<b>\$227.09</b>
20N	3/16-1"	5JT	LAM-L40075B	\$444.58	<b>\$311.21</b>
-	1/32-1/2"	6JT	LAM-L40626B	\$192.22	<b>\$134.55</b>



## PRO VISE STOPS

- Low profile design stays below the top surface of vise jaws
- Quickly and accurately positioned 1/4" hardened stop rod
- Stop rod stays parallel to milling machine table
- Lever arm can be rotated out of the way for cutter clearance
- Two sets of mounting holes for added versatility
- Mounting hardware included
- Locate long stock with the included stop rod collar
- Large 1/2"-13" bolt used to rigidly attach lever arm
- Utilizes non-marring 1/4"-20 set screws
- Body made from red anodized 6061-T6 aluminum



**NEW ITEM!**

**Single Side**  
Part # EDGE-03000  
Mfg's List: \$59.99

**Double Side**  
Part # EDGE-18000  
Mfg's List: \$89.99



**\$49.99**

**\$74.99**



## MILLING MACHINE VISES



- 7.5", 8.9" or 10" Jaw Openings
- 10 Year Warranty
- Body made from high quality ductile iron hardened to 45RC
- Sealed bearing system increases life of the vise
- Close tolerance bed heights for excellent accuracy
- Anti-lift mechanism keeps the workpiece from lifting
- Chip cover for lead screw protection

**SAVE 25% OFF**  
Mfg's List Price!

Size	Opening	Bed Height	Part Number	Mfg's List	SALE!
6"	7.5"	2.875"	BI-3220-006	\$ 520.42	<b>\$390.32</b>
6"	9"	2.875"	BI-3220-0068	\$ 599.71	<b>\$449.78</b>
8"	10"	3.310"	BI-3220-0081	\$ 1,173.88	<b>\$880.41</b>



## WISE JAW STOP

**NEW ITEM!**

- Stop pin positioned below top surface of vise jaw to allow for cutter clearance
- 1/8" x 2" hardened stop pin, adjustable
- Fits milling vises with 1/2" - 7/8" thick jaws and 1/8" minimum protrusion
- 1-1/8" wide body with 2 hardened steel guide pins
- Body made from red anodized aluminum

**Vise Jaw Stop**  
Part # EDGE-14000  
Mfg's List: \$24.99

**\$19.99 ea**



## 1/8" PARALLEL SET

- Made from high quality tool steel
- Stress relieved against distortion
- Precision ground and hardened
- 1/8" thick with 2 holes
- 10 pairs, 6" Length
- Heights: 1/2", 5/8", 3/4", 7/8", 1", 1-1/8", 1-1/4", 1-3/8", 1-1/2" and 1-5/8"
- Complete w/ fitted case

**1/8" Parallel Set**

Part # A-3900-3010

**\$54.00**



**1/4" Parallel Set**

9 Pair (#A-3900-3009) **\$90.00**



## CROSS SLIDE TABLES

Used for inspection and layout as well as various machining and positioning operations. Single axis movement in the X or the left-to-right direction.

- Table top: 0.001" indicator reading
- Dials are graduated in 0.001 inc.
- Bases have bolt lugs and 5/8" keyways for locating and accurate, secure mounting
- Table tops have 7/16" T-slots
- Base size: 7-5/8" x 6-3/8"
- Height: 4-3/8"

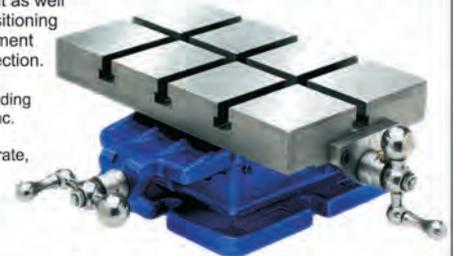


Table Size	Table Travel	Part Number	Mfg List	Our Price
10" x 6"	6" x 4"	PALM-36103	\$659.00	<b>\$ 626.05</b>
12" x 6"	8" x 4"	PALM-37123	\$794.00	<b>\$ 754.30</b>



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## CAT-40 BALANCED TOOLHOLDERS

**KINGSTON:** Balanced to 15,000 RPM @ g6.3

**SPIN TRU:** Balanced to 20,000 RPM @ g2.5

- Balanced on a **HAIMER** machine
- Includes certificate of balancing
- **Runout 0.0002" TIR or better**
- Manufactured to ISO 9002 quality control standards
- Traverse ground taper to AT3 specs
- H5 bore tolerance
- Collet chucks, Shell mill, Jacobs/Morse Taper holders available



**BUY 10 OR MORE-GET 10% OFF!**



Dia	Proj	BALANCED TO 15,000 RPM		BALANCED TO 20,000 RPM	
		KINGSTON Part Number	Price Each	SPIN TRU Part Number	Price Each
1/8"	1.75"	C40-01EM175-K	\$ 49.95	C40-01EM175-KB	\$ 69.99
3/16"	1.38"	C40-18EM138-K	\$ 49.95	C40-18EM138-KB	\$ 69.99
1/4"	1.38"	C40-25EM138-K	\$ 49.95	C40-25EM138-KB	\$ 69.99
	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
	1.38"	C40-37EM138-K	\$ 49.95	C40-37EM138-KB	\$ 69.99
3/8"	2.50"	C40-37EM250-K	\$ 53.85	C40-37EM250-KB	\$ 69.99
	1.75"	C40-50EM175-K	\$ 53.85	C40-50EM175-KB	\$ 69.99
1/2"	4.00"	C40-50EM400-K	\$ 53.85	C40-50EM400-KB	\$ 69.46
	1.75"	C40-62EM175-K	\$ 53.85	C40-62EM175-KB	\$ 69.99
5/8"	3.00"	C40-62EM300-K	\$ 53.85	C40-62EM400-KB	\$ 73.02
	1.75"	C40-75EM175-K	\$ 53.85	C40-75EM175-KB	\$ 69.99
3/4"	3.00"	C40-75EM300-K	\$ 53.85	C40-75EM300-KB	\$ 69.99
	1.75"	C40-10EM175-K	\$ 53.85	C40-10EM175-KB	\$ 69.99
1"	6.00"	C40-10EM600-K	\$ 60.45	C40-10EM600-KB	\$ 74.47
	1-1/4"	2.00"	C40-12EM200-K	\$ 53.85	C40-12EM200-KB

## CAT-40 BALANCED COLLET CHUCKS

**KINGSTON:** Balanced to 15,000 RPM @ g6.3

**SPIN TRU:** Balanced to 20,000 RPM @ g2.5

- Balanced on a **HAIMER** machine
- Includes certificate of balancing
- **Runout 0.0002" TIR or better**
- Manufactured to ISO 9002 quality control standards
- Traverse ground taper to AT3 specs
- H5 bore tolerance
- Collet chucks, Shell mill, Jacobs/Morse Taper holders available



**BUY 10 OR MORE-GET 10% OFF!**



Collet Series	Proj	BALANCED TO 15,000 RPM		BALANCED TO 20,000 RPM	
		KINGSTON Part Number	Price Each	SPIN TRU Part Number	Price Each
ER 16	2.50"	C40-16ER250-K	\$ 79.95	C40-16ER250-KB	\$ 93.08
	3.12"	C40-16ER312-K	\$ 82.45	C40-16ER312-KB	\$ 93.08
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
ER 40	2.50"	C40-40ER250-K	\$ 87.94	C40-40ER250-KB	\$ 98.07

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5/8" T-Slot  
1/2-13 Stud Size

- 4 each: 3", 4", 5", 6", 7" & 8" long studs
- 4 Coupling Units
- 6 Flange Nuts
- 6 Forged Steel step clamps
- 6 T-Nuts
- 12 Steel Step Blocks
- 1 Wall Rack
- T-Slot Cleaner
- Wrench
- Wall rack



Fits All Bridgeport® Type Milling Machines. Includes Wall Rack

**\$69.00** Each  
Part # CK-58

## PLASTIC TOOLHOLDER TRAYS

- Sturdy trays protect your valuable toolholders
- An inexpensive way to organize your tooling
- Available in CAT/BT 30, 40 & 50 taper versions
- 30/40 taper-10 holes, CAT 50-6 holes



Taper	# of Holes	Part Number	Price
CAT/BT 30	10	TRAY30-10	\$ 32.00
CAT/BT 40	10	TRAY40-10	\$ 29.50
CAT 50 (not BT)	6	TRAY50-6	\$ 36.00

## RETENTION KNOBS

Your VALUABLE Machine Deserves A Premium Knob!



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**10% OFF!**  
10 or more knobs

- Individually Magnetic Particle Tested
- Made in the USA!
- **LARGE VARIETY** Available!
- Made of 8620, Heat Treated to Rc 56/58
- Exceeds Industry Standards For Tolerance (ANSI, DIN, JMTBA)

Machine	Thread	Head Dia	Angle	Coolant	Part Number	Price EA
Fadal BT40	M16-2.0	.740	90°	No	B40-4501S	\$ 17.72
HAAS BT40	M16-2.0	.590	45°	Yes	B40-4500H	\$ 22.80
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

## TOOL TIGHTENING FIXTURES



SAVE **10% OFF!**  
Mfg's List Price



- Holds CAT or BT holders
- Lightweight, compact design
- Enables strong gripping power in horizontal & vertical positions



Taper	Height	Length	Part Number	Mfg List	Our Price
CAT/BT30	4.25"	7.09"	BI-8890-0730	\$161.98	\$145.78
CAT/BT40	4.25"	7.09"	BI-8890-0740	\$167.20	\$150.48
CAT/BT50	5.91"	9.84"	BI-8890-0750	\$186.01	\$167.41

## Accu-Collets™ ER COLLETS



**PRECISION ER Collets:**  
0.0005" TIR or better

- **TRUE INCH** and metric sizes
- Crafted from high quality spring steel
- Individually tested for accuracy
- TG, DA & AF collets also available
- 100% Satisfaction Guarantee!



**PRICES REDUCED OVER 45%!**

**ER 11/ER 16**  
Prices Starting At:  
**\$ 8.75** each  
OLD Price: \$16.50

**ER 20/ER 25**  
Prices Starting At:  
**\$ 9.75** each  
OLD Price: \$19.00

**ER 32**  
Prices Starting At:  
**\$ 10.25** each  
OLD Price: \$18.00

ULTRA PRECISION (0.0002" TIR) COLLETS ALSO AVAILABLE!

