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QUALITY ISSUE

- TARGETING QUALITY AND EFFICIENCY AT FRANKLIN ARMORY INC.
- ILM'S ADVANCED MACHINING SYSTEMS RELY ON GIBBSCAM FOR SPEED & ACCURACY
- MODULAR ZERO-POINT TOOLING ADVANTAGES

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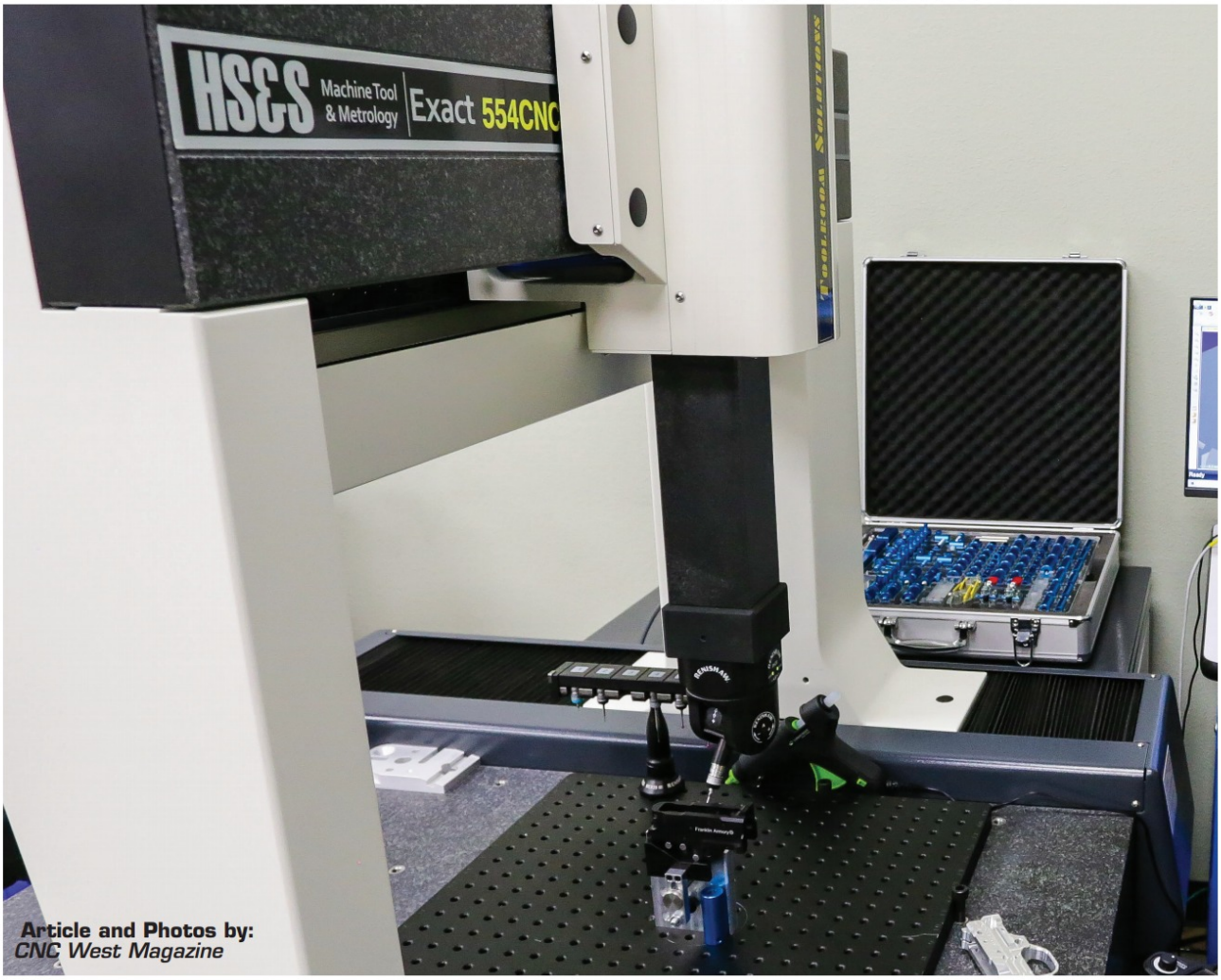
FRANKLIN ARMORY



