Q&A

INTERVIEW WITH AN INDUSTRY INSIDER

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What makes CT inspection and metrology important, particularly for the gear industry?

The key to CT scanning is the ability to see 100 percent of the part. A typical inspection device is a single-point tactile system. With structured light scanning, it's all line of sight. CT scanning allows us to see 100 percent of the parts, inside and out. When looking at plastic gears, you might have what we call voids or little air bubbles inside the gear. The capabilities of CT scanning allow the user to see all these variables without destructing the part. It's non-destructive. You can quantify the size and the location of those just like you would measure a feature on the part. And if it's close to another air bubble, another surface, or close to any other feature, it will warn me. So, I have a lot of analytical capability knowing that I have 100 percent of the part information.

Having 100 percent of the information gives you many other advantages. You may be looking at the root, crest diameter, or radius today, but tomorrow, there might be an issue with something else that you never noticed in the previous scan. There is an incredible advantage in this because you don't need to rescan the part. The data from the previous scan is still saved.

Exact Metrology recently installed the Zeiss Metrotom 6 Scout scanner in its Brookfield, Wisconsin facility. What makes the Metrotom 6 scanner superior to previous equipment?

Most CT scanners were kind of carry-overs from the medical industry, where accuracy was not a big deal. If they're within a millimeter, that's good enough, and you're usually not measuring something from a medical CT. You're just trying to see: Is it there? Is it not there?

When you bring CT into the metrology world, obviously we want certifications. We want accuracy statements, uncertainty statements. We want all that information, and CT scanners never had it. They were trying to take the medical CT scanners and qualify them so there would be an accuracy or uncertainty statement. The Metrotom 6 was designed and built from Day 1 from the ground up to work like a CMM and be a metrology tool. It is calibrated, and you do get a factor of uncertainty. And the accuracy on the machine is 3 microns +L/100, which is very impressive for a CT scanner.

And the second advantage is it has a 3K detector in it, and that gives us down to a 2-micron resolution.

Why was it important to add the scanner to the facility?

It provides a capability that very few people have. It's not a low-cost investment. The scanners are somewhat expensive, so not everyone has them. Not only can we provide that as a service to people, but we can also educate people on the capabilities of CT scanning.

How does the Metrotom 6 scanner offer an advantage over conventional tactile techniques?

The advantage is seeing 100 percent of the part. Assuming, of course, we can get through the part. Density can be an issue. You need enough power to get through the material, but assuming you are through the material, you are seeing 100 percent of the part, and that's the key.

The Metrotom 6 does have greater accuracy than traditional CT scanning, but it does not typically have greater accuracy than your conventional tactile measurements.

But I'm not controlling the temperature and humidity like you do on those machines. They have to be in very special environments. You're also measuring one point at a time, so if you didn't touch the area that had the defect, you wouldn't know there was a defect there.

How were similar inspections handled before this new technology was available?

This is so new that what we consider the conventional way is still being done by the mass majority, and that's putting the part on a conventional CMM, and a CMM would tactilely go around and inspect it. If you needed to see something that was not visible, you would have to destroy the part. You would have to cut it, and you'd have to look at it in a 2D sense on a vision machine. Now, you destroyed the part; you had to pod it and polish it and then put it on a vision machine. After that, you had to put it on the CMM to get the three-dimensional information. It's quite possible that it could take you an hour, hour and a half, to check one part, where on a CT scanner, I can put it in there, scan it for 10 minutes, and I'm done.

Can you give me an example of how the scanner will help with the inspection of gears?

Obviously, there's a gear, and then there's another gear that it's mating to. We can scan those two gears independently, even if they were made at separate manufacturing locations. I can scan those two, and I can virtually put them together, seeing if there's any interference, if there's any rubbing, any tight spots where, maybe it passed the inspection, but both parts were a little plus, it causes a situation when you put the two together. We call it virtual assembly. I can start doing that virtual assembly on those parts and understand that interference or potential wear points before I ever find it as a warranty claim from a customer.

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