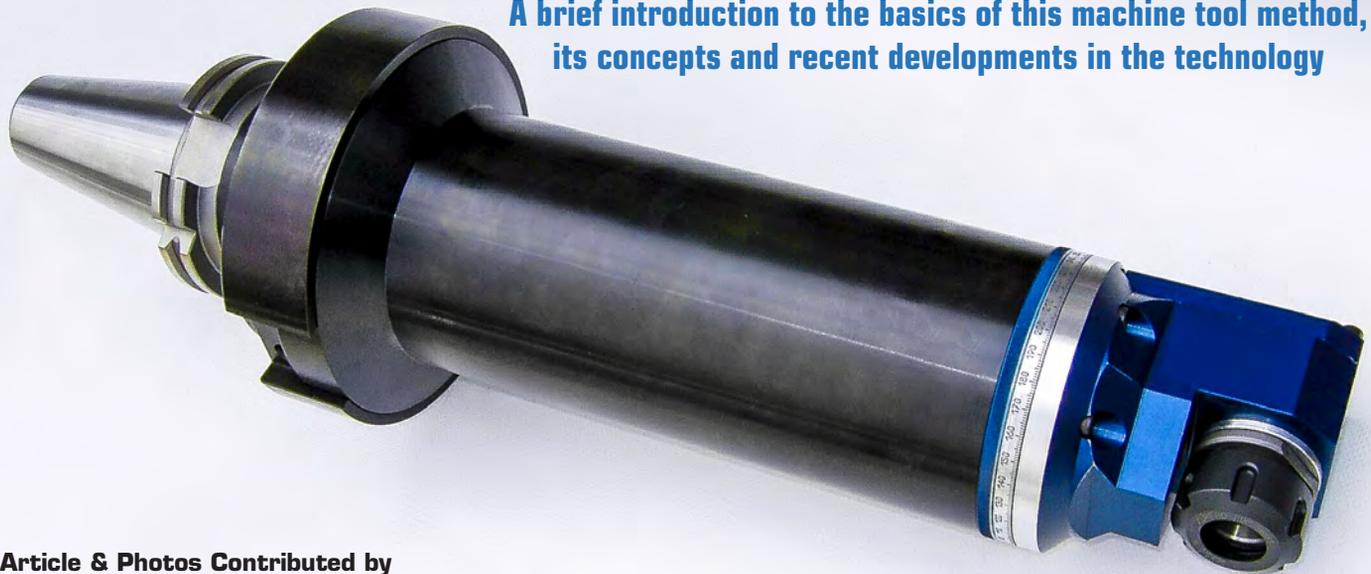


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# LIVE TOOLING

A brief introduction to the basics of this machine tool method, its concepts and recent developments in the technology



Article & Photos Contributed by  
Preben Hansen, President, Platinum Tooling Technologies Inc.

Example of a very large, deep pocket tool that initially seemed too expensive, until the tests proved otherwise.

Live tooling, as the name implies, is specifically driven by the CNC control and the turret of various spindle and powered sub-spindle configurations on CNC lathes to perform various operations while the workpiece remains in orientation to the main spindle. These devices, whether BMT or VDI, are also called driven tools, as opposed to the static tools used during turning operations and are usually customized for the particular machine tool builder's turret assembly.

Most often, live tooling is offered in standard straight and 90° configurations with a wide variety of tool output clamping systems, including collet chuck, arbor, Weldon, capto, whistle notch, hydraulic, HSK, CAT, ABS and a variety of custom or proprietary systems developed by the many suppliers to the industry.

As your jobs change or volume increases or you encounter specific challenges in machining very large parts with deep pockets or very small intricate parts, for example, and the need arises for new machinery, a common error is made by accepting the standard tooling packages provided by the builder. This is most definitely not a criticism of the standard packages from builders, but this article is meant to give you a set of parameters to consider when evaluating the tooling and toolholding devices to use in your shop or production department. Simply stated, you need to do as much evaluation of your process, when determining the proper tooling to be used, as you did when you evaluated the various machines available for purchase.

This examination can range from the simple (external vs. internal coolant, for example) to the sublime (adjustable or extended tooling configurations) to the truly exotic, an example of which will end this article.

Tool life is the product of cutting intensity, materials processed, machine stability and, of course, piece parts produced. Two seemingly identical job shops can have vastly different tooling needs because one is automotive and one is medical, or one specializes in the one-offs and low-volume work, while the other has a greater occurrence of longer run jobs. The totality of your operation determines the best tooling for the machines being purchased.

Bearing construction and the resulting spindle concentricity drive the life of any tool and you might find that just a 10-15% greater investment in a better design can yield both longer lasting cutters and consistently superior finish on your products. Of course, the stability and rigidity of the machine tool base are also critical factors, especially on large or deep pocket workpieces, where the distance from the tool base to the cutter tip is greater. Bevel and spur gears that are hardened, ground and lapped in sets are best for smooth transition and minimal runout. Roller bearings are consistently superior to spindle bearings in live tooling applications, so look for a combination system to get the highest precision possible. Also look for an internal vs. external collet nut, so the tool seats more deeply in the tool, as superior rigidity will result.



+135°/-30 universal style adjustable tool might be the ideal solution for families of parts.



Multi-spindle tool brings improved cutting capacity to your lathe.

Likewise, coolant high pressure might be desirable. Look for 2000 psi in 90° and 1000 psi minimum in straight tools.

You need to ask another question, namely, is the turret RPM sufficient to handle the work to be done? It's possible a speed increaser on the tool would be helpful.

Would it be beneficial to move secondary operations to your lathe? gear hobbing can be accomplished or producing squares or flats through the use of polygon machining.

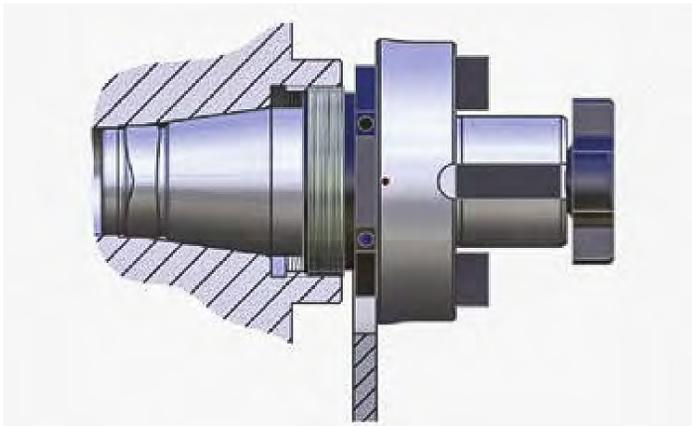
Standard live tooling most often is best suited to production work, where the finish, tolerances and cutter life are critical, while quick-change systems may be better suited to the shop producing families of products and other instances where the tool presetting offline is a key factor in keeping the shop at maximum productivity.

This opens the discussion of long-term flexibility and it's the most often overlooked consideration in buying live tooling. What work do you have in the shop, what work will be coming in the future and the overall economies of a changeable adapter system on your tooling may be considerations not often made when the focus is centered on the machine being purchased. Dedicated tools for large families of product may be desirable but consider a changeable adapter system and talk to your supplier before making that determination. Likewise, if the future work you're bidding involves more families of product, think ahead when buying the initial tooling on the machine.

If standard ER tooling is suitable for the work, there are many good suppliers but do consider the construction aspects noted above. For a quick-change or changeable



Internal clamping nut seats the tool more deeply.



**A typical ER collet adapter changing system allows faster presetting and improved production.**

adapter system, there are fewer suppliers in the market, so seek them out and be sure they can supply the product styles you need for all your lathe brands. Adjustable angle head systems can be costly but very worthwhile, owing to the stability and rigidity of their construction, when producing families of parts with only slight differences in the dimensions.

Now, one of the exotic examples promised earlier...it evidences the value of having test runs done on alternative tool styles...

One company was doing a cross-milling application on an AL6063 sheave, using an ER40 output tool on a Eurotech lathe, running 10 ipm at 4000 rpm. They were making three passes, with a cycle time of 262 seconds and getting a chatter finish on 20,000 pieces per year. The annual cost of the machining was over \$130,000. By using an improved adapter tool design with ER32AX output and the same parameters, they were able to produce the part in a single pass with a smooth finish and cycle time of just 172 seconds. Over the course of the year, this turned into a savings of \$45,000, approximately 20x the cost of the tool. The bottom line is the bottom line, as the accountants tell us.

In the end, you may not need a +135°/-30 universal adjustable tool or a multi-spindle live holder or even a quick-change adapter system but do consider all the options. Talk to your machine builder and several tool suppliers, plus the most important people in this equation, your shop personnel, as their input is invaluable.

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- **TRUE INCH** and metric sizes
- Crafted from high quality European spring steel
- **Fractional Collets** manufactured specifically for US shop requirements
- **INDIVIDUALLY TESTED** for quality and accuracy!
- Accu-Collets improve tool life, part finish and reduces spindle wear
- **100% Satisfaction Guarantee!**

<p><b>ER-11 COLLETS</b> Precision <b>\$8 75</b> each <small>ULTRA PRECISION Starting At: \$21.00 ea</small></p>	<p><b>ER-16 COLLETS</b> Precision <b>\$8 75</b> each <small>ULTRA PRECISION Starting At: \$21.00 ea</small></p>	<p><b>ER-20 COLLETS</b> Precision <b>\$9 75</b> each <small>ULTRA PRECISION Starting At: \$23.00 ea</small></p>
<p><b>ER-25 COLLETS</b> Precision <b>\$9 75</b> each <small>ULTRA PRECISION Starting At: \$23.00 ea</small></p>	<p><b>ER-32 COLLETS</b> Precision <b>\$10 25</b> each <small>ULTRA PRECISION Starting At: \$26.00 ea</small></p>	<p><b>ER-40 COLLETS</b> Precision <b>\$11 25</b> each <small>ULTRA PRECISION Starting At: \$26.00 ea</small></p>

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Bridge Type 5 axes Machining Centers

X-axis travel : 118.11" / 157.48" / 196.85" / 236.22"

Y-axis travel : 125.98"

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B : ± 110° C : ± 240° ( TCH-30F )



### — High performance two axes head —



#### TCH-30F

Spindle taper	HSK-A100	
Max. spindle speed	12,000 rpm	
Spindle motor	50 kW	



#### TCH-20F

Spindle taper	HSK-A63	HSK-A100
Max. spindle speed	24,000 rpm	15,000 rpm
Spindle motor	55 kW	65 kW



#### TCH-19F

Spindle taper	HSK-A63	HSK-A100
Max. spindle speed	24,000 rpm	15,000 rpm
Spindle motor	55 kW	65 kW

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### R series i models

Model	R 58 i	R 715 i
Max. Pressure Bar	70	100
Max. flow rate LPM	30	53
Pressure pump	Diaphragm	
Coolant type	Oil / Water	
Option	i	

i : Inverter motor + Ethernet connection.

# Five Ways Technology Helps Manufacturers

**Steven Brand CMTC [www.cmtc.com](http://www.cmtc.com)**

## Technology Creates Differentiation

Technology advances usually start slow as early adopters test the waters, gain momentum as others catch on, and then take off like a rocket when it becomes the norm. While many manufacturing technologies involved in the Fourth Industrial Revolution were once only affordable for industry giants, many of them have “taken off,” becoming increasingly available to small and medium-sized manufacturers (SMMs) as their price goes down. Whereas large manufacturers are often the early adopters, they may wind up investing in technology they don’t need or that ultimately doesn’t suit their business, taking a loss; SMMs, on the other hand, which usually adopt technology later when it’s more affordable, have the ability to pick and choose what technologies make sense for them based upon the experiences of others. By investing only in the technologies that can benefit them, SMMs are able to save money and improve their value proposition to customers and potential customers, differentiating their unique product or service from the masses.

## Technology Builds Customer Loyalty

The right technology improves the customer experience by helping manufacturers improve their processes and communicate with their customers. Some of this technology may be customer-facing, such as using intelligent online chatbots to quickly assist customers with common questions or concerns, or developing a better online inventory portal so customers can see what is available to them. Other technologies will be internal, yet ultimately benefitting the customer, such as using data analytics to gain deeper insight into their needs, or using additive manufacturing to produce small batches of a customized product for specific customers. By becoming more customer-centric through the use of technology, manufacturers can keep customers coming back.

