

Using 3D Scanning and Laser Tracker Technology for Large-Volume Measurements

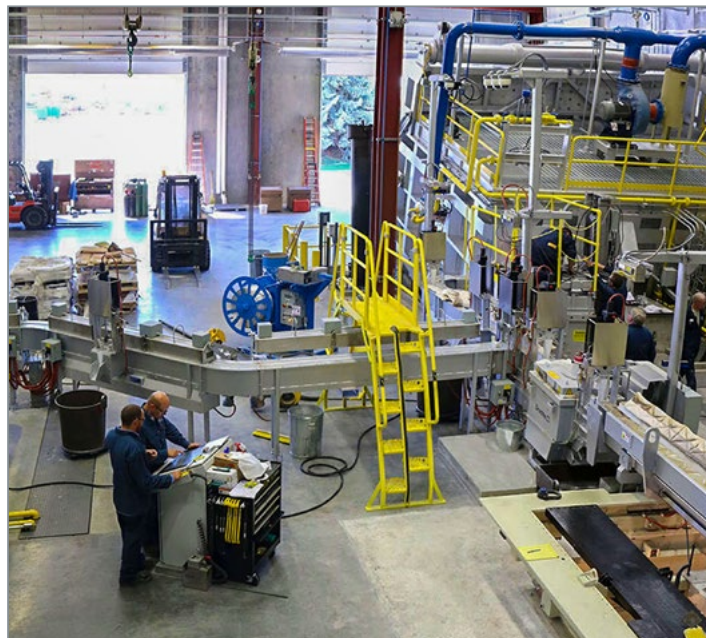
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Aluminum Tech Leader Wagstaff, Inc. Meets Big Challenges Head On

For manufacturers, big parts pose big challenges. How does one measure parts that are in excess of 15' and also have complex geometry? Design and inspection are part and parcel of all manufacturing operations, but as product size increases and part geometry grows more complex, the challenges take on larger proportions.

Wagstaff, Inc., based in Spokane Valley, Washington, is the recognized leader in the design, development, supply, and service of systems and equipment required to produce primary aluminum ingot and billet, using direct chill (DC) casting methods in casthouses around the world. The team at Wagstaff is well-acquainted with large-part inspection challenges.

“Some of the cylinders that we manufacture are over 36 feet tall,” says Jim Massey, Quality Assurance Engineer at Wagstaff. “And then tables and bases and other equipment are upwards of 25 feet x 15 feet.”



Enter Big Challenges

The challenge, of course, is being able to get accurate measurements of all the surface angles of parts that big.

“We were using rods and transit, wires, blocks, squares,” explains Janet McMillan, Quality Assurance Manager at Wagstaff. “They’re not inaccurate, they’re just very manually demanding.” Which translates to time and money.

“... with the FARO technology you capture a 3D model of [a complex part which] you measure and that gives you complete understanding of the shape, form, and size of the object. The real advantage is the 3D. It’s unbeatable.”

Aleksandr Bakhtin
Quality Assurance Technician,
Wagstaff, Inc.

“Let’s say you have two machine planes, one on the top and one on the bottom and some plane may be hidden or inaccessible,” says Aleksandr Bakhtin, Quality Assurance Technician at Wagstaff. “In some situations, there’s no fast and efficient way to manually measure the distance from one point to the other.”

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A Wagstaff casting cylinder being installed.

Enter Big Solutions from FARO Technologies

“We began our FARO® journey back in 2002,” says McMillan. “The owner of the company at that time went to a trade show and saw a FARO Arm in operation. By the end of that year, we had purchased a FARO Platinum Arm. Then we saw FARO’s Vantage Laser Tracker, which we also purchased. The two together allow us to perform large-scale measurements much faster and more efficiently than before.”

The combination of the FARO Vantage Laser Tracker with a ScanArm® is referred to as the Super 6DoF (6 Degrees of Freedom) TrackArm solution. By bringing together the Laser Tracker, Arm and TrackArm Kit, operators are able to measure anything, any size, anywhere. FARO’s Super 6DoF TrackArm combines all the capabilities of 3D Measurement Arm and Laser Tracker technology for an integrated 3D measurement system. It is the industry’s only 6DoF solution that completely eliminates line-of-sight challenges and significantly expands measurement range, while maintaining superior accuracy.

