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Tan Lam, Watts lead inspector, sets up the company's new Zeiss Contura G2 to inspect 5 bearings produced for Embraer. The run takes a total of 15 minutes on the Zeiss, compared to one hour for each part previously. The Zeiss is being used by Watts to pass a Measurement Systems Analysis test requested by one of the company's aerospace customers.

Hook, Line and CMM

***A Silicon Valley Job Shop Uses
Advanced CMM Metrology to
Catch the Big Ones.***

*story and photos
by C. H. Bush, editor*

Every good fisherman knows that to land a big one he has to have the right attitude, the right bait, the right line and the right tackle. He also knows that, if any one of those is wrong, that big one can escape and swim away laughing.

“As an avid deep-water fisherman, I know that to be a fact,” says Doug Watts, founder-president of Santa Clara, CA’s Watts Machining, Inc. “But, with 27 years experience running my own shop, I know that the same is just as true in business. You can lure a customer in with the right price and service offering, but if you don’t have the right internal services, or the right equipment to do the job, you’ll either lose your shirt or the customer and maybe both.”

By any standard, Watts is a very well equipped job shop, with 35 employees, an older HMC with 25 pallets, a newer Matsuura HMC with 12 pallets, expandable to 60, plus a 17,000-sq-ft facility filled with manual support equipment, CNC milling and turning systems.

“I thought we had everything we needed,” says Watts,

As seen in CNC-West December/January 2009 issue

Shop manager Chad Jackson, left, explains to company president Doug Watts how the Embraer bearing assembly is running on the company's new Nakamura-Tome SC-300 turning center.

“until we landed a large contract with Embraer to build high-precision bearings used on the flap system in their new VLJ (*very light jet, ed*) models. The tolerances on those bearings are in the tenths and the parts have to be 100% inspected, which is where we hit a snag.”

Inspection Bottleneck

The snag was performing 100% inspection of 10 or more critical dimensions on a manual Mitutoyo CMM.

“We’re currently building the bearing assemblies in batches of about 120 pieces at a time,” Watts says. “And with our manual CMM, inspecting those parts took a minimum of an hour each. It was eating into our profits and locking up our CMM to where we virtually had no time to check anything else. Our whole department was buried.”

Dismayed to find such a bottleneck, Watts raced to find a solution.

“This was a nightmare,” he says. “Luckily I have a customer who had a Zeiss CMM, which they had bought about a year earlier. I called him and said, ‘Hey, I’ve got this really tough part. I wonder if you can check this any faster than we can.’ He said, ‘Bring it on. Let’s take a look.’ So, we went over there, and I saw enough of what the Zeiss could do, and that was that. My friend told me to call Frank Black, who runs Precision Tool Distributors and sells the Zeiss machines. I met with Frank, showed him my inspection problem, and he recommended the Zeiss G2 Contura automatic CMM. I had to solve the inspection bottleneck, so I took the plunge and paid cash for the system.”



Bottleneck Resolved

Because of the need for fast action, Watts asked Black to create the original Zeiss inspection program for him.

“I wanted to get up and running as quickly as possible,” he says. “So, my thought was to get a working program, train my operators as quickly as possible, and then worry about learning the rest of the G2’s capabilities later.”

The ceiling in the Watts inspection room was too short for the Zeiss, so he had contractors come in, cut out a big hole and raise the ceiling over the area where the CMM was to go.

“We bought the system last April,” he says. “Once we had the room ready, they delivered the G2 on a Friday and showed up the following Monday to assemble it. The guy from Precision came over, installed the program, showed my guys how to set up the machine, and in two days we were checking parts. Eventually two of our inspectors went through about 40 hours of training that we bought from Precision Tool. But the main thing was that bottleneck was gone.”

Major Time and Cost Savings

How did the Embraer inspections go after delivery of the Zeiss Contura?

“Well, we had a bit of a fixturing problem at first,” Watts reports. “We wanted to do a complete inspection in one setup, with both OD and ID checks, but those bearings have to be handled with care. For inspection, you have to hold them firmly, but you can’t distort them in any way. So for fixturing we had to get creative. We finally

Five bearing assemblies are shown on this special fixture designed to allow the new Watts Zeiss G2 CMM to inspect both OD and ID critical dimensions in one set up. Inspection time was slashed from one hour each to a total 15 minutes for five.



As seen in CNC-West December/January 2009 issue



Cell operator Lawrence Rael, sets up Watts Machining's Matsuura horizontal machining center. The system is currently equipped with 12-pallet delivery and a 240-tool changer.

came up with a tool that would allow us to hold five parts, access all areas that needed inspection using a Renishaw Star probe, and do it all in one set up.” (See lower-left photo on previous page. Ed.)

So, how did the G2 do?

“We wanted to see real productivity gains, and we did,” Watts says. “We went from an hour a part down to a routine that fully inspects five parts in fifteen minutes. The G2’s rapids are really fast, but the machine loses nothing in accuracy. It has an accuracy capability in the millionths. We haven’t even begun to know and fully use all the system’s capabilities, but so far, we’re really pleased.”

Watts says the G2 will deliver virtually any report in any format he needs. On the Embraer program the system printed out a perfect report that was manually attached to AS9102 inspection report that Embraer required.

“Hey, the Contura gives us the numbers, and we’ll deliver them any way they want,” he says. “Right now, because of the Zeiss our future in the aerospace industry looks very bright. We’re gaining opportunities to fish for customers we would never have had before we got the machine.”

Measurement System Analysis Test

What kinds of opportunities have the new Zeiss brought along?

“We have a customer in the aerospace industry that we make parts for,” Watts says. “So, one day he sent us three bad parts made from castings. Actually, they were mating

parts for ones we already made. ‘Why did you send us bad parts?’ I asked him. ‘We want you to make these for us, but first you have to pass an MSA test. It will check your ability to inspect parts the way we want them. If you can pass that, then we think you have a good shot at getting this contract.’ Of course, I said, ‘You got it!’ But then I had to go find out what the hell an MSA test was.”

Watts says he cringed when he found out what the test involved.

“Basically we had to check 36 of 400 dimensions, on each of those three parts and do it six times,” he says, “three times each by two different people. And here’s the catch. The results had to match on all of the tests. This customer wants to be sure we can make the parts and ‘prove’ that we can make them right. The Zeiss machines have collected the information, and we know the tests are right by each of our people. All that’s left is to find a proper format to submit the information to them.”

What’s his chance of passing the test and getting the new contract?

“I’m positive we’ll pass,” he says. “The G2s are totally consistent. Our setups are the same every time. Our program is right. Basically our operators just push a button and the Zeiss does the rest. Right now we’re serving medical, semi-conductor, defense and commercial industries, but with the new Zeiss in our tackle box, I’m confident we have a great future in the aerospace industry, too. Personally, in a year from now, I believe aerospace will be our biggest market.” ■