## Technology Streamlines Processes

Much of the technology involved in the Fourth Industrial Revolution is designed to streamline processes for manufacturers. For example, automation through artificial intelligence and advanced robotics improves productivity and accuracy, while relieving employees from routine and time-consuming tasks which allows them to focus on more important, higher-value work or new projects. Other technologies, such as blockchain and the Internet of Things (IoT), have the ability to build smarter, more secure, and more transparent supply

chains, and gather data from a wide variety of manufacturing endpoints to enable real-time reporting for better decision making.

## Technology Aids in Recruitment

Manufacturing is often thought of as an unenviable job, but today, through technological advances, manufacturing offers some of the most exciting careers and work environments. Adopting technology, then, is very important when it comes to dispelling the notion that all manufacturing work is “dark, dirty, and dangerous.” As the baby boom generation enters retirement, adoption of technology will help recruit the next generation of manufacturing employees, who are looking for more exciting, rewarding, and innovative work environments. Technology is also responsible for networking through social media, which is a great way to connect with and recruit today’s youth; in fact, YouTube has been instrumental in recruiting new talent through virtual facility tours highlighting new technologies.

## Technology Expands Your Reach

Manufacturers leveraging technology can expand their reach into other markets and create new income streams. While some manufacturers may choose to keep their business within U.S. borders, manufacturers may also utilize today’s technologies to become global enterprises, finding or creating opportunities based on unmet needs and interests expressed by international consumers. Through the internet, entering new markets around the world and working with customers that were unreachable in the past now becomes much easier. Of course, there can still be hurdles to overcome, so you may want to check out our story, *How ExporTech Helps Manufacturers Boost Sales By Entering the Global Market*.

You’ve heard the adage work smarter, not harder, and technology gives you the tools to do exactly that. While it’s not always easy to keep up with technology, and finances can sometimes hold SMMs back, it’s importance to survival cannot be understated. From BetaMax to Blackberry, Blockbuster to Borders, many once-mighty products and companies have fallen for failing to keep up with evolving technology. Make sure you’re not the next casualty of changing times by joining the Fourth Industrial Revolution and bringing technology to your factory floors.

**Accurate**



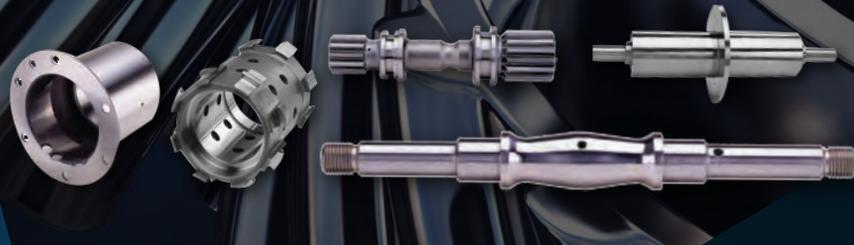
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# Tungaloy CARBIDE TURNING INSERTS



- 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	AH120	TM	Super Alloys	TO-1285	\$8.78
CNMG432	.031	AH120	TM	Super Alloys	TO-1364	\$8.78
DNMG431	.015	AH120	TM	Super Alloys	TO-1709	\$11.48
DNMG432	.031	T6130	SM	Stainless	TO-6805431	\$12.01
TNMG431	.015	AH120	TM	Super Alloys	TO-2833	\$9.50
TNMG432	.031	AH120	TM	Super Alloys	TO-2868	\$9.50
WNMG431	.015	AH120	TM	Super Alloys	TO-3277	\$8.78
WNMG432	.031	AH120	TM	Super Alloys	TO-3338	\$8.78

# 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



**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

# 3/4" REDUCED SHANK DRILLS



SAVE 10% OFF!  
Mfg's List Price

- 3/4" reduced shank
- High speed steel
- 118° point
- 6" OAL
- 3" flute length

Size	Part Number	Price EA
1"	BI-5168-072	\$30.83
1-1/32	BI-5168-076	\$32.61
1-1/16	BI-5168-080	\$32.08
1-3/32	BI-5168-084	\$32.56
1-1/8	BI-5168-088	\$35.94
1-5/32	BI-5168-092	\$36.14
1-3/16	BI-5168-096	\$45.10
1-1/4	BI-5168-104	\$45.41
1-5/16	BI-5168-112	\$50.40
1-3/8	BI-5168-120	\$55.83
1-1/2	BI-5168-136	\$68.43

# V7 HI-PERFORMANCE ENDMILLS

4 Flute • Variable Helix • Made From C10 Micrograin Carbide



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

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

# WOODRUFF KEYSEAT CUTTERS

High speed steel • Straight tooth • 1/2" diameter shank • Right hand cut • Staggered tooth and cobalt also available



Am Std#	Dia	Width	OAL	Part Number	Price
202	1/4"	1/16"	2-1/16	KEO-62010	\$26.30
303	3/8"	3/32"	2-3/32	KEO-63030	\$26.30
204	1/2"	1/16"	2-1/16	KEO-62040	\$26.30
304	1/2"	3/32"	2-3/32	KEO-63040	\$26.30
405	5/8"	1/8"	2-1/8	KEO-64050	\$26.56
806	3/4"	1/4"	2-1/4	KEO-68060	\$27.83
608	1"	3/16"	2-3/16	KEO-66080	\$33.24

# SPIRAL POINTED TAPS

Spiral point, 3 flutes, H3 limits • HSSE-V3 3% vanadium • Ideal for hardened tool steels such as 4140, H13 & D2 • Up to 35 HRC • Additional sizes available



Size	# flutes	Part Number	Price EA
6-32 NC	3	SOWA-123-300	\$ 6.72
8-32 NC	3	SOWA-123-302	\$ 6.72
1/4-20 NC	3	SOWA-123-308	\$ 7.44
5/16-18 NC	3	SOWA-123-310	\$ 8.40
7/16-14 NC	3	SOWA-123-314	\$ 12.32
1/2-13 NC	3	SOWA-123-316	\$ 14.24
5/8-11 NC	3	SOWA-123-318	\$ 25.84

# SOLID CARBIDE ENDMILLS

4 Flute • TiAIN Coated

- 4 flute, single end
- TiAIN Coated
- Center cutting
- 30° helix, right hand



Dia	LOC	Shank Dia	OAL	4 Flute TiAIN Coated	Price Each
1/8"	1/2	1/8	1-1/2	MO-EM 001067-4	\$ 7.91
3/16	5/8	3/16	2	MO-EM 001107-4	\$ 10.68
1/4	3/4	1/4	2-1/2	MO-EM 001137-4	\$ 15.35
5/16	13/16	5/16	2-1/2	MO-EM 001153-4	\$ 21.84
3/8	1	3/8	2-1/2	MO-EM 001177-4	\$ 25.39
1/2	1	1/2	3	MO-EM 001207-4	\$ 40.75
5/8	1-1/4	5/8	3-1/2	MO-EM 001226-4	\$ 74.00
3/4	1-1/2	3/4	4	MO-EM 001244-4	\$ 109.50

# CARBIDE DRILLS

135° drill point • Right hand cut • Made from premium submicron carbide with 10% cobalt • For steels, stainless, titanium & nickel alloys



Size	LOC	OAL	Part Number	Price
3/64	1/2	1-1/2	SRTA-3/64-MO	\$10.04
1/16	5/8	1-5/8	SRTA-1/16-MO	\$10.12
7/64	13/16	1-13/16	SRTA-7/64-MO	\$10.80
1/8	7/8	1-7/8	SRTA-1/8-MO	\$10.82
3/16	1-1/8	2-3/16	SRTA-3/16-MO	\$14.68
1/4	1-3/8	2-1/2	SRTA-1/4-MO	\$22.66
3/8	1-13/16	3-1/8	SRTA-3/8-MO	\$44.26
1/2	2-1/4	3-3/4	SRTA-1/2-MO	\$77.94

# COOLANT-THRU BORING BARS

SCLCR/L Bars Using CCMT21.51 Inserts



**MICRO 100**

- Coolant-thru hole design
- Chrome nickel
- 90° boring & facing with 95° approach
- Uses CCMT 21.51 inserts (not included)

Shank	OAL	Min. Bore	RIGHT HAND	LEFT HAND	Price EA
1/4	3.00	.330	MI-200821	MI-200822	\$ 69.65
5/16	4.00	.380	MI-200823	MI-200824	\$ 71.50
3/8	4.50	.490	MI-200825	MI-200826	\$ 74.60
1/2	5.00	.630	MI-200827	MI-200828	\$ 77.75
5/8	6.00	.775	MI-200829	MI-200830	\$ 83.10



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- 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
	9	SC	Fine	3M-09549-3	\$ 75.01
				3M-05132-1	\$ 75.01

## Rustlick COOLANT/CUTTING FLUIDS



**FULL LINE AVAILABLE!**



### POWERCHIP 2000 Coolant

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

5 Gal Pail **\$186.43** Each  
Part # RUST-76305

### Ultracut 375R Semi-Synthetic

- Controls rancidity
- Easy care
- Ideal for carbon, steel & stainless

5 Gal Pail **\$180.93** Each  
Part # RUST-74905



## HAND PADS



- 6" x 9" size
- Scotch-Brite™ material never rusts and can be used with water solvents
- For cleaning, deburring or finishing by hand

As Low As **\$1.22 Each!**

Mfg Ref.	Description	Color	Pkg Qty	Part Number	Price
7447	Gen. Purpose Hand Pad	Maroon	20	3M-04029-5	\$ 26.76
7447B	Gen. Purpose (Bulk)	Maroon	60	3M-04229-9	\$ 73.18
6444	Extra Duty Hand Pad	Brown	20	3M-16553-0	\$ 31.43
6448	Light Duty Hand Pad	Dark Gray	20	3M-16555-4	\$ 28.55
7440	Heavy Duty Hand Pad	Tan	20	3M-04050-9	\$ 36.02
7445	Light Duty Cleansing Pad	White	20	3M-16976-7	\$ 27.44

## COUNTERSINK TOOLS



### SHAVIV

- Ideal for chamfering and countersinking
- Mango handle provides maximum comfort
- Deburrs steel, aluminum, copper, brass, stainless steels, cast iron & plastics



Part # SHAVIV-90071  
**\$30.14 ea**

## 1/4" AIR DIE GRINDER



- Air regulator on top
- Safety throttle lever
- Rear exhaust with silencer
- 360 degree swivel air inlet
- Low noise 79 dB(A)
- Free Speed: 20,000 RPM
- Air Inlet: 1/4" NPT
- Air Pressure: 90 PSI
- Air Consumption: 4 CFM
- Overall Length: 7-3/8"
- Hose Size: 3/8"

**Rubber Molded Cushion Grip!**

1/4" AIR DIE GRINDER  
Part # A-7609-0903  
**\$77.62**

## BALLDRIVER SETS



SAVE UP TO **15% OFF!**  
Mfg's List Price



- Screw turns much faster
- Precision fit burr-free tip
- No need to exit and reenter screw, even when it is obstructed
- Works at up to 25° angle
- Comes complete with plastic holder

Type	# of Pieces	Includes Sizes:	Part Number	Mfg's List	Our Price
Inch	13	.050, 1/16, 5/64, 3/32, 7/64, 1/8, 9/64, 5/32, 3/16, 7/32, 1/4, 5/16, 3/8	BO-10937	\$ 18.65	<b>\$15.74</b>
Metric	9	1.5, 2, 2.5, 3, 4, 5, 6, 8, 10mm	BO-10999	\$ 15.15	<b>\$12.79</b>
Combo Pack	22	BO-10937 & BO-20199	BO-20199	\$ 31.80	<b>\$26.86</b>

## TOUCH OFF GAGE



**NEW DESIGN!**

- Accurately establishes tool length offsets for CNC milling machines
- The contact face is lightly spring loaded to protect against overrun
- Contact face diameter is 0.250"
- Offset height 4.000 in (101.6mm)
- Large 2.2" indicator face
- Gage graduations 0.001"
- Repeatability 0.0002"
- Body and contact face are red anodized 6061-T6 aluminum
- Base: 2.4" W x 1.3" D x 4" H



TOUCH OFF GAGE  
Part # EDGE-52000  
Mfg's List: \$124.99  
**\$99.99 ea**

## 6"/150mm ELECTRONIC CALIPER

Xtra-Value Cal with Regular Display



- Accuracy: .001"
- Resolution: .0005"
- Stainless steel frame
- Large easy-to-read display
- Absolute/incremental measurement
- Direct inch/metric conversion
- 4-way measuring
- Includes case

OVER **35% OFF!**  
MFG'S LIST PRICE!

