CASE STUDY

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Cutting Down on Airtime

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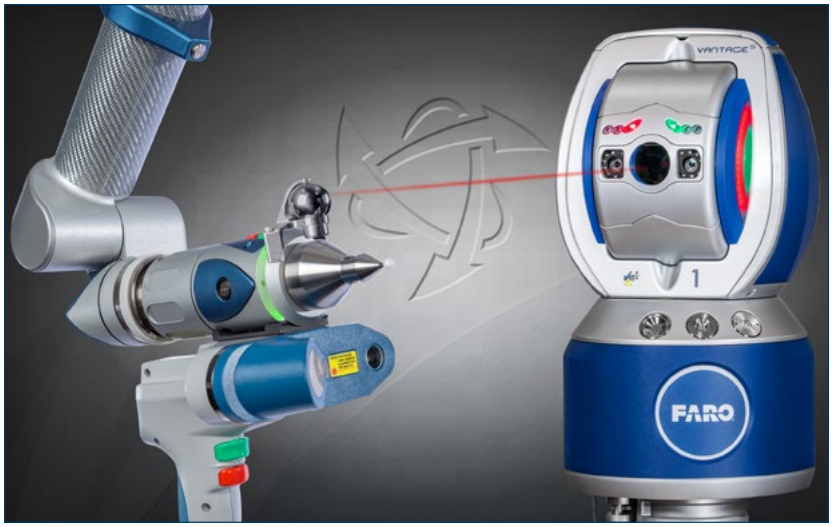
Janicki Industries achieves 35% reduction in required machining by combining 3D measurement arm and laser tracker technology.

When you work on projects like NASA's Space Launch System and deep-space radio telescopes, the opportunity for accolades and large revenues can be great. However, due to the massive scale and demanding tolerances of such projects, the opportunity to have your lunch eaten by wasteful processes is also eminent. Janicki Industries is one company that has successfully addressed that problem.



Founded as Janicki Machine Design in 1993, Janicki Industries is a contract manufacturer to the aerospace industry, specializing in aerospace tooling. Janicki Industries designs and builds high-precision parts and tooling for aerospace, marine, energy, space, military, transportation, and architecture customers.

"Today's tooling market is very competitive. Our suppliers are constantly asking for reduced pricing while still maintaining the same quality they've come to expect," says James Diedesch, senior manufacturing engineer at Janicki Industries. "One way we're reducing costs is by limiting the amount of nonvalue-added cutting moves during the rough machining stages. These nonvalue-added cutting moves are especially prevalent when dealing with large metal tools. The metal is originally formed as close as possible, but it always varies from the original uniform offset stock models provided by design. Because the exact as-built surface of the tool is not known, the machine path is programmed to move along the nominal surface instead of the as-built surface."

This means that as a CNC machining tool moves along the designated path, it cuts a high point in the tool material, continues moving to where there may be no material—thus "cutting air"—reaches another high point where it cuts some more material, then cuts more air, then material, etc. The CNC then steps down in the z-axis and cuts again. Eventually it will reach the base material and be cutting material 100 percent of the time, but until then, a lot of time is spent cutting air. On large parts this could mean hours of wasted time.

To address the problem, Janicki uses a FARO Vantage Laser Tracker coupled with a FARO Edge ScanArm HD in a solution known as the FARO Super 6DoF (6 Degrees of Freedom) TrackArm. Along with InnovMetric Software's Polyworks™ software, the solution provides Janicki a high-accuracy 3D scan even for large tools.

"Together they provide greater flexibility for scanning larger parts," says Diedesch. "We set up a reference system on the tool using SMRs—a target used with laser trackers—and value those targets using the FARO Vantage Laser Tracker.