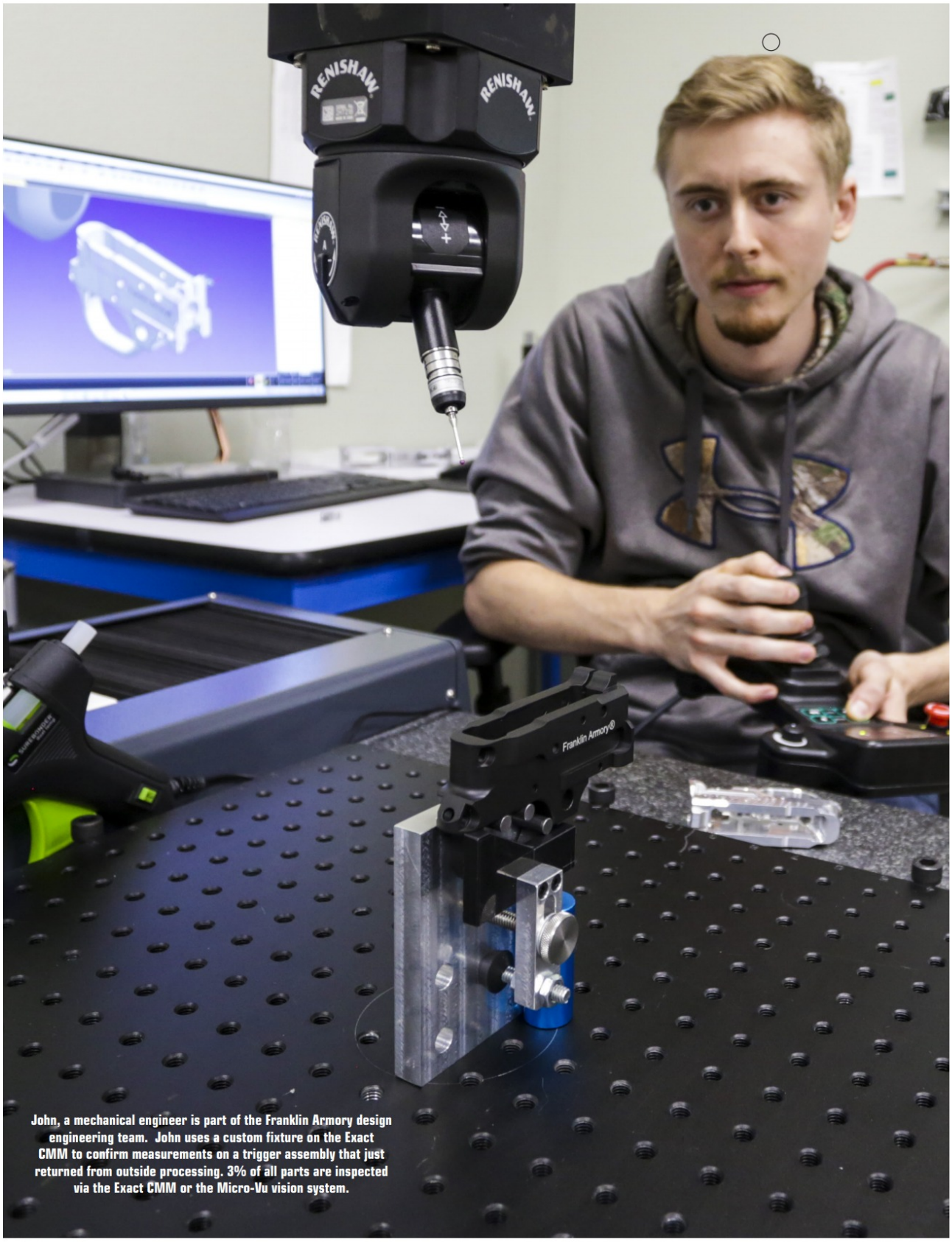
Article and Photos by:
CNC West Magazine

