by Susan Woods, managing editor

United Lens Co. adds a new spherical polishing machine to expand its capabilities

POLISHING PRO

Since 1916, 100 years to be exact, United Lens Co. has served the optics industry. Beginning with a foundation in molded ophthalmic blanks, such as for eyeglasses, the company grew into a manufacturer of thin film-coated, polished and precision-machined optics for a variety of industries. Today, the company's expertise in optical components includes machined flow tubes, spacer cavities, laser windows, debris shields, high-damage threshold reflectors and finished mirrors. Many of the companies ULC works with service the laser industry.

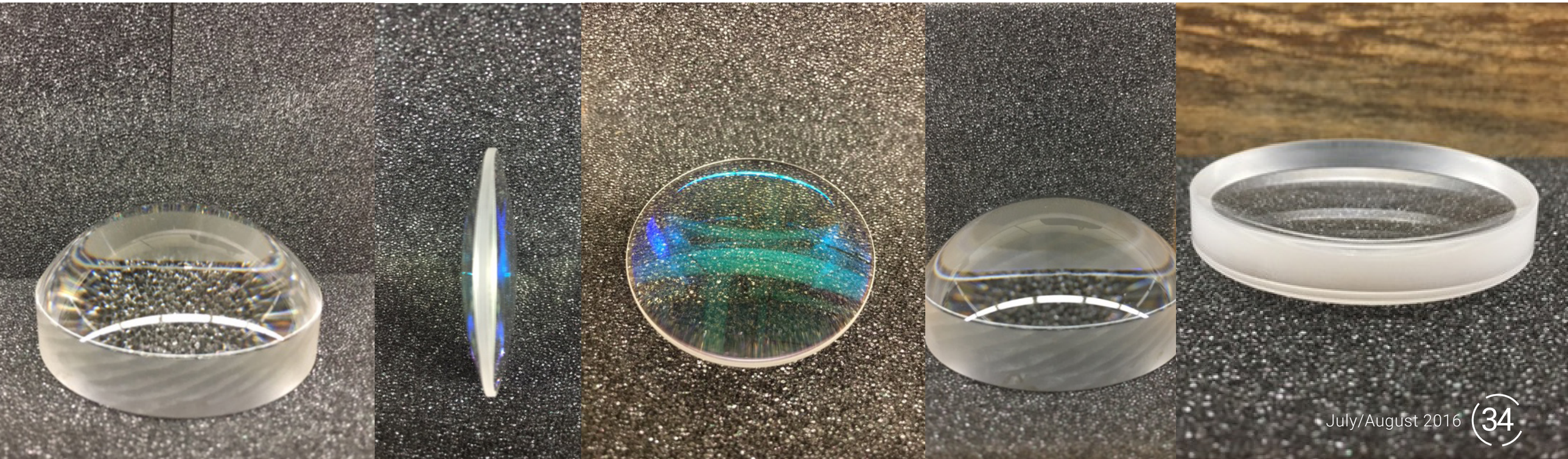
"We see a lot of reshoring efforts this year," says Tara L. King, sales manager at ULC. "Currently, almost all of our workload is coming from jobs previously being done overseas. Customers are seeing the value of a reliable American supplier for high-end, high-powered optics for their laser systems."

The rest of ULC's workload is offsetting the polishing capacities of its customers that are trying to keep up with demand for their laser customers, as well. Finished optics need to be optically clear. The raw glass material is made through a melting or fusing process, depending on the type. To extract smaller components, the glass is machined with harsh abrasives, such as diamond tooling. These abrasives scratch the surface, giving the glass blank a frosted appearance. To make the component usable as an optic, it has to be polished.

"Once an optic is used and becomes scratched or dirty, it's possible to refinish it instead of replacing it," says King. "This depends on the material type – cost of material – and configuration. Often times it is more cost effective to replace, and less risky. But in other cases, it may not be, such as if the lens is extremely expensive or if the material is no longer available. The hope is that the debris shield or cover slide protects the lenses behind it in the laser systems."

