

A photograph showing a worker in a dark shirt and with tattoos on his arms, operating a large industrial honing machine. The machine is stainless steel with various components, including a control panel with buttons and knobs on the right. A large black bucket with a red handle is visible in the foreground. The background shows a factory environment with other machinery.

# E.T. Hone Home

*Gears manufactured by Forest City Gear are found in aerospace-related, medical, military, and other industrial applications, many of which demand high process capability where honing provides critical advantages in control and consistency.*

## An early decision to hone put Forest City Gear on a path to precision, earning a reputation for some of the best gears in the world and beyond

Phil Hanna, Product Manager—Machines/Gages, Sunnen Products Company

For more than 60 years, Forest City Gear has crafted a legacy of excellence in precision gear manufacturing, leveraging advanced techniques and cutting-edge technology to earn the business of customers as exclusive as NASA. At the heart of the company's technology-focused philosophy lies a long-time relationship with Sunnen Products Company, a leading manufacturer of honing systems, tooling, and accessories. The relationship helped Forest City set itself apart as one of the world's most precise gear makers, and now the company's parts are found on everything from fishing reels to the Mars Rovers.

Stetler and Evelyn Young started Forest City Gear in 1955 after Stetler's employer, Rynel Gear, was sold and liquidated. When a former Rynel customer approached Stetler with a need for high-quality gears, Forest City Gear was born. Since then, the company leadership was assumed by Stetler and Evelyn's son, Fred Young, who ran the company for nearly 50 years, continuing its traditions of high-tech precision and innovation. Fred's daughter, Kika Young, is now the company president. "Staying on the forefront of machine tool technology goes to our core values because it makes us a better partner for our customers," said Kika. "Likewise, Sunnen checks all the boxes we're looking for in a partner—communication, quick response, quality equipment."

Forest City Gear doesn't produce standard, off-the-shelf gears; they specialize in crafting custom gear solutions tailored to the unique needs of diverse industries. "Everything we make is custom, directly from a customer's design or CAD file," added Young. "Our company's strategic directive has always been: 'excellence without exception.' It boils down to always giving the customer a higher level of quality than specified and doing it without adding much cost or time to a job. Our automated vertical honing systems allow us to hit tight tolerances and produce precision finishes, easily and efficiently without adding production time."

About 30 percent of Forest City's work is aerospace-related, 5–10 percent medical, 5 percent military and the remainder are industrial or instrument work. Many of these applications demand high process capability where honing provides critical advantages in control and consistency, according to the team at Forest City.



## Evolution: From Parts to Assemblies

The collaboration with Sunnen has allowed Forest City Gear to push the boundaries of gear manufacturing—delivering tight tolerances and exceptional surface finishes, to ensure that each gear meets the highest standards of quality and reliability. It has also helped Forest City expand its product line to gear assemblies where precision also plays an important role.



*Forest City Gear's principal products are fine and medium-pitch custom gears, such as internal, spline, sprocket, helical, spur and worms/worm gears. Typical materials include 12L14, 1215, 4140, 8620, 9310 and various stainless grades, as well as aluminum, bronze, brass, Inconel, Hastelloy, titanium, plastics, wood fiber and powdered metal.*

“We evaluated our Sunnen hones and how we used them over the years, and as the gear tolerance requirements got tighter, we started to take over more of the value stream,” said Jared Lyford, Director of Operations, Forest City Gear. “We used to be more of a cut-teeth production, then we migrated to whole-part-complete, from raw material to finished part. Even after ID grinding, we needed to have more finite control of the bore tolerances, and that’s where the Sunnen machines came in. They allowed us to meet the roundness and perpendicularity for both finished parts and in-process requirements for gear finishing.”

## Honing Makes the Difference

Forest City Gear's principal products are fine and medium-pitch custom gears, such as internal, spline, sprocket, helical, spur and worms/worm gears. The company works to quality levels as high as AGMA 15 (DiN 2-3). Part runs range from one to several hundred thousand. Maximum O.D. on most parts is 20", except for worms (5") and worm gears (16"). Typical materials include 12L14, 1215, 4140, 8620, 9310 and various stainless grades, as well as aluminum, bronze, brass, Inconel, Hastelloy, titanium, plastics, wood fiber and powdered metal.