Mfg's List Price: **\$50.72**  
**\$32.50 EA**  
Part # FOW-54-1011502

## STEEL PROTRACTOR



- Square Head Locking Type
- Measures angles from 0 to 180°
- Used for drawing radial lines, transferring angles, setting bevels
- Blade is secured firmly by lock nut at any angle
- Made from empered steel with satin chrome finish
- 6" arm and knurled thumb lock nut



SAVE **23% OFF!**  
MFG'S LIST PRICE!

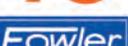
Mfg's List: **\$28.64**  
Part # PEC-5170  
**\$21.99**



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# CAD/CAM/CNC Perspective

By: Tim Paul  
Tim.Paul@Autodesk.com

## Is it worth it?

Last week I was at Autodesk University in Las Vegas, the yearly conference held by Autodesk where users and employees alike share knowledge in classes, round tables, and panel. The topic for this article came to mind while I was sitting in Kevin Ellingson's "CAD for CAM" class where he showed the power of integrated CAD/CAM in Fusion 360. He showed tips and tricks like how surface manipulation and patching can make better 3D surfaces that make better 3D toolpaths how to systematically model work holding assemblies to easily use in a manufacturing assembly while programming in CAM. During one of the longer workflows, someone spoke up and asked, "Is it really worth it?" As Kevin was explaining the value of modeling work holding as part of a CAM assembly I chimed in and said, "It really depends on what you are doing and what time you value." So, let's break down modeling work holding, think about what the value is, and find out if it is really "worth it".

I break modeled work holding into a few categories:

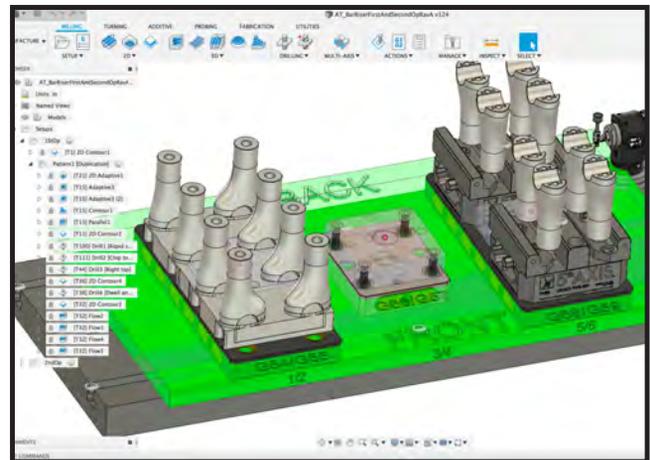
- Low density fixture models such as a single vise
- High density fixture models such as multiple vises or a tombstone
- Specially designed fixture models

### Low-density fixture models:

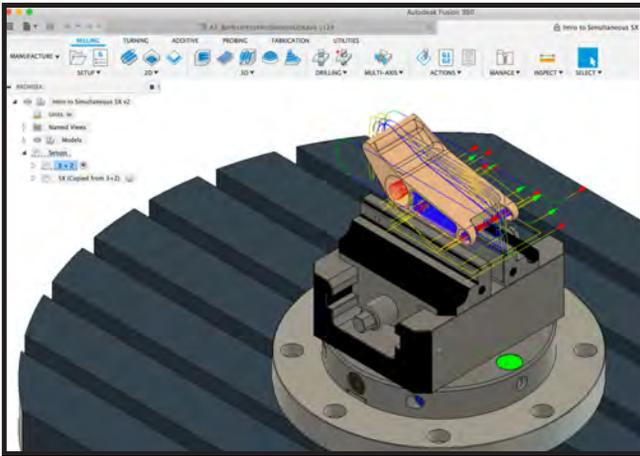
Including a single station vise in a CAM program for a simple setup is often considered "demo magic" for software salespeople to make their software look fancier. CAM programming with accurately modeled, low-density work holding like a single vise does add some value when it comes to capturing your intent on specific things like cutting depths when you have an integrated CAD/CAM environment such as Fusion 360. The real value in this situation is when it comes to making changes. If you were deep in the process of programming a part and then realize you need to move the part deeper or shallower in the vise you can easily move the part while still capturing your previously captured intent. A good example of capturing your intent would be setting a cut depth to be .010" above your vise jaws instead of setting the depth relative to the part itself. I can think of countless times in my early days as a machinist of finding jaws that were unexpectedly cut when someone changed something and forgot to scrutinize all of their cut depths. Many people also find value in modeling a vise to help them design, program, and cut soft jaws.

Few people will argue that there is not ANY value in programming while having a complete assembly that includes even a simple single station vise. The real question and debate, as asked in Kevin's AU class, is, "is it worth it?" Everything we do is a balance of many things. Process development, learning, training time, and the time it takes to do each time you are working on a job weighed against the value returned for the work done. One important and valuable return for the work of any machining assembly is more predictable toolpath simulation. The more accurate and predictable your toolpath simulation is, the less time you need to spend running programs at reduced rapid and federates and/or running at single block.

The question still remains unanswered. Is it worth modeling a low density fixture model as part of a machining assembly for CAM programming? That answer really depends on the work you are doing, the culture in the shop, and the willingness to invest in processes. There are too many details unique to each shop to cover in this article. I do urge anyone to look at what is stopping them from investing in any new process that shows potential improvements and I especially encourage analyzing the possibility of creating a system



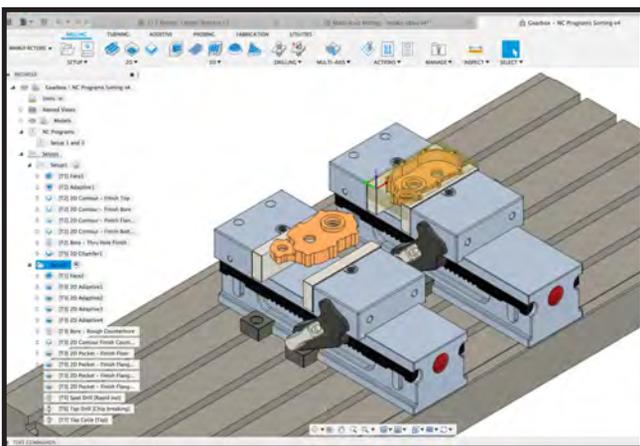
around the process to make it more efficient. I often find that an upfront investment in developing a repeatable process makes many time-consuming processes worth doing. In this case, one option would be to have pre-defined vise assemblies with the proper joints already applied. Personally, I also include a stock block and vise opening that are driven by CAD parameters. With a decent pre-modeled vise assembly it should only take 1-2 minutes to create an assembly ready to CAM program. The 1-2 minutes spent creating the machining assembly could easily save many times that time when proofing out the part at the machine once the process is proven to be consistent and trustworthy.



### High-density fixture models:

The higher the part density in the machine the easier it should be to justify the time it takes to accurately model a machining assembly. When programming across multiple vises or other fixtures on a vertical table or tombstone, modeling the whole assembly can save a lot of time when proving the program out. Having everything accurately mirrored between the machine and the CAD file that is being programmed in CAM is critical to trusting the toolpath simulation. Having a system to efficiently create a machining assembly becomes increasingly important and the number of components in the assembly increases.

I have a Haas VF2SS in my garage and I've invested a lot in the 5th Axis Rocklock modular work holding system to quickly mount and locate my different vises and fixtures. I've also invested a lot of time in building pre-assembled models so I can quickly select and assemble the appropriate vise or fixture plate for the job I'm working on – for up to 5 separate vises – within a few minutes. The other advantage I've discovered in having an accurate model of what is in my machine is that I no longer manually probe each job. Because my whole CAD model is accurate to what is in my machine, I use the 5th Axis Master Pallet to set up standard Work Coordinate Systems. From those standard Work Coordinate Systems, I use the WCS probing routines in Fusion 360 to program probing routines to locate what I am working on.



So let's return to the initial question: "is it worth it?" For the system I use, I've found that spending the few minutes it takes to create a high-density machining assembly saves me a lot of hard-to-quantify time during programming where I would otherwise have to be more mindful of where things are in the machine. What I can quantify are the numerous minutes I save each time I don't have to manually probe parts in my machine when I am able to program the WCS probing routines from Fusion 360. Even more than the time I save manually probing parts in my machine, I save countless minutes each time I run a job without manually overriding the rapid and cutting feeds or testing programs in single block.

When you are working with a multi-axis machine such as a 5-axis, 4-axis, or a 4-axis horizontal, the benefits of accurate machining assemblies are compounded as accurate toolpath simulation become even more important with increasing machine complexity.

### Specialty fixture models:

Specialty fixtures are the biggest reason I switched to an integrated CAD/CAM tool years ago. Odd shaped parts, high part density, and challenging tolerance consistency from run to run are common reasons for specialty fixtures. With increasing labor costs it's been easier to justify custom fixtures to increase part density to keep the machine running longer so operators can do multiple jobs at once. In years past, it was common practice to have an operator in front of each machine to swap parts, prep material, de-burr parts, and perform in-process inspection. In those days the focus was mostly on reducing cycle time while producing parts within tolerance. As labor costs go up, many shops are finding that high density fixtures are a cost-effective way to increase their productivity and process consistency.



So, "Is it worth it?" It really depends on how you want to process work through your shop. I'm not totally against quick and dirty workflows, but I think it's important to analyze the work you do, the tools you have, and what is available to make a decision about all the processes you use to make parts. I think the more I've invested in accurately modeling machining assemblies the more I've been able to load programs and run them at the machine without having to stand over them like a bomb could go off at any moment. If efficiently modeling machining assemblies is intimidating, I encourage you to seek out more knowledge. I see a lot of shops growing, but those shops are always looking to do things more efficiently and intelligently.

# Mazak DISCOVER 2019 Draws Thousands of Attendees



More than 2,000 manufacturers from across North America attended Mazak Corporation's DISCOVER 2019 event held November 5-7 and 12-13 at the company's North American manufacturing headquarters in Florence, Kentucky. The event featured over 30 live machine tool demonstrations, and Mazak unveiled for the first time in North America several productivity-enhancing technologies such as its new MAZATROL SmoothAi control as well as a new mixed reality training and service support system. The company also showcased some of its investments in its Florence, Kentucky, manufacturing campus, including a sneak preview of the latest improvements to its Mazak iSMART Factory™ and a new spindle rebuild facility in the campus' South Building.

