

## Case Studies: Time for an Upgrade

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Votaw Precision Technologies (Santa Fe Springs, CA) has been making Critical parts for the aerospace industry for 45 years. It has grown from a startup in the owner's garage to a 240,000-square-foot facility, employing 130 people. The current job list contains aerospace and defense projects that include the Mars Land Rover, the Aries 1 rocket, Raptor fighter planes and various satellites.

"We are a go-to source for these types of projects because our equipment can handle it," says Richard Roy, maintenance manager at Votaw. A case in point was a vertical machining center (VMC) bought several years ago. The previously owned, though almost new, VMC was at Votaw less than a year when it was discovered that the machine needed to tighten its tolerances in order to meet stringent customer requirements. It was critical that its accuracies and tolerance be on spec.

"We ran this used machine on many projects, and time and time again saw that it wasn't as accurate as we expected and just wasn't holding tolerances," says Roy. "We had to repeatedly do time-intensive adjustments. Important parts just could not be done on this expensive machine." That was when the staff at Votaw knew it was time for some assistance. "We ultimately went with A Tech Authority, which ended up putting Heidenhain (Schaumburg, IL) linear scales on our VMC," says Roy. "That turned out to be the right decision."

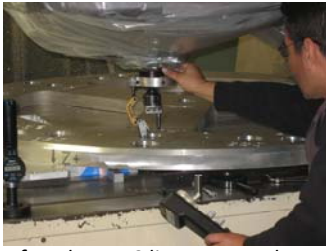
### Discovering Cyclic Error

Votaw's VMC is a five-axis milling contouring machine, employed to serve a wide range of aerospace and industrial customers in the machining of flight components. It is on a moving table, working a schedule of 16 to 20 hours a day, 5 ½ days a week. The hardware itself consists of an 8-foot Y axis, a 15-foot X-axis, a 3-foot Z-axis and A and B tilting axes. When purchased, its main measurement feedback system consisted of rotary encoders on the ball screws. "After we started using this VMC, it began to have problems holding tolerances so we did some testing ourselves," says Roy. Votaw found that the machine was experiencing cyclic error on one axis, a mechanical error believed to have originated in the ball screw and rotary encoders. That error was then, in turn, affecting the accuracy of the other axes. One of Votaw's outside vendors said there was nothing it could do, and even advised the company against doing a linear scale upgrade because it doubted that would be effective. "And they sold linear scales themselves," says Roy. "They couldn't have been more wrong." Lucky for Votaw, A Tech Authority (Chino, CA), a machine tool equipment distributor and service provider, was prepared to do the job. "Unfortunately, it is not uncommon for some machine tool equipment distributors to not understand the full benefit of a linear upgrade," says Craig D'Ambrosio, owner of A Tech Authority. "We were happy and prepared to help Richard and Votaw out."

"I believe that the top machines in the industry all come with linear scales already on them," says Roy. "I also believe that even if there are mechanical problems with the machine, it will be negated by good quality scales. They truly are the best way to achieve the best accuracy." Votaw specifically requested the implementation of high-precision linear scales from Heidenhain to be used for replacing the measurement systems on the X-, Y- and Z axes. "In my 25 years of industry experience," says Roy, "Heidenhain has had the best, most reliable product, and we needed this job done right."



Standing next to Votaw's retrofitted VMC is Richard Roy(left), Votaw Maintenance manager, and Craig D'Ambrosio (right), owner of A Tech Authority, the company that conducted the upgrade. Source: Heidenhain



*After the VMC linear upgrade at Votaw, a full range of critical aerospace parts can once again be made on the machine.  
Source: Heidenhain*

A Tech Authority obtained two Heidenhain LS 100 Series linear scales and one LB 382 scale to do the job. Both of these sealed linear scales are highly accurate and characterized particularly by high tolerance to vibration. After the plans were made and the components on site, it took the A Tech Authority technicians only a couple of days to complete the job.

“We have a customer here that purchased a half-million dollar machine entrusting us to drill 50 or 60 holes in it and basically give the machine a new sense of balance,” says Bill Ritter, A Tech Authority sales manager. “It also is important to note that many people who work in this industry think rotary encoders are good enough, and it’s proving time and time again to be untrue, especially as jobs and requirements change.” A Tech Authority’s technicians mounted the scales and ran cables, giving their work the look of an OEM installation. After the cables were plugged into the control, the VMC’s new measurement system was operational.

### **A New Sense of Balance**

Votaw regularly does laser calibrations on its working machines and this was no exception. After the linear upgrade retrofit was complete, the laser calibrations showed success. “The cyclic error had disappeared,” says Roy. “And overall, where the accuracy had been  $\pm 0.0005$  on the three axes, it had now dropped down to  $\pm 0.0002$ . That is an increase of 150% in accuracy.”



*Heidenhain LS 187 precision linear scale integrated on the Viper VMC*

### **Benefits**

- The implementation of three linear Heidenhain scales has given Votaw’s vertical machining center (VMC) a 150% increase in accuracy.
- Where the VMC’s accuracy had been  $\pm 0.0005$  on the three axes before the retrofit, it dropped down to  $\pm 0.0002$  after.
- The VMC has been extremely accurate since the retrofit, producing parts for the Boeing 787 Dreamliner and JAF Joint Strike Fighter.

### **Contact**

A Tech Authority if you are interested in having a NC machine diagnosed, and possibly retrofitted with Heidenhain high accuracy linear scales and rotary encoders.