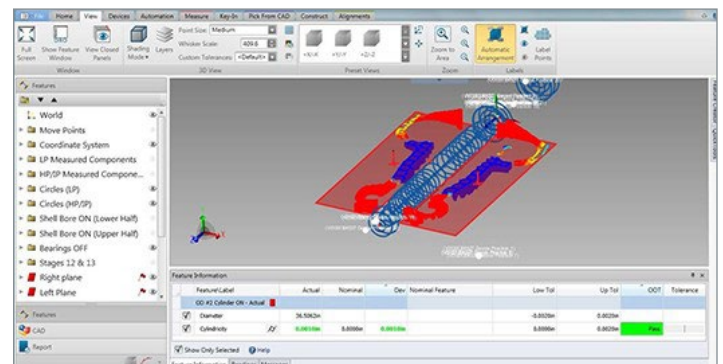
Depending on the nature of the project or part being measured, Wagstaff uses their ScanArm and Laser Tracker in various configurations. When measuring smaller parts of under six feet, the ScanArm is typically used by itself. On larger parts when accurate measurements are needed, but not a lot of detail, the Vantage Laser Tracker is used without the ScanArm. For large parts in which accuracy and detailed measurements are needed to measure into the “hooks and crannies”, the Arm and Tracker are used together in the Super 6DoF TrackArm configuration. These highly-accurate measurement tools give Wagstaff the flexibility to quickly switch between using a 3D measurement Arm and Laser Tracker independently, and additionally for Super 6DoF applications. Most of the time, the two devices are used independently, but the ability to use them together to measure across a single, large coordinate system is crucial.

“Manual tools only measure point-to-point,” says Bakhtin. “This doesn’t give you a good dimensional picture of what a complex part looks like, whereas with the FARO technology you capture a 3D model of whatever you measure and that gives you complete understanding of the shape, form, and size of the object. The real advantage is the 3D. It’s unbeatable.”

Big Innovation

Reading the “History” page on Wagstaff’s website is a lesson in a culture of innovation. Wagstaff, Inc. has been innovating and improving constantly since it all started in 1946 in a pump-house behind George Wagstaff’s family home.

“Manufacturing specific widgets over and over is not our thing,” admits McMillan. “We innovate. We know our product and the casting technology. We engineer and manufacture to customer specifications. We are constantly trying to anticipate and exceed customers’ expectations to cast aluminum in bigger sizes, shapes, and new alloys.” We’ve had to come up with different casting technologies to be able to fulfill those demands.”



3D modeling with the CAM2® and Polyworks® software is key to Wagstaff’s innovation efforts.

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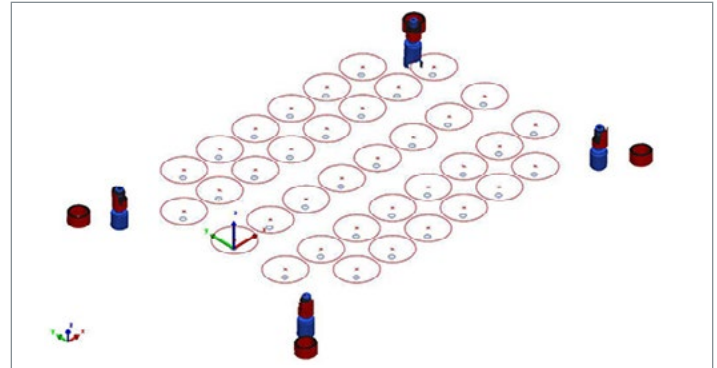
Extra Benefits

Reporting: “The other thing the FARO equipment has over manual methods is the reporting capabilities which are much more professional. That’s a nice addition,” observes McMillan. “For some jobs, that kind of reporting has become part of the contract. For defect analysis, you need a lot of data, and the FARO [solution] has given us a lot more capability in collecting, analyzing, and reporting on that data.”



Aleksandr Bakhtin scanning mating components to determine if there are any alignment issues.

Internal Customers: “Our own engineers are learning about the technology’s capabilities as they have questions in defect or capability analysis in their research and development,” reveals McMillan. “It’s our internal customers who are driving us to do more analysis.”