Developed with automation in mind, Mazak's new SmoothAi control includes artificial-intelligence-driven machining functions such as SMOOTH Robot Cell Controller and SMOOTH Robot Teaching Assist that make it easier than ever to integrate a wide range of digital technologies into part-production operations. Featuring graphical user interface enhancements, an optional second monitor and operation panel enhancements to support other new SMOOTH TECHNOLOGY solutions, including SMOOTH Ai Spindle, Solid MAZATROL and Ai Thermal Shield, the SmoothAi CNC also incorporates new products like SMOOTH CAM Ai, MAZATROL TWINS software and SMOOTH Project Manager.

Also garnering much attention at DISCOVER 2019, Mazak's mixed reality training and new remote service modalities are expected to revolutionize training, service and maintenance with powerful display technology. The system takes virtual objects from VR and overlays them in the real world with an AR approach, enabling risk-free training and new possibilities for machine service and maintenance.

On the machine tool side, many of the advanced machines under power and cutting parts during DISCOVER 2019 included those paired with automation solutions such

as articulating robots and palletized part loading/unloading systems. Other machine tool innovations included Mazak's HYBRID Multi-Tasking series of machines, which add technologies such as 3D metal printing with Hot Wire Deposition (HWD) and using force to join metals with Friction Stir Welding (FSW) to conventional machine tools.

Looking back at the success of the DISCOVER MORE WITH MAZAK series of events in 2019, Dan Janka, president of Mazak Corporation, commented, "Our customers have come to rely on these events to keep up with the latest manufacturing advancements and strategies, which is why Mazak DISCOVER continues to hold the distinction as the industry's largest privately held manufacturing technology and education event in North America,"

as articulating robots and palletized part loading/unloading systems. Other machine tool innovations included Mazak's HYBRID Multi-Tasking series of machines, which add technologies such as 3D metal printing with Hot Wire Deposition (HWD) and using force to join metals with Friction Stir Welding (FSW) to conventional machine tools.

In keeping with the event's educational focus and stemming from Mazak's various technical collaborations, the company welcomed several of the manufacturing industry's leading minds as keynote speakers during DISCOVER 2019. Presentations from Oak Ridge National Laboratory (ORNL), University of Cincinnati, Lockheed Martin, GE Aviation, Cisco Systems, Fanuc America, AMT -The Association for Manufacturing Technology and others addressed industry-critical topics including automation, workforce development, HYBRID Multi-Tasking, digitally connected factories and cybersecurity.

As part of DISCOVER 2019, Mazak opened the doors of its Mazak iSMART Factory for tours, during which attendees experienced the company's latest investments in its own manufacturing operations, including a new completely automated manufacturing cell currently being installed and the initial stages of the entirely new Spindle Rebuild facility. This new state-of-the-art facility will provide efficient and high-quality OEM-factory-certified spindle rebuild services and will further improve Mazak's ability to quickly deliver spindles and reduce customer downtime.

In line with the Mazak iSMART Factory concept, the new automated manufacturing cell spotlighted the effectiveness of Mazak's SMOOTH TECHNOLOGY digital manufacturing solutions – including its new Smooth Spindle Health Monitoring – that contribute significantly to increased productivity and maximized machine utilization. The new manufacturing cell features Mazak's MAZATEC Smart Manufacturing System (SMS) for both machine pallet and raw material stocking and six of Mazak's most advanced machine tools and also incorporates the Mazak SmartBox IIoT technology for process monitoring and optimization.

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# Industry News



## BIG KAISER Enhances Online Access to 2D and 3D Tooling Data

BIG KAISER has redesigned one of the most popular tools on bigkaiser.com—the manuals, DXF and STEP (STP) Search. The improvements make finding 2D and 3D data and specific product manuals easier. As users type a catalog number into the search field, a drop-down menu will display available DXF, STP and manuals.

“After gathering feedback from our

customers, the tool was completely redesigned for the North American market,” Alan Miller, engineering manager, said. “The hope is that making both DXF and STP models available online helps customers’ work a little faster and their day-to-day jobs easier.”

DXF standard allows customers to combine products from multiple companies with unified layer structures. The STP standard keeps things simple for program simulation. DXF access is open to anyone but STP downloads will require a login (application link on download page).

The tool can be found here: [bigkaiser.com/en/downloads/manuals-dxf-and-step-search](http://bigkaiser.com/en/downloads/manuals-dxf-and-step-search).

## Optomec Delivers 500th Industrial 3D Printer

Optomec, Inc., a New Mexico privately-held supplier of proprietary additive manufacturing equipment and software, in November announced it has delivered its 500th Industrial 3D printer. The machine is installed at a division of General Electric, which now counts more than 20 Optomec systems in use across GE business units including aviation, healthcare, power, and oil & gas.

The company has invested more than \$50 million developing its proprietary solutions for 3D Printed Metal and 3D Printed Electronics, resulting in a comprehensive Intellectual Property

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# Industry News

portfolio that includes more than 60 patents issued and a wealth of enabling materials and process knowledge.

Optomec's installed base of 500 Industrial 3D printers includes more than 200 LENS® machines for 3D Printed Metal, where Optomec was first to market with a DED (Directed Energy Deposition) based solution. These metal printers are used for a range of high ROI production applications including short-run manufacturing, upfront wear coatings and rebuild of worn or damaged components.

Additionally, Optomec has fielded almost 300 of its patented Aerosol Jet® systems for 3D printed electronics. These machines are used in production for applications including high-density 3D semiconductor packaging and directly integrated 3D antenna and sensors, for industry leaders in consumer electronics, medical device and mil-aero markets.

## Tsugami/Rem Sales Continues to Support Wounded Warrior Project as Corporate Champion

Tsugami/Rem Sales, the exclusive North American importer of precision Tsugami machine tools, announced recently that it is committed to support our nation's wounded warriors through Wounded Warrior Project® (WWP) and the nonprofit's free programs and services. Many wounded veterans face significant challenges when they return to civilian life, and through the generous support of donors and corporate partners, WWP is able to provide support during their recovery, wherever they are in that process.

Through financial contribution, Tsugami/Rem Sales, LLC is directly supporting the programs and services that give warriors access to mental and

physical health support, employment and education assistance, and the many other services that WWP provides to

its warriors, free of charge. To learn more, please visit: <https://www.woundedwarriorproject.org>.

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The advertisement features a central graphic of a CNC tool bit machining a yellow part, with a yellow banner containing the text 'CNC Machine Simulation, Verification, & Optimization Software'. Below this, the slogan 'SAVE TIME • SAVE MONEY SAVE YOUR MACHINES' is displayed in large white letters. Three smaller inset images show different simulation scenarios: a tool bit cutting a part, a tool bit cutting a part with a red 'CRASH DETECTED!' warning, and a completed multi-colored part. The background is dark blue with faint white text representing G-code.

# Industry News

“We are honored to support Wounded Warriors as a Corporate Champion for the second year in a row. The continuation of this initiative is one that our business is proud to share as it shows Tsugami/Rem Sales’ commitment to service through dedication to helping injured service men and women across the nation,” said Michael Mugno, president, Tsugami/Rem Sales, LLC.

“The support we receive from Tsugami/Rem Sales, LLC. gives Wounded Warrior Project the critical resources we need to serve warriors,” said Gary Corless, chief development officer at WWP.

## CGTech Welcomes Mark Forth as Global Business Development Manager

CGTech announces the appointment of Mark Forth as global business development manager. Mr. Forth joined CGTech corporate headquarters in Irvine, CA on October 1st, 2019.

“Mark is a great addition and asset to CGTech. With many years’ experience in the manufacturing industry we are extremely pleased to welcome him to the team,” said Jon Prun, founder and president of CGTech.

Mark has over 25 years’ experience in the CAD/CAM industry, during which time he has held roles at Delcam and Autodesk within applications,

sales, product management, marketing and business development.

## MC Machinery Systems and ADIRA Form Partnership to Provide Press Brake Line to North American Market

MC Machinery Systems, Inc., a subsidiary of Mitsubishi Corporation, and ADIRA, a Portuguese manufacturer, part of SONAE CAPITAL portfolio, have formed a sales and service partnership to deliver quality press brakes throughout North America from 100 through 2000+ ton capacity machines.

ADIRA was established in 1956

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# Industry News



in Porto, Portugal, manufacturing a variety of sheet metal working machinery. With over 162,000 square feet of production space, ADIRA is capable of producing hundreds of quality machines for export all over the world. ADIRA's commitment to innovation and continuous improvement have

linked ADIRA's engineering department to universities and development institutes (University of Porto, MIT, INEGI, & INESC) in a network to develop and transfer innovations and knowledge.

MC Machinery Systems, Inc. has recently partnered with ADIRA to offer customers more products at economical prices, while providing an extensive network of service and support.

## Emuge Corp. Hosts Grand Opening of Newly Expanded Manufacturing Facility

Emuge Corp., held a grand opening ceremony of its significantly

expanded, custom-designed manufacturing facility on October 15, 2019. Marking a 35 year presence in the U.S. along with increased growth in North America, the Emuge expansion includes more manufacturing and tool reconditioning space, the addition of a new PVD coating center as well as an expanded technology and training center. The expanded facility doubles the size of the original building to over 50,000 square feet total.

Over 150 attendees joined Emuge to celebrate the occasion. The grand opening featured a formal ribbon cutting, a special unveiling of a statue of Emuge founder Richard Glimpel, a full facility tour and live machining technology demonstrations.

"The expansion will allow us to bet-



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# Industry News

ter serve our customer base in the U.S. and Canada,” said Mr. Bob Hellinger, president of Emuge Corp. “The growth we have experienced in our aerospace and power generation customer base has been significant in the past few years. The expanded facility will provide additional capacity to domestically manufacture special solid carbide tooling and other standard solutions within our milling tools portfolio.”

The expansion construction began in September 2018 and accelerated rapidly throughout 2019. Emuge currently has tool reconditioning capabilities in West Boylston for taps, end mills and drills, combined with the ability to manufacture tools such as spot drills, chamfer mills, carbide end mills, carbide special tooling, carbide step drills and make other round tool modifications.

## Expand Machinery Purchases Product Line of Ganesh Machinery

Expand Machinery LLC is now the owner for the highly regarded product line of Ganesh Machinery. This includes the complete inventory of the Genmill high speed vertical machining centers, Genturn multi axis machines, the Ganesh toolroom machines, the parts department and the service department. Expand Machinery will continue to sell the same machines under the same brand names (Ganesh, Genmill and Genturn). The machines will be manufactured in the same great factories in Taiwan.

The phone number will remain the same at 818.349.9166. The toll-free number will also remain unchanged at 1.888.542.6374. You can continue to email your orders to [parts@ganeshmachinery.com](mailto:parts@ganeshmachinery.com). Please email all machinery sales inquiries to [sales@ganeshmachinery.com](mailto:sales@ganeshmachinery.com). You can continue to send the service emails to [service@ganeshmachinery.com](mailto:service@ganeshmachinery.com).

Please note that the physical loca-

tion for the company is still 20869 Plummer Street, Chatsworth, CA 91311. The website will continue to be [www.ganeshmachinery.com](http://www.ganeshmachinery.com).

Expand Machinery is pleased to

announce that their sponsorship with Arrow McLaren SP racing team continues. They are proud to partner with a great team and wish them continued success.



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# Industry News

## Mitutoyo America Corporation Announces Sponsorship With Titans of CNC

Mitutoyo America Corporation

announced a sponsorship agreement with Titans of CNC, a free project-based education platform that helps guide students and teachers on CNC machine operation and programming.

