WHITE PAPER

Speed, Accuracy, Ease of Use

FARO's new 8-Axis Quantum ScanArm changes the game for manufacturing

Mike Richman | Publisher | Quality Digest | November 12, 2018

Technological breakthroughs tend to change the way users perceive of a problem, offering a solution that, in retrospect, comes to seem obvious and apparent. So, it is with the new FARO® 8-Axis Quantum ScanArm and FaroArm.

"This is such an obvious solution to a challenge that every single portable-arm operator has faced, why did somebody only just now invent it?" asked Quality Digest editor-in-chief Dirk Dusharme, in previewing a demo of the 8-Axis on our recent Virtual Test and Measurement Expo event. "I'm not kidding … when we saw this at IMTS, I actually giggled. Have you ever seen somebody present something to you and it's so obvious that you just laugh?"

The eighth axis offered by this system is not jointed in the way seen in other articulated-arm portable coordinate measuring machines (PCMMs). Instead, it is a rotary stage that results in a seamlessly integrated, high-accuracy additional axis that requires no additional setup time or effort. In this way, a part can be rotated in real time relative to the arm, eliminating the need to move the arm around the part. This makes it easier to scan and measure hard-to-reach areas, and because the part itself rests on a stable, consistent platform, measurement time as well as human error are dramatically reduced.

The Problem and the Solution

One of the key issues causing slow work flow, reduced accuracy, and ergonomic inefficiency has always been leap-frogging—the practice of having to move an arm around a workpiece, especially within confined spaces.

"We are always looking to improve ergonomics, speed, and ease of use," says Chuck Pfeffer, FARO's Director of Product Management and Product Marketing for 3D Factory. "We challenged our engineering team to solve customer problems in scan workflows—reaching over parts, moving the arm, refitting it, and having the scans match. Those are the challenges on the inspection side. At the same time, however, we had product design customers with different workflows and different setups. One of their challenges is that, very often, a design engineer works in a confined space. That engineer might be looking at a part with an arm mounted in a cubicle, where there's limited room to do a scan by moving the part or moving the arm. With that information, we were able to conceive of an idea to rotate the part, which saves space for the designer and gives a much nicer workflow and ease of use for the inspection customer as well."

The "aha moment" came about, as they so often do, when a group of smart people were gathered together to better understand the parameters of this very specific problem. In such an environment, the free exchange of ideas can spark innovative leaps that lead to breakthroughs.

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"This whole initiative started from our own 3D Design vertical trying to get measurements done in a confined space," says Orlando Perez, Chief Platform Owner for the FaroArm and ScanArm. "We had some ideas for creating a scanning station or a smaller arm. All these interesting concepts were being tossed around, and one day we were just sitting there looking at a dismantled arm, when we realized that we had all the components on hand to turn it into a rotary stage. It's all part of the same ecosystem, so to speak—the arm has all these cartridges that calculate the rotations and the movements, and we wondered what would happen if we just added one more, even if wasn't attached. We then realized that we could use it not only in the 3D Design, but also in the 3D Factory vertical, too."

Hardware is only one part of the equation when it comes to a product like the 8-Axis; it's the software that really makes this product work for the largest number of users. From that perspective, the fact that the 8-Axis so easily integrates with a wide range of software for computer-aided design, computer-aided engineering, and computer-aided manufacturing (CAD/CAE/CAM) makes it an indispensable tool. Whether it's FARO's CAM2®, PolyWorks®, Geomagic, Verisurf®, SpatialAnalyzer®, Metrologic®, or others, the 8-Axis offers "plug-and-play" functionality for a wide range of software providers.

The Results

The team at FARO exhaustively tested scan data from various parts with and without the 8-Axis and uncovered the following results:

- Up to 40 percent time savings when scanning larger parts (examples included a car door and an eight-cylinder engine block)
- 25 percent to 35 percent time savings on medium-sized parts
- 15 percent to 30 percent time savings on small parts

The reasons for this impressive level of performance include:

- The user does not have to move around.
- The measurement area can be brought to the user without the user having to walk around the part during scanning.
- The user can focus on the actual measurement and not the difficulties of scanning.
- Prior to the advent of the 8-Axis, for some large objects scanning would require the movement of the measurement device itself (i.e., leap-frogging) which consumes time and adversely affects accuracy or might require post-processing to register multiple scans together.

For many manufacturers, quality inspection can be a production bottleneck; however, reducing inspection times by 20 percent to 40 percent unlocks significant overall productivity increases. Other key benefits include:

- Extended measurement volume. The 8-Axis effectively increases the measurement volume by 50 percent by allowing the part to be seamlessly rotated toward where the user is doing the scanning. Some parts that previously required the use of a 4-meter arm can now be scanned with a 2.5-meter arm, which is a major improvement because smaller arms are more accurate than longer ones.
- Better ergonomics. The 8-Axis provides less need to move around and/or engage in "scanning gymnastics" to reach around the object being scanned.
- Exceptional accuracy. The 8-Axis has the same level of accuracy as FARO's 7-Axis solutions because fewer and smaller articulations of the arm allow for improvement in accuracy.

Why the 8-Axis?

Michelle Edwards, FARO's Director of Global Applications Engineering and Training, was suitably impressed when she first encountered her company's new breakthrough product. "When I first saw the 8-Axis, the thing that impressed me the most was the speed it gave and the ease of use. When you think about portable measurement equipment, you recognize how fast it is versus a standard CMM or certainly more legacy hand tools, but with the 8-Axis the speed at which you can capture point cloud data and complete the analysis is very impressive to see. I remember also that I had heard about it, but to really appreciate it I had to see it

for myself, maybe because I'm more of a visual person. What impressed me the most was being able to see what I was scanning and rotating at the same time, without having to register together these point clouds or take that extra processing step. The time savings as well as the accuracy stood out, because the 8-Axis allows you to eliminate those steps of putting one point cloud set together with another point cloud set. With this device everything is captured in the same world coordinate system as one complete cloud.

"And who doesn't want greater speed?" Edwards asks, perfectly summing up one of the key benefits of the 8-Axis.

Perez underscores the tool's accuracy and ease of use. "This device allows you to avoid articulating the arm into all these crazy positions, which increases accuracy," he says. "You simply stand in front of the part and spin the plate. It couldn't be any more comfortable or simple to use than that."

In the end, FARO's 8-Axis is the rare advanced metrology tool that combines not only speed, accuracy, ergonomics, and ease of use, but something even more rare—a sense of eye-catching fun married to all that great utility.

"I think to a person, everyone who saw somebody scanning something for the first time with the 8-Axis said, 'Wow, that's amazing!'," says Pfeffer. "Every person that I witnessed seeing it for the first time just had this great big smile on his or her face."

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