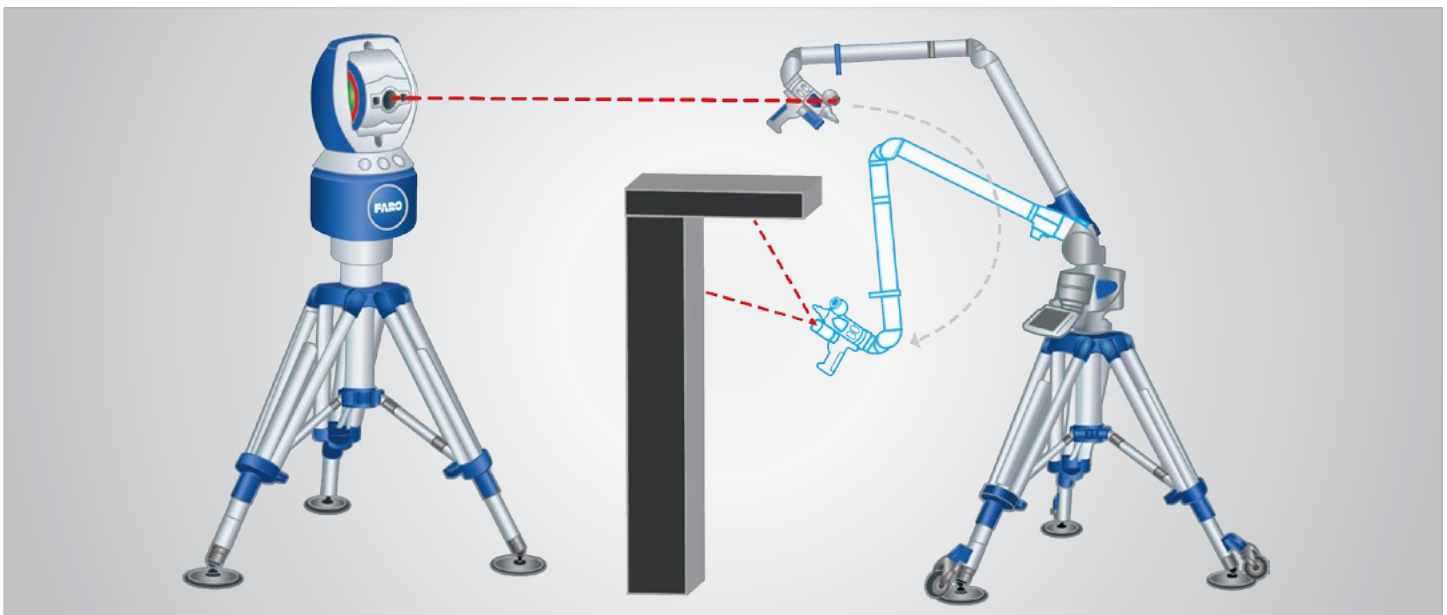


Screenshot of Bakhtin’s scan as rendered in Polyworks.

Repeatability: “The Tracker provides efficiency while at the same time offering a level of repeatability that we didn’t have with the manual methods,” says Massey. “Even with different operators, we’ll get the same results using the tracker.”

“We create programs with the software to guide our operators through the measurement process, and specifically tell them which features to inspect and how to measure,” says Bakhtin. “Every operator follows that same program, so repeatability is enhanced by the guidance that’s built into the program.”

Data You Didn’t Know You Needed: There’s an old adage that says, “I didn’t even know the questions, let alone the answers.” Indeed, sometimes you don’t know which measurements you will need in the future. Without a complete 3D model, future questions of space and proportion will necessitate future measurements.



As an operator uses the ScanArm from various locations, the Laser Tracker remains in place, and data continues to be sent to the same workstation. All of the scan data from various positions is registered into a single coordinate system.

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Each mold table is mated to a custom Wagstaff Mold Table Mounting System.

“We did a reverse engineering project here,” says Bakhtin. “I did a full laser scan of my part and provided information to the engineers, but later there were more questions and other data needed. I just went to the model that I had scanned in and extracted everything they requested. Once you capture the 3D data of your part, you can go back as many times as you want to extract information. Even a year down the road, if that part doesn’t even exist anymore, you still have the data.”

This advantage is even more pronounced in the context of working offsite.

“We do fit-up inspections when we’re shipping a major project,” says Janet McMillan. “Now we can save a model of what we measured and have data for all the equipment that gets installed out at a customer’s facility. When they order replacement parts or new sizes and tables and bases, we have that reference point to refer to.”

“I can personally see taking the ScanArm and/or Vantage Laser Tracker to a customer facility because it’s portable, and you can fly them on a plane,” muses Bakhtin. “Let’s say a customer wants us to make some custom equipment for their facility. I can travel there, scan the area of operation, including the building and nearby machinery, bring the data back here, and we can design the custom piece of equipment specifically to fit what they already have in place. When something comes up that we hadn’t thought of, we can extract the data we need from the 3D model.”

McMillan added, “The custom manufacturing division, Wagstaff Applied Technologies, is also located at the Spokane location. Wagstaff Applied Technologies designs and builds complex parts for hydroelectric and nuclear industries that are incredibly large and irregular in shape. 3D measuring with the CAM2 and Polyworks software makes our jobs in Quality more efficient.”

For industry-leading Wagstaff, Inc., investing in industry-leading technology has been worth its weight in ... well, world-class aluminum.

To read the white paper on the Super 6DoF TrackArm,



To schedule a **FREE** 15-minute web demo of the Super 6DoF TrackArm

Click Here

Or call FARO at **800.736.0234**

View more of FARO’s case studies at www.faro.com