TARGETING QUALITY & EFFICIENCY

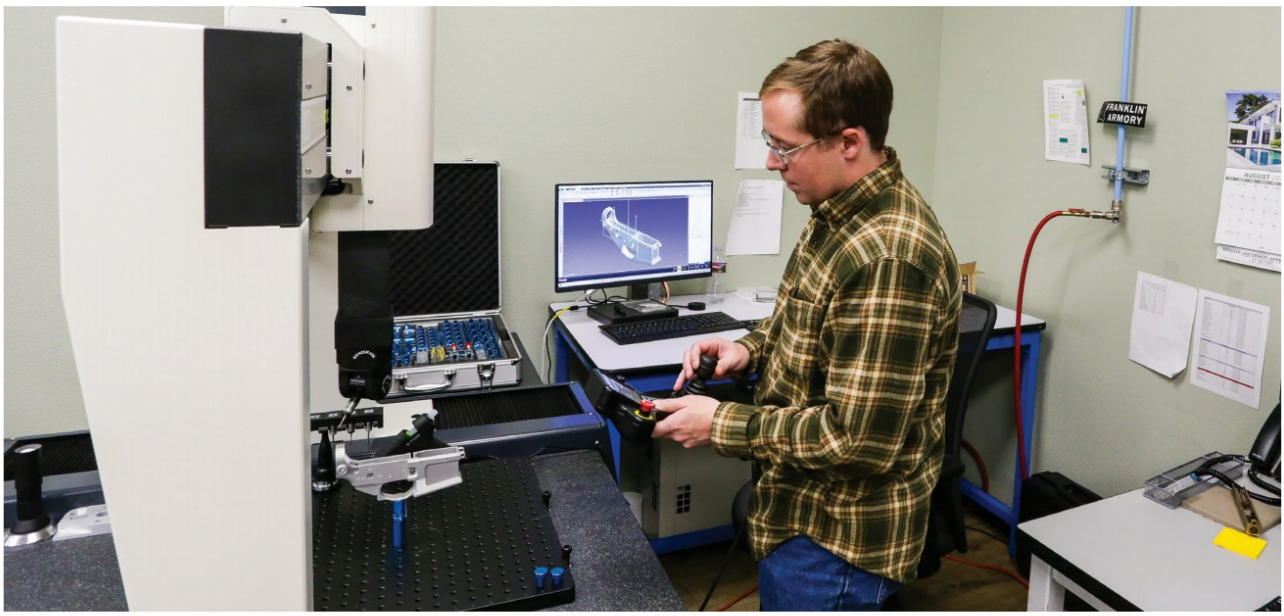
Jay Jacobson, president of Franklin Armory Inc. (FAI) began manufacturing parts and accessories for the popular AR platform in Morgan Hill, Ca. in 2010. Now a Nevada Corp. located in Minden, Nevada, they are embracing lean practices to improve quality and efficiency throughout their many different product lines.

FAI specialize in manufacturing quality firearms and accessories for sporting, military, and Law Enforcement applications. They are best known for their patented Binary Firing Systems but are gaining popularity with their own weapon platforms and high-end AR builds. Everything they make is made in America with American materials. William Smalley joined FAI two years ago as director of operations with the purpose of improving processes across the board. Smalls as he is called has spent a lifetime in the firearms manufacturing business and his experience has played a role in FAI rising to new challenges.

Workflow at FAI begins with a concept being brought to life by one of their design engineers. From there the design team prototypes it at the R&D facility that houses (4) 3-Axis spindles, (1) 4-Axis spindle, and (1) 5-axis mill turn. They cut it there and take it to QC for final checking that the part matches the print. When the design is crystalized, Arrowhead Machining gets to cut the parts, and deliver them back to QC for validation. First article is then inspected by FAI's quality assurance manager Forrest.