FARO

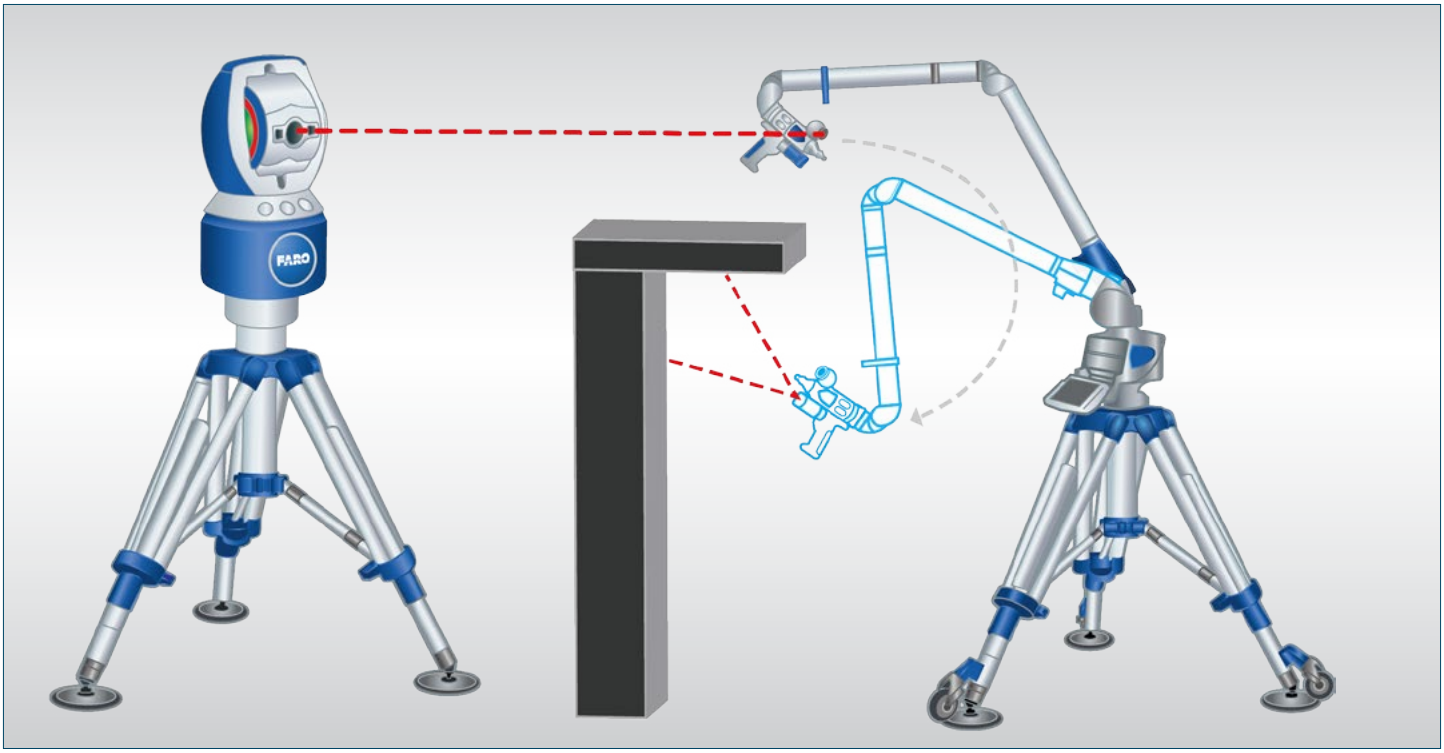
Once that is established we can tie into the tracker's reference system through Polyworks' device localization feature. So now, instead of locking into tooling points, you connect the FaroArm (which, for the TrackArm solution, has SMRs attached directly to the FaroArm) to the laser tracker and take a couple of thousand points to localize the arm to the tracker. Once that is established, you start scanning the tool with the integrated laser scanner on the FaroArm."

FARO Super 6DoF TrackArm System

The FARO Super 6DoF TrackArm system combines a FARO Vantage Laser Tracker with a FARO ScanArm to expand the working volume of the FaroArm®. This allows the FaroArm or ScanArm to be quickly repositioned anywhere within the Laser Tracker's measurement range while remaining in the same coordinate system and the same software interface. Users can now unite the laser tracker with the FaroArm into a long-reach, 6-degree-of-freedom probe.

The FARO Laser Tracker is a very accurate, portable coordinate measuring machine that enables users to build products, optimize processes, and deliver solutions by measuring quickly, simply, and precisely.

The FARO ScanArm combines all of the advantages of the FaroArm with a hand-held laser scanner (Laser Line Probe or LLP), and is the perfect contact/noncontact measurement system. The ScanArm enables users to accurately measure prismatic features with the hard probe, then laser scan sections requiring larger volumes of data—all in one simple tool.



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Even with the FaroArm's 12-ft-diameter reach (for the largest model), on a large tool it may be necessary to move the arm from station to station (leap-frog). However, with the Super 6DoF TrackArm solution, because the arm is referenced to the tracker, in the end all of the data sets are already prealigned to the same coordinate system and can all be fit together. Individual fitting is not necessary.

"Additionally, unlike leap-frogging with a standalone arm where measurement errors will stack up with each move, the Super 6DoF TrackArm system has no stacking error. The nice thing about the FARO Super 6DoF TrackArm system is that each time you move, you don't introduce more error to the system," says Diedesch. "When you are calibrating the device localization you're going to be about 0.0015 of an inch out of sync between the devices, but when you move the FaroArm, you are not stacking the error, because you establish its position in relation to the Laser Tracker".

Once the scan is complete, the reference object is imported into Polyworks, and a best-fit alignment performed with the scan data, so when the datasets are exported they are in the same position as they are for the CNC program. The CNC program can now be developed for the as-built surface instead of the nominal surface.

"The particular tool path we are using is cavity milling and it requires a stock model," says Diedesch. "With a polygonal-scanned stock model, this tool path knows exactly where all the stock is rather than giving it a uniform offset and having it cut a high corner, then cut nothing, then cut the corner again. Now it slices layers based on the tool engagement depth and focuses on the high corners and waits until it gets to the proper z-level depth before it engages in the low spot of the tool. It's been a real savings in machine time as a result."

"The result of this solution is roughly a 35-percent reduction in machining," says Diedesch. Depending on the size of the tool, he figures the company can save up to 20 hours per tool.

Click above to watch a video on Super6DoF TrackArm.

*To schedule a **Free** 15-minute personalized live web demo of the of the Super 6DoF TrackArm*

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