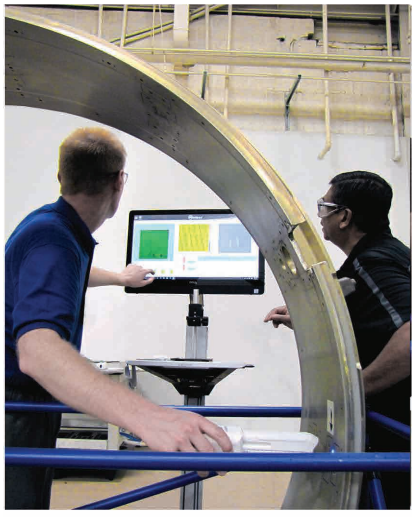
www.4dinspec.com / HQ: Tucson, Ariz. **/ Specialty:** Metrology products **/ Mike Zecchino, marketing communications manager:** *"What we found is there is no instrument that did this."*

West

Hi-Res Metrology

4D Technology's surface gauge improves quality and profits. By Janice Hoppe-Spiers



BY TAKING ON THE CHALLENGES ITS CUSTOMERS FACE, 4D HAS MADE MAJOR CHANGES IN THE FIELD OF INTERFEROMETRY.

4D Technology is known for its innovative design and manufacturing of metrology products for optics fabrication, astronomy, aerospace and other challenging applications. Dynamic Interferometry®, the technology behind many 4D products, ensures precise measurements in the most difficult environments without vibration isolation.

"We are a small and innovative company that has taken on measurement challenges that make projects such as space-based telescopes possible," Marketing Communications Manager Mike Zecchino says. "We have been the company that's taken on the real challenges and developed very many of the changes in the field of interferometry over the years."

Founded in 2002, 4D's patented technologies continue to set it apart from the competition. Built around proprietary phase sensors, 4D interferometers acquire high-resolution phase data and are insensitive to vibration and environmental noise. Dynamic Interferometry technology enables measurement of optical-grade surfaces in challenging environments, as well as high-resolution measurement of moving surfaces.

Many of 4D's products originated from unique customer requirements that it turned into product lines to meet more customers' needs. The company's 45 employees are made up of mechanical, optical, electrical and software engineers, and the manufacturing team who build the instruments.

"They are very specialized," Zecchino says. "It's like watching Swiss watchmakers; they do some incredible work."

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Driving Innovation

4D prides itself on being the leader when it comes to innovation and driving product advancements or developments based on customer requirements, Zecchino explains. "General Electric came to us to develop a way to measure surface pits and defects with a handheld gauge," he says. "GE required a portable, handheld system that can measure surface features with micrometer-level resolution. That was the impetus for a whole new product line with a wide reach and a much higher manufacturing volume for us."

4D InSpec Surface Gauge is the result of two years of research and development and a major new version of the company's software. The handheld device serves a wide range of applications that involve precision surfaces, including aerospace, drive train, engine components, turbines and medical devices. "What we found is there is no instrument that did this," Zecchino says. "It's very exciting not only meeting a customer's need, but also finding that this solution is launching us into manufacturing new technology. It's a game-changer for the industries that we are selling it to."

To date, the most common methods for measuring surface defects such as corrosion, scratching, pitting, etc., involve visual comparison to known samples. These methods, however, are subjective and not highly repeatable. High-resolution metrology systems, such as stylus and optical profilers, provide more accurate data. Their price, however, is often prohibitive for smaller manufacturers and repair facilities.

Furthermore, these systems are typically confined to a stand in a metrology lab. In order to measure large components or difficult to access features, small areas of the surface must be replicated using rubber or silicone. The replica can then be measured in the lab. The entire process can take an hour for one measurement, Zecchino says.

"4D InSpec will give inspectors a repeatable and traceable number in a few seconds," he adds. "They can make many measurements and sample large areas of a surface in the time it used to take to obtain a single data point."

Making Metrology Affordable

4D InSpec is expected to be invaluable to 4D's customers because it reduces cost, waste and time.

"Inspectors err on the side of caution, scrapping parts that may actually be within specification," Zecchino explains. "4D InSpec gives a more accurate image of the surface and the severity of wear and defects so inspectors can make much more accurate decisions. And, reducing the inspection cycle translates directly to a manufacturer's bottom line, and to getting refurbished parts back to the field for duty."

4D InSpec delivers the same surface measurement precision as larger interferometers that are too expensive for smaller manufacturers. "Small manufacturers must be more reliant on lower-tech options because high-resolution metrology is prohibitively expensive," Zecchino explains. "We brought 4D InSpec down into a price range that will allow smaller manufacturers and repair facilities to access precision metrology that couldn't before."

In addition to economies of scale helping 4D bring its new product to customers at a more affordable rate, the manufacturing process is simpler than the larger instruments.

"We are using additive manufacturing and other techniques to simplify the assembly process," Zecchino says. "We know that the gauge has to withstand the rigors of a manufacturing facility. The engineers spent a lot of time with beta testers to hear what they needed from that standpoint."

4D InSpec debuted in September during the International Manufacturing Technology Show. Customers have been impressed, Zecchino attests, saying they are affirming the product is a game-changer.

"This is the combination of usability, affordability and accuracy that lets [customers] actually do what they want to do," Zecchino notes. "We are hearing such things as, 'This is exactly what the industry needs,' and 'It is the holy grail for shop floor inspection.' It's very satisfying to see that we are really delivering what's needed."

"Several other companies have considered handheld metrology systems with this resolution, but they have approached it from the standpoint of, 'we have a technology, how can we make something useful from it?'" Zecchino says. "In this case, what we said was, 'Tell us more about what you need and we will develop the best technology into the best product to do that job.' It's a much better solution in the end because we have something now that's not just a compromise, but it's actually answering the need." **mt**

Published by Knighthouse Publishing Tel: 312.676.1101 Fax: 312.676.1280