John, a mechanical engineer is part of the Franklin Armory design engineering team. John uses a custom fixture on the Exact CMM to confirm measurements on a trigger assembly that just returned from outside processing. 3% of all parts are inspected via the Exact CMM or the Micro-Vu vision system.



Franklin Armory design engineer Grant with his aerospace experience is well versed in the use of CMMs and has helped others to gain to experience and confidence.

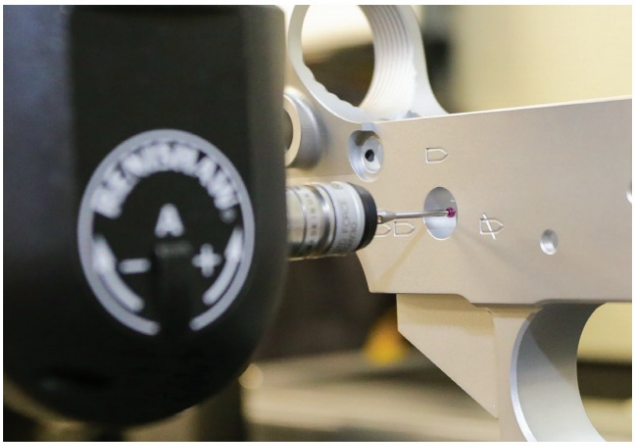
"If a new part passes inspection it is sent out for dynamic testing, if need be," explains Forrest. "If the dynamic testing goes as planned it is ready for production, and outside processes like heat treat or anodizing. Assemble it, package it, ship it to our network of distributors. We check 3% of every batch, more if those parts are a higher end/higher value product. Most everything is inspected via our Micro-Vu Vertex or HS&S Exact Series CMM."

In 2018 FAI purchased a Micro-Vu Vertex 251HC automated vision system from HS&S Machine Tools and Metrology, Inc. It was their first foray into automated QA for their growing line of products. Like FAI, Micro-Vu is made in America, close by in Northern California. The Vertex camera-based measuring system allows for fast and accurate measurements on a wide variety of parts with optical and digital zooming. The InSpec Metrology Software comes standard and provides point and click simplicity, proprietary edge detection, advanced lighting control, automated calibrations, and a clear display of measurement data and tolerances. Trigger systems are the bread and butter at FAI, it truly is their core competency. The trigger's flat parts with holes and specific edge shape were a perfect fit on the Micro-Vu. "We used the Micro-Vu on everything we could," tells FAI design engineer Grant. "It was purchased to speed up trigger QC, but we were making jigs and checking lower receivers with multiple setups. The machine wasn't designed for how it was being used but it was still faster and more accurate than doing it by hand. Now that we have the HS&S Exact Series CMM we inspect lowers on there."

In 2020 FAI were in the market for a conventional probe-type CMM. Again, they called upon John Servin of HS&S Machine Tools and Metrology, Inc. The Micro-Vu was a success and HS&S have their own line of CMMs, so it was a logical progression. On the CMM wish list was an articulating probe head and easy to use software. "After showing the management team the strength and accuracy of our machines FAI purchased our HS&S Exact Series CMM with the popular Renishaw PH-20 5- axis head," describes HS&S president John Servin. "Our Exact line of CMMs are assembled in Santa Clara, California. They have a robust granite frame that is very reliable and come standard with CMM Manager Software." As someone who moved from the armory department into QA, Forrest is probably the most appreciative of the CMM Manager software.