Honing, a precision machining process, plays a pivotal role in ensuring the superior quality and performance of Forest City Gear's products. By employing two Sunnen SV Series vertical honing systems, as well as an SH-4000 horizontal hone, the shop achieves unparalleled accuracy and surface finish in its gears. This meticulous approach not only enhances the durability and reliability of the gears but also optimizes their performance in various applications.

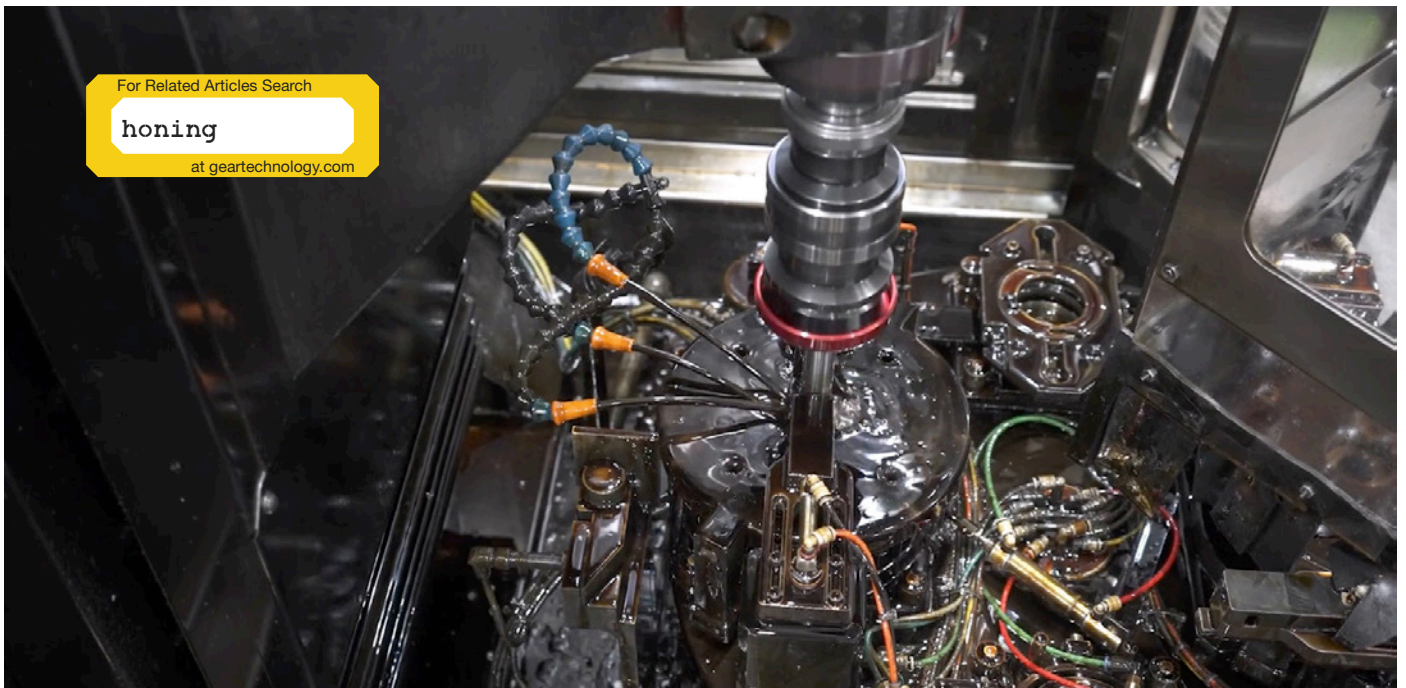
Forest City Gear has used honing since the inception of its business. The company also tried hard turning, but found it more difficult to control quality, especially for micro finishes. “On bore-type gears, we have found that automated honing is a good way to give the customer tighter control of bore size, roundness, straightness, and finish,” said Joel Miller, ID/OD Department Supervisor at Forest City. Miller is responsible for the honing, lapping and grinding duties at Forest City. “The customer notices the difference in a smoother, quieter, more efficient drive.”

