

Using lasers to nail critical QC checks on compressors

Hi-Tech Compressor and Pump Products, based in Tullytown, Pennsylvania, had just taken on a challenging compressor reconditioning project and was trying to sort out how to QC the alignment. Known for providing expert, responsive service, the company specializes in refurbishing reciprocating compressors and industrial pumps.

Don Weidemann, Hi-Tech's director of quality, had to be certain the tolerances of the compressor bearing bores were on spec, but his customized dial indicator setup was not providing consistent results. The company's reputation was on the line, the tolerances were very tight and his measurements had to be repeatable and reliable. After careful research, he found the answer in the L-702SP, a new laser alignment system made by Hamar Laser Instruments in Danbury, Connecticut.

The high Gage R&R (Repeatability & Reproducibility) of the L-702SP gave Hi-Tech "absolute confidence" in the accuracy of its work; quick and intuitive setup made it easy for shop floor techs to use.

The Hi-Tech team got an enthusiastic "high-five" for the compressor reconditioning job and quickly got more business from the customer.

Hi-Tech has added laser alignment to its robust suite of capabilities and expects to win additional business as a result.

Large Multi-Throw Frames

Founded in 1999, Hi-Tech serves customers in many industries, including oil & gas, which makes wide use of reciprocating compressors. Owner Todd Pollazzi said Hi-Tech stands out for its ability to respond much faster than large OEMs and similar companies, with little red tape, to address customers' needs. It is a small, nimble



Hi-Tech's Quality Inspector Phil Sofia checks compressor housing with Hamar Laser's L-702SP Scan Laser with Plumb Beam.

Hi-Tech's Management Team (L to R): Operations Director Adam Cojocar, Director of Quality Don Weidemann & President Todd Pollazzi.



company with big capabilities, including full-service machining and in-house thermal spray, he said.

Hi-Tech's customer for the reconditioning job at the heart of this case study is a large service company that specializes in servicing reciprocating compressors used throughout the world in P.E.T. bottle blowing applications. These units' multi-throw frames are very expensive to replace, so being able to repair the bearing bores to

better-than-original condition with thermal spray represents a huge savings for the owner. The tolerances are very tight and maintaining perpendicularity is essential.

"Our customer for this job knew us for repairing their other reciprocating wear parts," Pollazzi said. "During a tour of our shop we showed them our metal spray capabilities, and they asked us to repair their worn frames. Our customer had tried to repair the frames by "bushing" them, but had



Hi-Tech's original dial indicator QC setup in compressor housing.

only encountered more problems because no one could maintain the needed sizes and perpendicularity."

Extremely Tight Tolerances

According to Weidemann, the reconditioning job that others would not or could not tackle effectively was a great fit for Hi-Tech. "While our company is only 22 years old, our founders have extensive experience with compressors," he explained. "For a smaller company we have broad in-house capabilities; this includes CNC and large machining capabilities, non-destructive testing capabilities, and multiple types of thermal spray. We can spray stainless steel, carbide, aluminum and bronze, and we have an extremely impressive ability to inspect our product."

Weidemann explained that the bearing bores are especially critical on these compressor designs, and this is why the manufacturer assigned extremely tight tolerances for them. "They have three in-line bearings on a single shaft so if there is any misalignment at all, the techs can feel it when they slide the parts together," he said. "Because of our broad knowledge, we were able to take on the job and develop a process for reconditioning the bores that has worked very well."

Although well-equipped for Quality Control, Hi-Tech did not have equipment that would let Weidemann check the compressors with sufficient confidence. Initially, he designed a custom fixture using dial indicators, but the extended length of the fixture and indicator

arms made it heavy and sensitive to angular movement, which made the readings inconsistent and less accurate. This led to a search for a laser solution instead of a mechanical one.

Repeatability & Reproducibility

Weidemann said he researched several offerings targeting bore alignment, but Hamar Laser's L-702SP Scan Laser with Plumb Beam was the first laser he saw that also addressed perpendicularity. "The L-702SP looked like a promising solution," he recalled. "This prompted me to talk with Rod Hamar, the president of the company. Rod was really terrific. He helped me design and fabricate a fixture to support and center the laser and brought his laser equipment to our facility."