With guidance from the engineering team, Forrest is teaching himself how to get the most from the CMM. "We got the Exact CMM deep into Covid," tells Forrest. "We primarily use it to measure the lower receivers that otherwise are very time consuming to do by hand. Most points we want to measure can be done manually with a height gauge indicator, but it takes forever. An AR style lower for example takes us over an hour to measure all the points needed by hand. We inspect it now with higher accuracy in about 5 minutes on the Exact CMM. Higher end parts and assemblies come with the expectation of better fit, better finish, and better performance. We are a company known for fit, finish, performance being above the industry standard." "We check for fit and function," adds Grant. "Inspecting angles, diameters, size, slot width, pin holes in relation to the face, squareness. You don't want to pick up the weapon and have it all loose and sloppy. Our tolerances are tight where they need to be. When checking a billet lower receiver, we manually locate the part on the table and hit go. CMM Manager auto checks all the

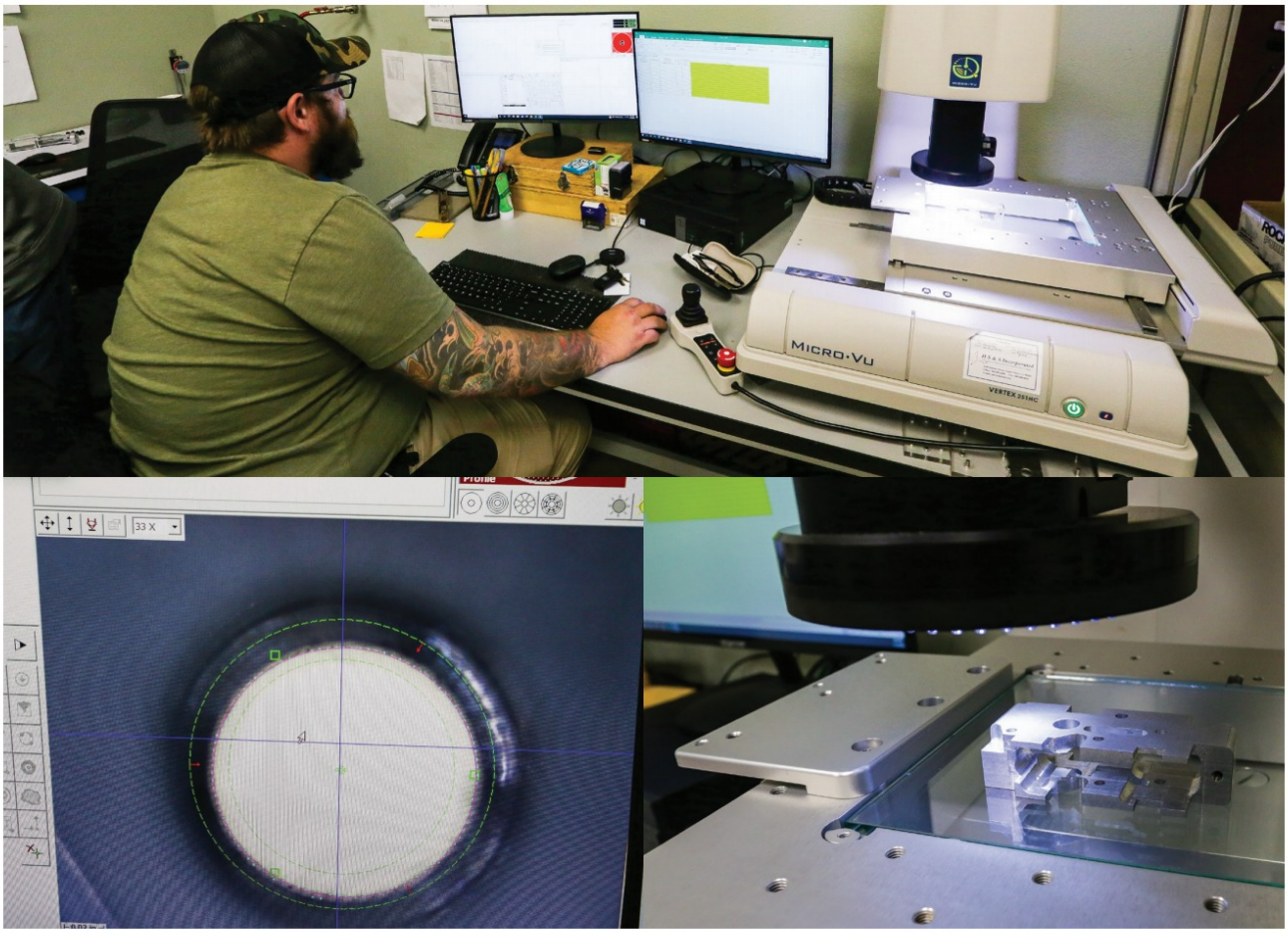
Above - Quality assurance manager Forrest is virtually self taught on the CMM thanks to the easy to use CMM Manager software that came standard on their Exact CMM. Right - The Renishaw PH-20 5 axis probe head was a must have on the CMM for its ability to access holes and slots deep inside a part.