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“ID grinding is a fine process for gears with larger (>0.75 in.) bores and low L/D ratios (0.5:1), but our range of work includes smaller diameters and relatively deep bores,” Miller explains. “When you start to reach an L/D of 2:1, honing has a real advantage in speed of material removal, and over 5:1 you might start to see deflection on a grinding spindle, exacerbating taper issues.”

Forest City uses Sunnen’s diamond-plated CGT tooling with the Sunnen MB30 honing fluid. “We’ve had excellent results with the diamond-plated tooling as far as consistent, cool cutting, holding size, and giving us long wear,” added Miller. “And the Sunnen machines are tanks. We depend on them to be accurate and repeatable. We can run on Friday afternoon hitting split limit, come back Monday morning, turn the machine on and we’re within 20 millionths.”

### Software Upgrade Delivers Efficiency and Flexibility

Forest City Gear had been using Sunnen SV computer controlled vertical honing systems since 2007, and when a new software update arrived in 2022 there were concerns. Fortunately, the new software is compatible with the older model honing machine, so a simple software upgrade was all that was needed. “The entire software upgrade only took about two hours,” said Miller. “We were back up and running the same day.”

The new Sunnen software proved to be a game-changer for Forest City Gear—making machine setups, operator training, and overall operational efficiency even more efficient. The new software introduced features such as intuitive user interfaces, automated processes, easy tool setups

and enhanced compatibility. This allows operators to set up machines more efficiently, reducing the time and effort required for each setup.

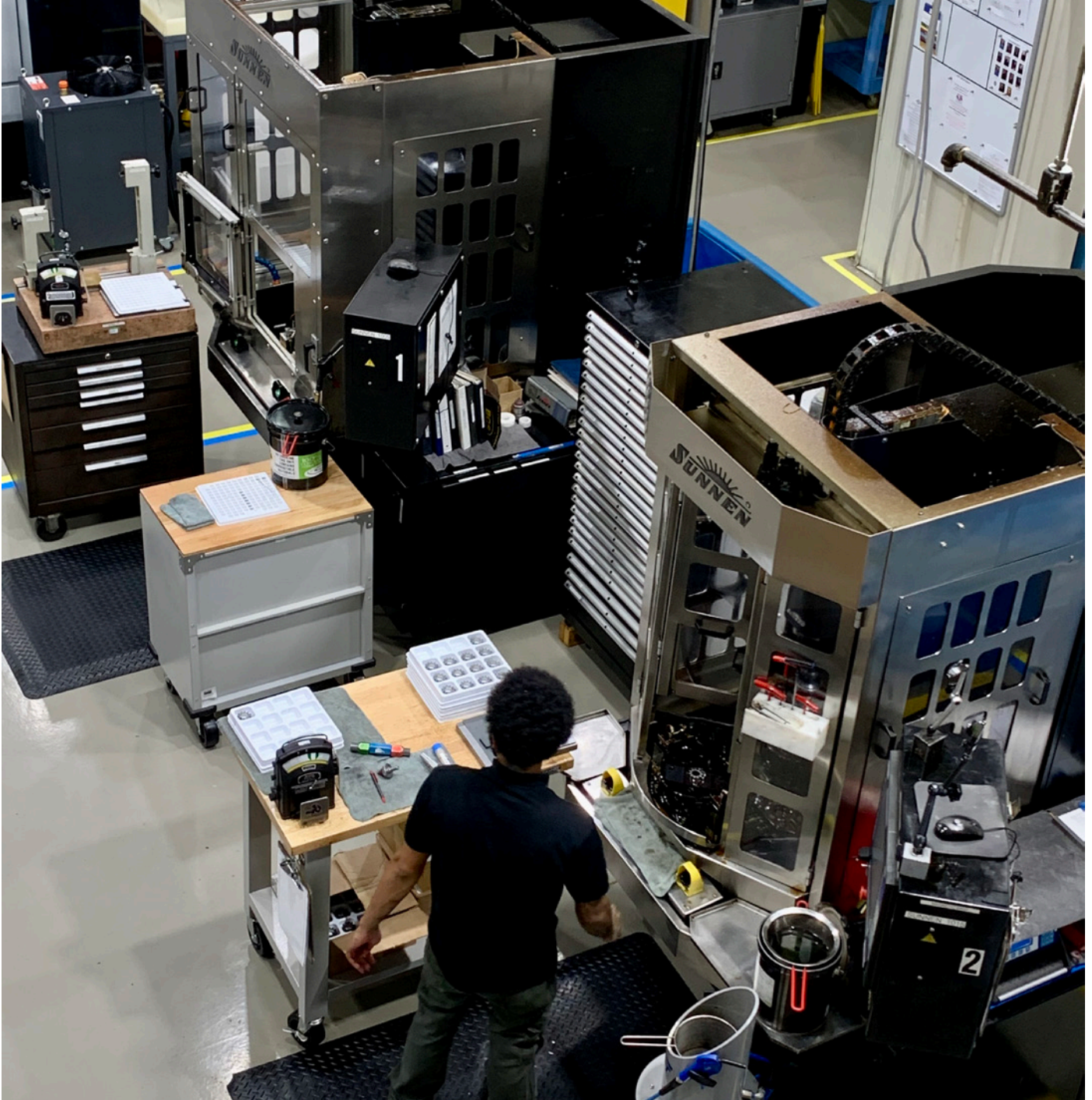
“The intuitive nature of the new software reduced the learning curve for our operators,” said Miller. “With the user-friendly interfaces and simplified workflows, operators can quickly grasp the functionalities of the software, requiring less time for training. This not only saved us resources in terms of training hours, but also enabled operators to become proficient more rapidly, contributing to overall productivity.”