"We were impressed by the outstanding Gage Repeatability and Reproducibility of the L-702SP," Weidemann continued. "While we

had been exceeding the compressor manufacturer's tolerances with the dial indicator, it had poor Gage R&R. We would set it up three times and get three slightly different results. With Hamar Laser's L-702SP we get extremely accurate and consistent results from setup to setup and from person to person, time after time."

"You don't want your gaging to use more than 10% of your tolerance," Weidemann explained. "That leaves 90% of your tolerance for machine variation. My inspector and I can set up Hamar's Laser's L-702SP multiple times and the laser will repeat to within .0002 in. With a .002 in. tolerance that's only 10% of the tolerance being used by the measuring device, and that's an ideal situation!"

Squareness-Checking Capability

The L-702SP combines an automatically sweeping laser scan plane with a perpendicular laser "plumb" beam for checking perpendicularity. Hamar describes the L-702SP as a versatile second-generation design the company introduced in 2018. "We saw the need to accurately and quickly check perpendicularity, especially on complex, multi-turn machines, so we added a squareness-checking capability to our 'workhorse' L-700 Spindle Laser, and the L-702SP was born," he said. "When I found out about Hi-Tech's bore-squareness application, I thought the L-702SP was a natural fit."

Hamar said the L-702SP excels at aligning lathes, turning centers and many other machines and, as this case study demonstrates, it can be readily adapted for

Hamar Laser's L-702SP Scan Laser with Plumb Beam (shown in lathe application.)





Hamar Laser's L-702SP (auto-sweeping laser scan plane turret on top.)

other applications like Hi-Tech's compressor housings. Like all Hamar products, the L-702SP was designed to be easy to use. "We didn't require any on-site training after Rod's initial visit," Weidemann said, "because the equipment was so easy to use. We used it right out of the box."

As with all of Hamar's systems, high accuracy is the starting point in every design. Following suit, the L-702SP has center resolution of .00001 in. (0.00025 mm) and angular resolution of .00001 in/ft (0.0008 mm/m). The laser provides live measurement data in four axes (vertical and horizontal, angle and center), and is sold with a proprietary software package.

Founded in 1967 by Martin Hamar, a Cornell-educated engineer with 25 U.S. and foreign patents to his name, Hamar Laser designs and manufactures highly accurate and easy-to-use laser alignment solutions for a wide variety of applications. The company remains relentlessly innovative. "We love nothing more than solving tough alignment challenges for our customers," Hamar said.

Return on Investment

Hi-Tech's return on investment with the L-702SP is impressive – and not entirely measured in dollars. The gains show up in multiple columns on its ROI spreadsheet: labor savings, greatly enhanced QC and measurement capabilities, longer and more reliable compressor operation, additional customer business and expanded market potential.

Streamlining setup, measuring and

machining processes and avoiding costly "do-overs" were important gains. "Each compressor housing takes approximately 80 hours of labor," Weidemann explained. "By getting them right the first time we save significant warranty and labor costs in not having to repeat parts of the process."

It's hard to put a dollar value on peace of mind, but Weidemann esteems that very highly. "Inconsistent checks with a dial indicator sometimes left us with a queasy feeling," he said. "But the data we get from the L-702SP – even from multiple setups, even by different people – repeat to each other within .0002 in. With the laser, we and our customers can have absolute confidence in our work."

Adam Cojocar, Hi-Tech's Service Center Manager, was the first to report that the customer was seeing tangible results from Hi-Tech's use of the L-702SP. "During final assembly, our customer noticed a decrease in difficulty when installing the second and third bearings into the bores and attributed this to improved concentricity of the finished bores," he said. The satisfied customer quickly shipped additional compressor housings to Hi-Tech for reconditioning.

"Typically, you only hear from a customer if they're not happy," Weidemann quipped. "They actually called us up to tell us that these are going together great – and by the way we have more that we're going to send you! In the long-run, we expect this customer to see longer bearing life due to improved alignment, which is a very important additional benefit."

Making the most of its success, Hi-Tech is expanding its new capabilities to all current and prospective customers as this can help make their compressors and pumps run longer and more reliably. The bottom line: A bigger piece of the reconditioning market because Hi-Tech can now do what others won't do – or can't do.

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The L-702SP can be quickly set up before final machining for spot checks.