important points. Not only is it faster, but it is also more accurate and freer of human inconsistencies. The PH20 is a fantastic touch probe system. It allows us to get deep inside a part unobstructed. On our critical holes the head goes in and touches off 25 points via a star pattern in a matter of moments."

FAI's R & D facility doesn't have their own CMM yet, so they are always using the one in QC. Design engineer John holds up a top-secret prototype and explains how the CMM is a valuable tool as part of their design and prototyping processes. "This prototype assembly is in its second or third iteration," tells John. "We can inspect it in under an hour on the CMM. Similar parts took a day doing it by hand. This item has holes within holes and at different angles. A ton of detail geometry makes it a tricky and time-consuming part to inspect by hand, but the CMM is up to the challenge."

When Smalls came on board FAI were relying a lot on temporary workers and everything was in a constant state of rush to catch up. FAI has transitioned from a build to order to a build to stock organization. "We've increased our efficiency, increased our throughput, reduced a lot of our constraints, and dropped our waste," explains Smalls. "It is like a completely different company than it was when I came here. The changes can be directly attributed to the people that work here. When you introduce lean manufacturing practices into a company it is typically met with resistance. Employees fear that the new system will eliminate their job or replace them with a machine. That wasn't the case at FAI. So many folks were immediate change agents and embraced the philosophy. Lean manufacturing is about making everyone's job easier. Efficiency thrives when you remove obstacles. The first month we pulled a bunch of junk, I mean constraints out of the shipping and receiving area and had a record month. We were able to effectively ship twice what we did the month prior. Companywide



FAI purchased a Micro-Vu Vertex 251HC automated vision system in 2018. It excels at quick and accurate inspection on FAI's trigger systems.

changes like that have made a huge difference in employee morale, profitability, and overall quality of everything we do."

FAI's MRP system is being beta tested and expected to be fully operation in the upcoming weeks. Their hope is added transparency and to give them a more accurate cost of goods metric. Good data makes a difference. FAI were able to identify obstacles early on that made a huge impact, but now they are at a point that the data needs to dictate where and how they need to make improvements. "Something like the CMM is a huge gain in efficiency when it comes to indirect man hours," explains Smalls. "No offense to the great people in QC but when they touch a part it isn't adding value, so reducing the amount of time they spend checking parts has a direct impact on how quickly a product can work through the system and be delivered to our customers. Historical data is also important to us now as we are looking closer at trends. Several vendors deliver the same components. For example, we can see that our internal shop isn't producing the same results as our outside vendors running the same parts. Or we might be doing a better job and we can take that data back to the vendor and help them to improve their processes." It works both ways for FAI. Having an accurate tool like the Exact CMM recording all the data is key. Notes regarding measurements are not nearly as compelling as months or years of data coming off the CMM.

"The difference between a big business and a small business is that a small business can't afford to put out a bad product," concludes Smalls. "A small business doesn't have the capital or name brand to ride on a bad product. When you design something and manufacture it, make sure it is a great product. Franklin Armory makes great products and takes a lot of pride in what we do. It shows. We have virtually zero employee turnover, distributors seek us out, and the end user knows exactly the quality Franklin Armory produce day in and day out."

Frankin Armory's patented Binary trigger system is their bread and butter.