

Bevel Gear Generators Get Better with Age

Gleason Corporation

An economical modernization program gives Designatronics' tried-and-true Gleason No. 102 Coniflex generators a new lease on life for fast, reliable production of smaller precision straight bevel gears.

Rare is the industry where new technology hasn't supplanted what was considered state of the art just a few years ago. A better mousetrap is almost always right around the corner. Companies like the Stock Drive Products/Sterling Instrument (SDP/SI) Division of Designatronics count on it. The company invests anywhere from \$1.2 to \$1.5 million in capital equipment every year, all residing in a new, ultra-modern, 96,000-square-foot manufacturing facility at its headquarters on Long Island, NY. It's the only way they know of to meet the production challenges of a vast 87,000-component product line that includes custom precision gears for everything from 3D printers to the Mars Rover – and to produce them all with a 0.5% rejection rate that's well above industry standards.

But standing incongruously among all the gleaming new CNC machines are nine Gleason No. 102 Generators. These mechanical machines, and thousands like them, were built in the '50s and '60s and dedicated to one purpose only: producing smaller high-precision straight bevel gears using the Coniflex process. Today, straight bevel gears with diameters of an inch or less are in high demand for many of the motion control applications that SDP/SI caters to. More often than not, customer specifications call for these gears to be produced using the Coniflex process, which raises an important question for SDP/SI and hundreds of manufacturers still using the ubiquitous 102s: Keep using them to meet demand, or make a substantial investment in new technology?

Coniflex and CNC: Best of Both Worlds

SDP/SI has found the right answer, and it's a resounding "yes", according to President and CEO Robert Kufner. "Many of our customers, particularly for certain aerospace applications, specify what's commonly referred to as a 'Gleason-type' straight bevel gear, and the 102s certainly give us the most proven solution," says Kufner. "If these machines have an Achilles Heel, it's that they are, by nature, very time-consuming and difficult to set up, and require operator skills that are in increasingly short supply. This situation is exacerbated by the fact that we now routinely customize 40% or more of our standard product line to meet customer demand and need more changeover speed and flexibility to meet any production scenario, whether 'high mix/low volume' or 'low mix/high volume.' Fortunately, Gleason has given us the best of both worlds: a 102 Coniflex 'CNC' Generator that operates with many of the capabilities of today's most productive CNC machines."

Enter Gleason Regional Sales Manager Paul Peone, who was instrumental in selling Kufner and his team on the benefits of working with the OEM to rebuild and modernize one of the company's existing 102s and add FANUC CNC firepower. "For the many companies still using their Coniflex workhorses, the proven Gleason remanufacturing and modernization program for these machines makes total economic sense," explains Peone. "It fills the production void between these older machines that depend so much on the experience of the operator for setup and to run reliably, and the latest CNC machines that come with a much higher price tag."

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Figures 1, 2 (before and after) The Gleason Modernization Program is enabling SDP/SI to add Coniflex capacity by transforming its manual, 60s era 102 Generators into CNC machines that set up easier and run faster and more reliably.

A 102, Like New

According to Peone, the Gleason 102 modernization program runs like clockwork. The machine is shipped to Kanie & Co., Ltd., a Gleason subsidiary based in Japan that has specialized in remanufacturing, retrofitting and upgrading older Gleason bevel gear cutting machines for more than 50 years. The machine is completely torn down to its cast iron base frame, scraped, re-leveled, and ultimately re-assembled with rebuilt cutter head and work head assemblies. These assemblies now feature new spindle and ballscrew servo drives/motors to replace the mechanical components like feed cams and change gears that require slow, time-consuming changeover when setting up part-to-part. Most importantly, a FANUC 32i A CNC controller is retrofit, along with all the other components necessary to operate the machine via CNC program. As a result, the vast majority of the manual settings and adjustments that contribute to time-consuming, labor-intensive setup and operation are eliminated.

After run-off and acceptance, the machine is shipped back to the customer. The entire process typically takes from eight to nine months.

Now Open for More Coniflex Business

The first of these 102 'CNC' generators is now operating alongside its mechanical brethren, five of which are scheduled for the same rebuild program downstream. The CNC generator proudly wears its distinctive original Gleason nameplate, but otherwise bears little resemblance to its former self. Most significantly, the machine has more than lived up to billing. According to Kufner, it has cut the typical setup time to change from one part family to the next from four hours to just one. (It's important to note that the machine uses existing cutting tools and workholding, so no special tooling is required.) Additionally, cycle times have been improved, since the machine now can run again at the feeds and speeds it was originally designed for, and without repeated cycle interruptions for part quality checking/rechecking. And, going forward, much needed capacity has been added for the small, precision straight bevel gears that are in high demand.

"Hats off to the Gleason service team that had the machine installed and set up, and four operators trained, in about two weeks," says Kufner. "It is important to note that three of these operators had no hands-on experience with the old 102s. But that doesn't matter. Since the machine is now CNC and setup and operation are largely summary-driven, any of our operators can be trained and operating the machine productively practically overnight. The machine, and the others to follow, will help to further establish us as a go-to source for very reliable, very flexible Coniflex production." 

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Stock Drive Products/Sterling Instrument (SDP/SI)

is a Designatronics company. The company is ISO 9001:2015 + AS9100D certified, offers mechanical based design, engineering and manufacturing services for critical motion control and small power transmission applications, including aerospace, defense, robotics, industrial automation, and medical. Over 87,000 standard inch and metric small mechanical components are available for fast turnaround. SDP/SI specializes in high-quality machined parts, molded components, synchronous belt drives, precision gears and subassemblies. For more information go to: www.sdp-si.com.



Figure 3 The 102 CNC Generator is far less dependent on an increasingly scarce pool of operator experience for setup and operation. The Fanuc CNC retrofit enables an operator with just a week or two of training to run the machine more productively and with far less time spent on setup.



Figure 4 The 102 CNC Generator has cut setup time for different part types from an average of four hours to just one, helping SDP/SI meet increased demand for straight bevel gears 1" or less in diameter produced using the Coniflex process.



Figure 5 SDP/SI annually invests up to \$1.5 million in capital equipment for its ultra-modern, 96,000-square-foot Long Island, NY facility.