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Precision Measurement Solutions for Manufacturers

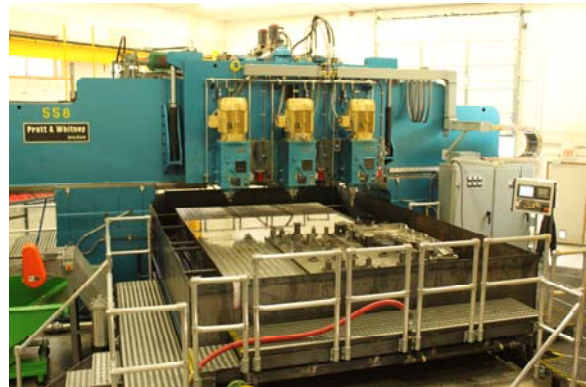
Case Study: Rebuild / Retrofit Hard Metal Machining Center

Project: Rebuild 6-Spindle Wilson

Location: Precision Machine Works, Tacoma, WA

The large multi-spindle milling machine was originally built in the 1960's with cast iron box ways designed with hydrostatic lift capabilities. This allows the bridge and table to float on a thin film of oil, enabling the machine to handle the weight of the 50-ton bridge assembly. The table has the same features and weighs in at 30 tons with the riser blocks and parts. These features make this type of machine a valuable CNC retrofit candidate for the machining of hard metals such as Inconel, other super alloys, and titanium. Precision Machine Works located in Tacoma, Washington asked Morley to rebuild and retrofit the machine.

This job would not be recommended for the “faint of heart” as every part was massive. The total weight of the machine is over 100 tons. The first task: repair the damaged ways under the table. The table ways had been coated with a bearing material called Moglice. The Moglice had to be reconstructed within .001 of an inch and the hydrostatic pockets rebuilt to capture the high-pressure oil flow. Morley used hand scrapers and the Hamar[®] laser to accomplish the task with a minimum number of pick-up and turn-over events that required a rigger with a 70,000-pound forklift.



The machine was leveled and aligned square with the Hamar[®] laser. This involves setting the table bed level and at the correct height to the two columns, and square and parallel to all axes. The 7-ton Z-axis slides required extensive work to fit properly into the Z-axis bridge ways. The cast steel ways were scraped, and the slides were fitted with Rulon bearing material and scraped to very tight tolerances. All the gibs were hand scraped and fitted.

The 4-inch diameter ballscrews required custom drive boxes manufactured and fitted into un-machined areas. The retrofit also called for Heidenhain glass and tape scales to be fitted to all machine axes. These too were mounted on un-machined areas. The Faro[®] laser tracker was used to set the drive boxes precisely into position and to position the spars onto which the scales were mounted. Massive scale-reader head brackets were used to prevent any vibration.

The six 50-horsepower spindle gearboxes were rebuilt and new Setco spindle assemblies were added. The six spindles had to be mounted to the Z-axis slides within a .0015-inch tolerance for the spindle spread (120 inches between the banks of spindles and 40 inches between the centers). The spindles also had a .001-inch tolerance for spindle sweeps. The distances were set using the Faro[®] laser tracker.

Finally, the machine was calibrated with the Renishaw XL80 laser Interferometer and checked with the Renishaw QC20 ballbar. Precision Machine Works maintenance department provided the electronic engineering and retrofit by adding a new Fanuc control. They also added high volume coolant (fire hose), auger chip-removal, and the steel frame walkway system. The machine is now in production and is “the pride of the fleet”.



Many new methods were used to provide a series of baselines for similar rebuild and retrofit projects that are planned for this type of machine. PMW has many of these machines and we have been performing rebuilds for them for the past 15 years. On each rebuild, we have been able to add time saving technology to speed the process, achieving an accurate and modern rebuild process.