The Academy provides over 3,000 free online courses in CAD, CAM and CNC machining techniques, and is now used by over 45,000 members in 170 different countries.

Mitutoyo metrology products will be featured in both the Titans of CNC Show airing on Titan TV and will be utilized on Titan CNC Academy videos for demonstration purposes.

“As a leader in the field of precision metrology, Mitutoyo America is excited to partner with Titans of CNC Academy. We look forward to supporting skill development in US manufacturing by providing metrology experience and leading technology to the Titans of CNC team,” says Matt Dye, president of Mitutoyo America Corporation.

Titans of CNC will highlight Mitutoyo products through video tutorials in Gilroy’s personal manufacturing facility located in Rocklin, CA. These videos, along with other content, will be featured on Titans of CNC social media platforms including YouTube, Facebook, Twitter and Instagram.

Titans of CNC was started by Titan Gilroy as a CNC machine shop in Northern California focused on making the most difficult parts in aerospace. The company transitioned into a massive reality TV series as a world-first CNC educational platform recognized by a global network of engineers, machinists, hobbyists, students and educators.

## Methods Machine Tools Announces Partnership With OKK Corporation

Methods Machine Tools, Inc., announced that effective October 1, 2019 it is representing OKK Corporation in North America. For over 100 years, customers worldwide have relied on OKK horizontal, vertical, and 5-Axis machines for quality, reliability, preci-

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Educators, ask about our education program.*



# Industry News

sion and innovation.

“We are very pleased to announce our new partnership with OKK to import, distribute and provide service and support for its broad range of high-quality machine tools,” said Mr. Mark Wright, president and CEO of Methods Machine Tools, Inc. “The addition of the larger capacity line-up of OKK horizontal, vertical, and 5-Axis machines ideally complements our current machine solutions.”

OKK machines have a rigid construction and versatile design, and offer over 60 models of horizontal, vertical, and 5-axis machines to serve industries such as aerospace, automotive, energy, die/ mold and more. To ensure 100% quality control, OKK produces all key machine tool components in-house such as spindles, mechanical gears,

precision square slide guide ways and special controller features.

Horizontal machining centers from OKK include the HM Series which are fast and powerful and provide easy access, maintenance and operation. The OKK HM Series is offered in several sizes with Big Plus 50-taper spindle, and a high-speed rotation APC and ATC by synchronization cam (OKK patent), delivering smooth performance and production efficiency. The HM6000S is an all-new HMC that supports face mills up to 11.81” and features an extended rigid spindle that enables tools to reach to the back side of the work envelope.

OKK vertical machining centers are exceptionally well positioned for aerospace, mold making and other demanding applications. The VM/R

series, featuring large box-ways, high torque and high horsepower spindles, is designed for ultra-heavy duty cutting of titanium and other exotic materials. The VM/R series comprise of several models including the VM53R which features increased rigidity in the main body and the spindle to provide high cutting performance. The VMC’s have highly rigid and accurate box-ways similar to traditional machining centers.



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# Industry News

## Forkardt Acquires Soft Touch Technology

Forkardt Inc. announced the acquisition of the intellectual property

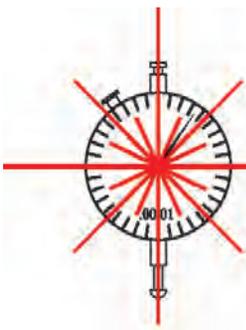
(IP) Soft-Touch® technology assets from General Manufacturing Systems, a supplier of custom workholding products in Saginaw, Michigan. With Soft-Touch, Forkardt strengthens its

advanced custom and highly specialized workholding capabilities and IP portfolio for challenging applications in the automotive and aerospace markets.

With this acquisition, a Forkardt spokesman said, “we will now provide a leading technology solution for thin walled, advanced materials, where part deformation is a concern. The unique Soft-Touch chuck design allows clamp fingers to actually conform to a part’s natural, as processed contour. Coupled with regulated clamping pressure, the resulting force dynamics actually give rigidity to fragile and delicate parts”.

The acquisition closed in October, 2019. Terms were not disclosed

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## Milltronics Names Foothills Machinery Sales Exclusive Distributor for Colorado and New Mexico

Milltronics USA has named Foothills Machinery Sales as its exclusive full-service distributor for the states of Colorado and New Mexico. Founded in 1984, Foothills Machinery Sales is Colorado’s oldest independent dealer of machine tools. Located in Broomfield, Colorado, Foothills Machinery Sales is home to both knowledgeable sales and service support staffs.

“We’re excited to be representing Milltronics,” said Tim Beer, general manager of Foothills Machinery Sales. “The Milltronics brand is well known for its line of tool room machines that have integrated conversational controllers that make CNC seamless, but they also have a range of CNC machining centers and CNC lathes that offer shops well-built machines at a competitive price. Another big advantage to the Milltronics controller is the G-code visualization screen that helps conversational programmers see the G-code as the program is being created. We’re really proud to offer Milltronics as an

# Industry News

option for our customers throughout Colorado and New Mexico,” said Beer.

Foothills Machinery Sales is in charge of sales, service, parts, training and applications support for Milltronics customers in Colorado and New Mexico. They have industry veterans within the Foothills service, parts and applications team with in-depth knowledge of machining, tooling, programming, fixturing and workholding.

“The team at Foothills is top notch,” said Louie Pavlakos, Milltronics USA general manager. “We know they’re going to help us sell machines and often excellent service.”

## Mastercam Partners with TITANS of CNC

CNC Software, Inc., developers of Mastercam, has announced a new partnership with TITANS of CNC, Inc. to help train the next generation of highly skilled CNC machinists. The organizations have entered into a three-year partnership to develop media that advocates for CNC education and high-level aerospace manufacturing processes.

TITANS of CNC is a free educational platform, consisting of more than 3,000 online courses, that guides students and teachers through CNC machine operation and programming. The Academy consists of online courses in fundamentals, learning CAD, CAM, advanced work holding, 5-axis, and more. The organization has an expansive following among students and professionals in manufacturing and are preparing the release of TITANS of CNC: Aerospace Academy – a tutorial-based platform teaching high-level manufacturers the skills necessary to produce complex aerospace parts using the most difficult materials.

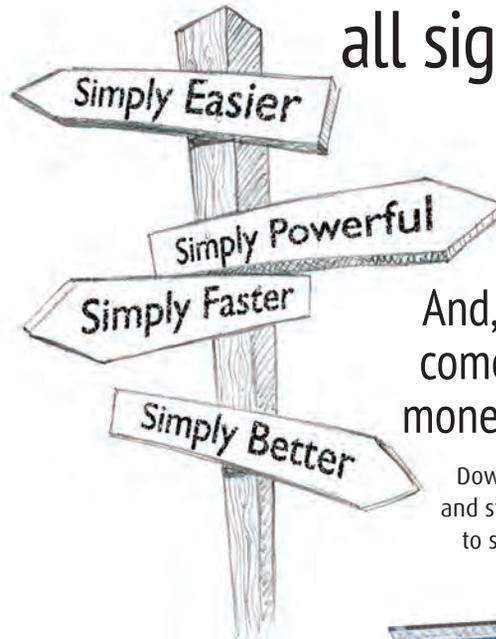
“We are proud to partner with such an inspirational team,” said Meghan West, president, CNC Software, Inc. “From the beginning of our existence, CNC Software has made a concerted effort to address the educational market. We have always recognized

the importance of recruiting young minds into our field. TITANS of CNC has made it their mission to do just that. We are proud and humbled to be working with such a wonderful group of people that have the same mission,”

West continued.

As a result of this partnership, TITANS of CNC will feature Mastercam in the production of videos for education and social media purposes.

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# New Products

## High Performance CMM Specifically For the 5-Axis PH20 Probe

### —Helmel

Helmel Engineering, a 46 year old American manufacturer of Coordinate Measuring Machines, has introduced a new CMM developed to take advantage of the capabilities of Renishaw's PH20 Probe concept. The Microstar Model 320-185 is an evolution of the company's venerable Microstar line of durable mechanical bearing CMMs that are proven workhorses in labs, gage rooms and on the production floor.

Virtually all moving bridge CMMs today were developed for slower probe

systems that index between limited numbers of locked A-B position angles then measure with 3-axis moves. In contrast, the Renishaw PH20 Probe system with U C C T 5

Controller provides true 5-axis functionality with infinite positions throughout the 230° x 360° head range in combination with the X, Y and Z axis motion of the CMM. The PH20 also includes "head-tap" mode



where the probe rapidly acquires data autonomously while the CMM remains stationary.

The new design includes several advances. For improved accuracy, the Z-axis has a larger section for stiffness and stronger bearing separation, and the X-axis carriage employs an innovative dual bearing flexure stabilizer concept combined with new self-aligning mounts for linear bearings. Scales are upgraded to Vionic long-life stainless steel tapes mounted on steel surfaces with 50-nanometer resolution reading heads. Error correction is implemented at the controller and temperature compensation is offered. The company reports these improvements make the 320-185 among the most accurate

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# New Products

mechanical bearing CMMs available.

The drive system has been improved as well. The steel and Kevlar reinforced drive belts are larger and the tachmotors are stronger on all three axes. Due to the rapid capabilities of this system, the company expects plenty of interest for in-production applications. Added protection for harsh environments is also available.

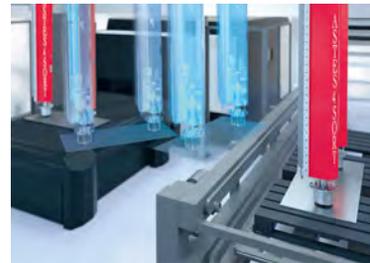
Initially offered with a measuring range of 20" x 30" x 18", the system includes CMM Manager CAD software as standard. Renishaw's MODUS software is an option. The system also includes a TCR20 six-port automatic stylus changer.

## Mitsubishi Electric and ASTES4 Offer Fully Integrated Laser Automation Solution

### — Mitsubishi Electric

Mitsubishi Electric Corporation, an established MC Machinery automation solutions partner, has teamed up with ASTES4 to offer its laser automation solution. They report this multifunctional system is the first fully integrated system capable of controlling the entire production process from loading, cutting, sorting, and unloading through to the storage of finished parts.

The system utilizes four cartesian grippers for loading, unloading, and the sorting of parts. Each gripper is capable of using vacuum or magnetic tools in a variety of shapes and sizes to produce a more effective sorting speed.



The process sorts the parts into kits, and its wide variety of options allows for different material thicknesses to be kitted on the same pallet. Downstream processes are taken into account to provide seamless integration into the production process.

Its software automatically optimizes and manages the production process through to storage, without the user having to intervene. Remote access and a camera system allow for continuous monitoring and intervention if needed.

# THANK YOU CHARLENE

For all you have done to help CNC WEST be the #1 western region metalworking magazine these last 30 plus years. We could not have done it without your help.

*Best Wishes in retirement. You will be missed!!*



# New Products



## TalonGrip™ Long Length Serrated Grip —Mitee-Bite

Mitee-Bite products introduces the TalonGrip™ long length serrated grip. The new grips were produced as a “drop fit” into the original 6” TalonGrip™ jaw set and provide line

contact the full length of workpiece. The standard TalonGrip™ grips are very popular due to being compact (.750” / 19mm) long, and designed to be placed anywhere in jaw whenever specific tooling clearance is required. All TalonGrips™ and VersaGrips™ remain a standard for fixturing when low-profile workholding is desired opposite Pitbull® Clamps for the most demanding applications.