Through new software, Forest City gained access to advanced features designed to optimize various aspects of their operations. These include tools for process monitoring, data analysis, and predictive maintenance, among others. These features allow the shop to identify and address inefficiencies more effectively, leading to smoother operations and improved overall performance. “With this new software our operators can monitor which fixture is running and where we are in the part run,” added Miller. “This gives us built-in consistency across all operators and allows one operator to run multiple machines.”

Overall, the decision to upgrade to new Sunnen software appears to have had a significant impact on Forest City Gear’s operations. By embracing Sunnen’s advanced honing technology, the shop was able to enhance machine setups, expedite operator training, and streamline overall processes.

From its start, and through three generations of leadership, Forest City Gear has emphasized quality and precision in its parts and products. “We have always put a high value on machine tool technology, and we’re very proud of that





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heritage,” added Young. “In fact, we still have a photo hanging in the shop of my dad and a bunch of Forest City Gear folks with one of the Sunnen machines we purchased at IMTS.”

Fred Young’s passion for innovation not only established Forest City as a go-to gear maker, but it also brought new best practices to the gear making industry as he willingly shared his methods and techniques. Fred passed away in 2023.

“All of us at Sunnen enjoyed working with Fred,” said Tom Dustman, Sunnen’s Director of Sales, Americas. “He was a true manufacturing icon, constantly pushing the boundaries of what could be done to improve the quality of gears, and then sharing whatever he learned with the entire industry rather than keeping it as a competitive advantage. The synergy that

was created by Forest City Gear and Sunnen working together helped both companies improve our capabilities and quality.”

Through continuous innovation and a relentless commitment to machine tool technology, Forest City Gear has earned a reputation as a trusted partner for customers seeking top-tier gear solutions. By harnessing the power of honing technology from Sunnen Products Company, they continue to lead the way in precision gear manufacturing, driving success across a wide range of industries.

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