Manufactured from S7 steel, heat-treated and then finished with a black oxide coating, providing tough, low grippers. Each long length grip is laser engraved with a 10mm scale, allowing the user multiple reference points when repeatable part placement is needed.

## Support for Renishaw PH20 Introduced —Verisurf Software

Verisurf Software, Inc. announced at the Quality Show its new device support for the Renishaw PH20, 5-axis probe-head. Verisurf customers running the PH20 currently or planning to retrofit their CNC CMMs will realize the power of Verisurf



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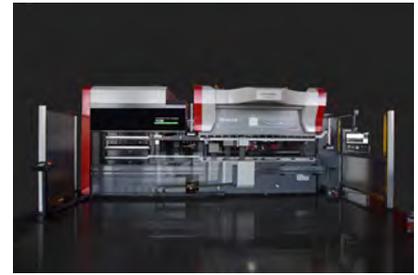
# New Products

automated inspection software with the full potential of 5-axis probing. A Verisurf spokesman said, "Inspection cycle times are reduced by as much as 3X when probing in 5-axis, compared to traditional indexing heads, without sacrificing accuracy".

"Accuracy, speed, flexibility, and overall efficiency are key factors in today's measurement solutions. Verisurf software controls measurements from virtually any CMM, a process that is limited only by the mechanical capabilities of the machine. The Renishaw PH20 probe-head is very accurate, and through enhanced motion control, improved touch-trigger, and calibration technology, it allows our software to do more, faster," said Ernie Husted,

president and CEO of Verisurf.

Verisurf CMM programming software and the PH20 5-axis probe-head are used to maximize inspection throughput on new or existing CMMs with Renishaw controls. In addition to the enhanced measurement data collection, Verisurf software CAD model-based productivity features speed up the quality inspection and reporting process. Easy object-oriented CMM programming tools quickly create automatic inspection and quality reporting routines, and during inspection, an Auto Inspect panel and feature balloons present real-time deviations of measured features compared to the CAD nominal.



## New Automatic Tool Changer for Dual-Drive Press Brakes —MC Machinery Systems

MC Machinery Systems introduces its new high-capacity automatic tool changer (ATC) for its BH series of dual-drive press brakes. The ATC is

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# New Products

designed to increase production levels and utilization rates while reducing setup time, especially in high-mix, low-volume environments.

The ATC allows for fully automated tool setup and removal, freeing up the operator to perform other tasks. Its available 107.3 x 170.6 foot storage capacity allows for the greatest tooling variation on the market ranging from high-runner V-dies to specialized hemming or offset tools. Up to two-inch V-die openings and 19.7-inch lengths can be placed with the single, large-capacity tool manipulator with the added functionality of pick and place for small tool sections for setups that do not require the full setup to be removed. The manipulator is also

equipped with a tool and bed cleaner that runs automatically during tool changes.

The ATC is engineered for operators of all experience levels. Programs can be created offline using DiamondBend software, at the control, or imported from other MOS controlled press brakes. Further support for operators is available with MC Machinery's VIDERE operator support system for real-time bending information, sequences, and automatic tool changes.

Machines equipped with the ATC are not limited to the tools in the changer's storage. The machine can be used as a stand-alone press brake or automated system, allowing for the flexibility for one-off jobs.



## New Horizontal High Speed Machining Center —Femco

Introducing the FEMCO BMC-100HT large capacity horizontal high speed machining center with a traveling Z-Axis Column, an 8,000 RPM

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# New Products

spindle, full 4th B-Axis table with an incredible 40,000 lbs. table load capability. Although the FEMCO BMC-100HT was designed with the mold making industry in mind, it has already proven to be a highly efficient metal removal machine for the aerospace industry. The large machining envelope represented by X, Y, Z travels of 118" x 80" x 59" allows for the machining of large complex parts as well as the sweeping contours of large molds.

The FEMCO BMC-100HT comes equipped with a Fanuc AI contour control II. FEMCO reports the AI contour control is a high speed machining look ahead function allowing for faster machining cycle times and better finishes. AI contour control looks ahead in the

part program to eliminate the acceleration/deceleration and servo delays that limit feed rates when cutting short line segments or contours, and effectively eliminates machining trajectory error in corners and small radii.

The FEMCO BMC-100HT is a hybrid design combining the open structure of a large horizontal boring mill with the highspeed machining capability of horizontal machining center. Whether it's intricacies of a large, heavy steel mold or the intricate details of an aluminum aircraft component, the FEMCO BMC-100HT full 4th B-Axis table allows cutting tools to approach the part at any conceivable angle.



## Next Generation CMM Platform —Hexagon

Hexagon's Manufacturing Intelligence division recently announced the launch of the multisensor OPTIV



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# New Products

M CMM which deploys Hexagon's Enhanced Productivity Series (EPS) to provide manufacturers of small and medium precision parts a range of configuration packages optimized for their individual applications.

Hexagon reports the EPS concept offers manufacturers a choice of productivity drivers based on their application's need for throughput, precision, flexibility or shop floor capability. The pre-configured, highly evolutive EPS packages make it simpler for quality engineers and CMM operators to create, execute and analyze measurement routines that drive higher productivity. The OPTIV M is available in three performance levels of Green, Blue and Chrome, making it ideal for a full range

of budgets and applications.

Dr. Tobias M. Weber, product manager vision says: "The OPTIV M multisensor CMM helps precision part manufacturers in fast-paced, competitive environments raise inspection productivity in line with their specific business goals. On top of satisfying demand for a multisensor CMM tailored for today's applications, the OPTIV M is designed to adapt readily to future smart technologies and changing production requirements." A flexible, easily upgradable configuration makes the OPTIV M future-ready and compatible with a comprehensive portfolio of contactless and tactile sensors, software and collaborative technologies.

## Signature Series Rotary Broach Tools —GenSwiss

Precision manufactured in-house at their world headquarters in Westfield, Massachusetts, Swiss-style tooling provider GenSwiss® has released a brand new line of premium hexagonal rotary broach tools to deliver high-performance cutting for industries requiring the highest degree of standards. Each tool is meticulously ground to ultra-high standards, featuring a dished cutting face and vent holes for relieving hydraulic pressure.

Two sizes of overall lengths have been introduced to the market, 28mm and 1 1/4in, with hexagonal cutting features ranging from 1.5mm to 10mm



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# New Products

in diameter. Each broach is machined from a proprietary premium-grade material for use in alloys commonly machined in the medical industry. These rotary broach tools pair perfectly with any holder that can accept an 8mm shank size for use in Swiss-style CNC machines, CNC lathes, and CNC turning centers.

After many years of honing its skills modifying broaches, GenSwiss® has released this new line of broach tools under its Signature Series tooling line, joining several very popular products such as the Ti-Loc® end mill extensions, high-precision Signature Series saw arbors, and compact straddle knurling holders. Signature Series broach tools are engineered and manu-

factured for use in the aerospace industry, medical industry, or any industry requiring the highest quality standards for inspection.

## Expanded Hardness Testing Line —Starrett

The L.S. Starrett Co. has significantly expanded its line of benchtop hardness testers, adding seven Rockwell systems, eight Vickers systems and one Brinell system, a total of 16 new testers. “From basic analog and manual control, to advanced digital and fully automated systems, our new Hardness lineup offers customers a complete and comprehensive range of



solutions for any or all of their hardness testing needs,” said Mr. Emerson Leme, vice president industrial products – North America.

The new Starrett Rockwell Hardness Systems include two regular Rockwell digital testers, two Superficial Rockwell testers, (one dial and one digital), two twin Rockwell-superficial Rockwell testers (one dial and one digi-

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# New Products

tal), and two twin Rockwell-superficial testers with a dolphin nose design that are fully automated digital systems with output to PC and capable of measuring 30 different Rockwell scales.

New Starrett Vickers hardness testers include six Micro Vickers testers for handling a testing range of 1HV-2967HC and 8 test forces, two with Digicam basic manual software for manually selecting edges of indentation, two with Digicam auto software for automatically detecting edges of indentation, and two testers with auto turret control (one with basic software, one with auto software). In addition, there are two Macro Vickers testers for

handling up to 17 test forces; one featuring Digicam basic manual software and one featuring Digicam automatic software.

The new Starrett Digital Brinell hardness tester features automatic loading and can handle 10 scales.

## New Shaft-End Adapters —Stafford Manufacturing

A new standard line of machinable shaft-end adapters that are offered with a plain bore or keyway and a variety of options is being introduced by Stafford Manufacturing Corp.



Stafford Machinable shaft-end adapters feature the Accu-Clamp™ design with an integral clamp on one

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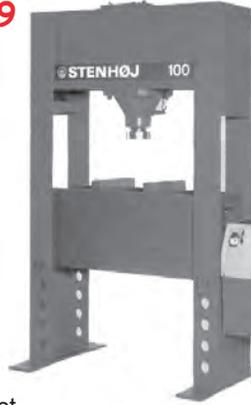
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# New Products

side while leaving the other side fully custom-izable by the user. Available with or without a flange, these parts can be modified by the user or by Stafford and are offered with a plain bore or keyway for greater torsional holding power and fixed shaft phasing.

Ideally suited for use in conveyor systems and special machinery, Stafford machinable shaft-end adapters can be provided with options including custom bolt-hole patterns, indexers, cam profiles, milled slots, and more. Available in aluminum, steel, and stainless steel, they come in 11 standard bore sizes from 0.5" to 2.0" I.D.

## SBD Inserts for Back Draft Milling —Dapra

Dapra's new SBD series inserts were designed to help operators finish their back draft jobs faster, with greater accuracy – and fewer insert changes – for maximum performance in long-reach, low-pressure finish cutting.

SBD inserts are the latest addition to Dapra's EDGE<sup>2</sup> SBN finishing system and are interchangeable with SBN series twin-edge ball nose inserts. A positive-rake cutting wiper allows for larger stepdowns and faster feed rates. Ultra-robust carbide insert thickness provides optimum rigidity and heat control for superior tool life, and strong

insert seating accepts cutting forces with minimal deflection to eliminate insert movement.

These inserts are available in .500" to 1.000" diameters. Dapra offers a choice of two new premium coatings for SBD: TS (AlTiN-based) for general-purpose machining in most steels, irons, and 400-series stainless steel; and HM (AlCrN-based) for hardened steels, high-temperature alloys, and tough 300-series and PH stainless steels.

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# New Products

## New Vision Capabilities for Precimar® ICM 100 IP—Mahr

Mahr Inc. announced the expansion of its Precimar® ICM 100 dial and digital indicator calibrator with image processing, designed for the automated testing of measuring equipment. Existing Precimar Optimar 100 devices can also be upgraded with the new vision capabilities.

The new image processing upgrade now makes working with the measuring instrument safer and faster—a camera automatically records the indicated values of the test indicators and forwards them to a software for processing.

The hardware and software add-on package provides a way to equip new or existing ICM 100 measuring stations for automated testing. The measuring system including image processing is also available as a complete package under the name Precimar ICM 100 IP.

The new vision capabilities incorporate the fast image processing of a USB 3.0 camera and stable daylight-independent LED illumination, along with secure digital identification and reading of digits. Mahr's Precimar software for gage calibration controls the measuring device, evaluates the camera image of the scale or number display of the test object, compares the values with the high accuracy internal reference scale and automatically

completes the process of calibrating the product under test. The software also makes it possible to create and store test certificates.

Precimar software is preloaded with many standard indicator calibration routines as defined by various national standards. Simply choose the indicator type to be calibrated and the appropriate standard, and the system is ready to automatically perform a detailed calibration of the test piece.




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# New Products

## Cloud-Based Data Integration To Machine Monitoring Solutions —Marposs

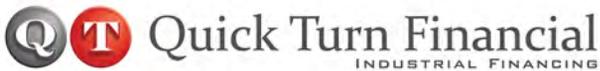
Marposs has announced the availability of its new data management software—C-THRU4.0, designed to collect and process data from multiple machine tools equipped with Artis machine monitoring systems via a central hub. This information can be accessed remotely, via an iPad, computer or laptop as well as offering the ability to integrate with MES and higher level ERP systems. The data collected can be used to analyze tool life, machine capability and cost comparisons, as well as alarm tracing and counts, profit and

loss accounting, profitability analysis and more, all leading to enhanced productivity and profitability.

The software works by feeding real-time information from the machine tools to a cloud platform network, which can then be accessed and used in either a centralized or decentralized manner. This interconnectivity helps to optimize production flow from preventative maintenance, process stabilization, and quality assurance to resource planning. Production costs and quality are always transparent and traceable through the statistical recording and evaluation of performance indicators.

To initiate C-THRU4.0, data collected from the monitoring processes

is coordinated with the customer's cost and resource information to provide a dashboard that meets the customer's needs. Any changes coming in from the customer side can be fed back to the machining center. This interconnectivity and data flow supports the move toward the Industrial Internet of Things (IIoT) and Industry 4.0.



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# New Products

## New Leitz Reference BX CMM

### —Hexagon

Hexagon's Manufacturing Intelligence division recently launched the new Leitz Reference BX coordinate measuring machine (CMM) designed for blade and glass manufacturers. The specialized system combines leading-edge technologies to accurately capture detailed measurement data across the entire surface of a freeform shape, while dramatically reducing cycle time. The CMM's optical white light sensor performs well on matt and reflective surfaces, including glass and polished metal. Its fixed scan probe maintains the high precision needed



for critical alignment on the root of turbine and fan blades, and also measures inclined fir tree or dovetail root surfaces, which are not easily accessed by an optical sensor.

The Leitz Reference BX CMM's integrated rotary table and sensor exchange interface help to reduce cycle time even further by providing accessibility to a part's surfaces without moving the part and reducing inspection delays caused by manually exchanging sensors. The system's combination of an optical white light sensor and fixed scanning probe enables accessibility of hard to reach features such as the curvature of edging on glass, or the profile of a fan blade, while maintaining precision for tight tolerance sections such as the blade root. The CMM's data capture, speed, and flexibility are all enhanced by its integrated rotary table, horizontal sensor alignment and 4-axis scanning.

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# New Products



## New Range of Compact CMM's With the Latest Multi-Sensor Technology —LK Metrology

The new ALTERAC machines from LK Metrology are available in three sizes - 7.7.5, 10.7.5, and 10.7.7 - their respective X,Y,Z axis movements being 700 x 650 x 500 mm, 1,000 x 650 x 500 mm and 1,000 x 650 x 650 mm.

ALTERAC is equally at home in an inspection department or on the shop floor, especially as pneumatic mounts isolate the CMM well from nearby sources of low frequency vibration such as large machinery. The CMM control may be either stand-alone or integrated into the machine base with a keyboard on an arm at the side. The latter option also facilitates relocation of the equipment once installed. It includes Renishaw encoders with 0.05 µm resolution optical scales.

Measurements taken with a touch-trigger probe at a series of points is increasingly being augmented by continuous-contact probing (analogue scanning) and laser scanning to allow high speed collection of data on complex freeform surfaces. ALTERAC measuring machines can deploy all three types of sensor. Such flexible data acquisition boosts measurement throughput to avoid bottlenecks in the metrology department and provides a comprehensive awareness of component conformance.

The CMM structure is finely tuned to maximize stiffness, reduce vibration and provide smoothness of axis motion. LK offers a 10-year guarantee covering dimensional stability.

All guideways use LK-designed, low maintenance, pre-loaded air bearings of wrap-around design. They run with a reduced air film thickness for low energy consumption and give repeatable measurement results, even at fast axis speeds. Friction drives provide smooth motion and exact positioning at continuously varying speeds, as well as zero backlash.

LK CMMs use ceramic for the moving bridge and spindle. LK reports it is more than three times stiffer than aluminum yet only one-third heavier by volume, resulting in higher machine acceleration and speed.

ALTERAC is available with LK's powerful CAMIO8 DMIS-based, multi-sensor software enabling programming and measurement based on 3D CAD data and comprehensive reporting.

## New LENS Laser Deposition Head —Optomec

Optomec recently announced the new LENS Laser Deposition Head (LDH 3.X), with a variable optics system that can create three discreet focused spot sizes to accommodate changes in laser power. The LDH 3.X supports a wide range of laser powers from 500 W to 3 kW.

The wide range of laser powers supported by the LDH 3.X is enabled by an advanced cooling system that allows for high-power duty cycles, and variable optics the user can control to keep processing optimal over the full range of laser power. With improved channeling for water cooling the head, the LDH 3.X will not overheat while operating at high powers and for long build times.

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# ...Hotline Continued From Page 8

## Northrop Grumman Partners with San Diego Colleges to Prime Talent Pipeline

Aerospace and defense giant Northrop Grumman is partnering with two San Diego community colleges to develop programs for future talent.

The company is partnering with MiraCosta College and Palomar College, with plans to launch the pilot phase of the new program in the 2019-2020 school year. The program will provide students with STEM (science, technology, engineering and math) degrees with paid opportunities to learn on the job.

"Establishing a framework to collaborate with education systems is necessary for building a strong local talent pipeline and supports a long-term workforce planning strategy," Northrop Grumman vice president of engineering Alfredo Ramirez said in a news release. "Our decision to develop a community college pilot fills a critical gap bridging K-12 and university programming, allowing us to reach and engage students in San Diego throughout their education journey."

For the program's first cohort, a small group of college students were selected to work as part-time engineering assistants and technicians at Northrop Grumman's San Diego Autonomous Design Center of Excellence. They will also earn credit at their respective schools.

Northrop Grumman's effort dovetails with the San Diego Regional Economic Development Corporation's inclusive growth initiative, which set a regional goal of creating 20,000 new jobs by 2030. Northrop Grumman has nearly 5,000 employees in San Diego.

## Tyvak in NASA Moon Program

Irvine, CA.-based nano-satellite company Tyvak said it will provide a moon lander for NASA's Commercial Lunar Payload Services program.

The lander will host payloads and perform scientific investigations on the lunar surface, paving the way to return to the moon, the company said in a statement.

"This is an exciting time in space. Performing these lunar payload deliveries is the next natural step of commercial space efforts supporting government initiatives," said Marco Villa, Tyvak's chief operations officer.

The Tyvak lander initially aims to deliver small payloads but through modular, flexible architecture, can eventually deliver larger payloads, according to the statement, which did not specify any money amounts involved.

## Haas Buys Land in Henderson, Nevada

According to the Las Vegas Review Journal, Haas Automation has completed a big land purchase in Henderson, with plans to develop a manufacturing plant and other buildings.

Haas Automation founder Gene Haas, whose company makes machines for manufacturers, acquired 279 acres south of Henderson Executive Airport for almost \$27.4 million. The sale, by the city of Henderson, closed in October, property records show.

The company expects to start grading land in April and to finish its manufacturing facility in late 2022, said Peter Zierhut, Haas Automation's vice president of outside operations.

Haas filed plans to build 4.3 million square feet of commercial space along Via Inspirada near Volunteer Boulevard, a few miles from the M Resort. The plans include a 2.3 million-square-foot, \$327 million manufacturing facility for his company and buildings that would be leased or sold to others.

Haas Automation, based in Oxnard, California, sells products in more than 100 countries through dozens of distributors and booked more than \$1.2 billion in sales last year, its owner wrote in a January letter to the city of Henderson.

Zierhut told the Review-Journal this summer that the company's 1.1 million square feet of factory space in Oxnard is "not enough," adding the firm's growth requires an expansion.

He said Henderson is a more affordable place for workers to live, Nevada is a "better state for us as far as taxation goes," and the proximity to Haas' headquarters is "very convenient for us."

## Fisker to Unveil Cars in January

Electric vehicle developer Fisker Inc. will unveil its first electric vehicle, the Fisker Ocean, in January 2020.

The Torrance, CA.-based automaker announced Oct. 31 that it will reveal pricing

Continued on page 90

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# ...Hotline Continued From Page 88

and begin accepting reservations to purchase or lease the Ocean through its mobile application on Nov. 27 .

"For the past two years, we have been working quietly on an emotionally appealing and affordable luxury electric vehicle that will serve as a flagship for driving positive global change - from the most sustainable materials possible across the supply chain to practicality that will change the perception of what an EV can be," Fisker Inc. founder and chief executive Henrik Fisker said in a statement.

Production on the Fisker Ocean is expected to begin at the end of 2021, the company said, while deliveries are projected to start in 2022.

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## **Boeing, Air Astana Announce Intent To Buy 30 737 MAX Airplanes**

Air Astana intends to order 30 Boeing 737 MAX 8 airplanes to serve as the backbone of its new low-cost airline FlyArystan, the Kazakh flag carrier and Boeing announced at the Dubai Airshow. The companies in November signed a letter of intent for the 30 airplanes with a list price value of \$3.6 billion.

In May, Air Astana launched FlyArystan to better compete in the growing low-cost segment. The company says the new airline has seen strong ticket sales in just the first few months of operation. The plan is to expand the fast growing domestic network, with international services to Moscow commencing next month.

"Since its launch in May this year, FlyArystan has exceeded all expectations and it is clear that low cost air travel has a great future in Kazakhstan and Central Asia," said Peter Foster, President and CEO of Air Astana. "Air Astana has had a strong relationship with Boeing ever since the airline started flying in 2002 with a pair of 737NGs. Today we operate both 757s and 767s and we believe that the MAX will provide a solid platform for the growth of FlyArystan throughout our region, once the aircraft has successfully returned to service".

## **AeroVironment Secures \$12 Million Contract with Middle Eastern Country**

AeroVironment Inc. has received a \$12 million contract from a Middle Eastern country to supply spare parts, repair services and logistics support for an existing fleet of Puma and Raven unmanned aircraft.

The Simi Valley, CA. drone manufacturer will provide the services to the unnamed country for two years.

The Raven is a small, hand-launched craft used by the military for low-altitude intelligence, surveillance and reconnaissance. It has a wingspan of 4.5 feet and weighs about 4 pounds. The Puma has a wingspan of 9 feet and weighs 15 pounds and was designed for land and maritime operations.

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## **Composite Solutions to Provide Wings and Fuselage to Drone America**

Composite Solutions has entered into an agreement with Drone America, located in Reno, Nevada, to provide the wings, horizontal stabilizer and fuselage for the Drone America Savant. The components will be built in CSC's Sumner, Washington facility.

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## **Eviation Alice Electrical Airplane Gets Recognition**

The Eviation Alice regional electric airplane, which is being flight tested in Washington, has been named one of 2019's best inventions in the world by Time Magazine.

"A fantastic recognition for the team," said Eviation chairman Roel Ganzarski, a Redmond aerospace executive. "Real work being done, real aircraft being built, real change being made."

The electric aerospace startup is hiring for seven new positions amid reports that it has notched orders from two U.S. airlines, which will make formal announcements in 2020. Eviation's hiring includes three engineering jobs in the Seattle region.



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