Dare to diversify

To grow, succeed and remain relevant over the course of 100 years, a company must be adaptable. One way ULC has adapted is by adding a new capability to its offerings with the introduction of an OptiPro PRO 160P. The investment in the high-speed CNC polishing machine for spherical →



LENS SPECIFICATIONS

United Lens Co. has high-speed polishing capabilities for single-sided, double-sided, spherical and cylindrical lenses on a range of materials, including fused silica, fused quartz, ceramic, optical glass, filter glass and low expansion glass.

Surface finishes are as low as 3 Angstrom RMS, and ground finishes and diamond machined edges are offered. ULC is equipped to handle surface flatness to 1/20 wave P-V and a thickness tolerance of ±0.0005 in.

The optical specifications of lenses, mirrors and other optical components are incredibly important. Even the smallest of deviations from specified measurements can cause optical equipment to malfunction. The most common specifications include diameter tolerance, radius curvature, center thickness tolerance, bevel, centering, clear aperture and angle tolerance. Although there are more than a dozen specifications to consider for every lens, a few of the most important include:

- **Radius of curvature** – This refers to the distance between the vertex and center of curvature of a component. The optical path length of rays passing through a mirror or lens can be determined by knowing the radius of curvature, which is also part of determining the surface power of the lens.

- **Centering** – Any given lens has two axes: the mechanical axis, as defined by the lens' edges, and the optical axis, as defined by the shape and curve of the lens' surfaces. Depending on the use of the lens, these axes can be aligned, also referred to as centered, or decentered. For a lens to function properly, the centering must be exactly as specified.

- **Surface power** – This mainly applies to curved optical surfaces, and it also refers to a method of measuring the curvature of surfaces with power, such as a lens or other curved optical component. As is true with the radius of curvature and centering, an optical component must be manufactured to precisely meet exact power specifications or it will not function as required.

These specifications – ones that have a direct impact on the direction and amount of optical rays through a component – are more important in some applications than in others. The laser industry maintains some of the strictest optical component specifications.

The OptiPro PRO 160P polishing machine provides ULC with many benefits, including polishing tool correction and truing process on the machine.

The PRO 160P polishing machine works with workpieces that are up to 160 mm in diameter and have a weight capacity of 66 lbs.

lenses was made after ULC noticed an increase in customer requests for curved surface or spherical polishing.

The PRO 160P is built on CNC standards for the best control of device positioning and velocity. The machine is driven by OptiPro's P Series software that streamlines all phases of high-speed spherical polishing.

With the polishing machine, the operator describes the job, as well as the tooling required, in the CNC based on the print provided by the customer. The user-friendly graphical user interface allows for easy and fast job setups. Once the polishing tool is trued to the radius of the lens, the operator is ready to begin running the job.

The machine works with workpieces that are up to 160 mm in diameter and have a weight capacity of 66 lbs. It has a B-axis travel range of -5 to 65 degrees and a 1,500-rpm, 1.8-kW work spindle with a pneumatic bladder.

The PRO 160P provides ULC with many benefits. A vibration-isolating granite core provides high precision, thermal stability and part-to-part consistency across multiple parts. The programmable polishing tool correction and truing process on the polishing machine itself save production time.

During high-volume processing, the polishing pad wears over time and the radius of the lens may drift. As a result, the operator needs to true the polishing pad. The P Series software guides the operator through the truing process.

The stainless steel enclosure is conducive to quick cleanup and fast slurry changeover, which increases efficiency when switching from one job to another. Polishing a range of materials at Angstrom-level qualities is possible due to the use of slurries and polyurethane pads in multiple combinations.

Polishing accuracy

The required accuracy for spherical lenses varies from job to job. The PRO 160P is capable of polishing spherical optics down to 10th waveform accuracy and 20/10 surface finishing or better, depending on glass type.

Other features include programmable, multi-step functionality for jobs requiring several processes. The polishing screen contains four separate process trees that allow the operator to specify different parameters within one polishing cycle. The trees can be chained to run consecutively or individually, which increases polishing efficiency by reducing reruns of the program.

The PRO 160P also features a compact footprint and retractable wheels for ease of mobility around the shop floor.

ULC constantly invests in expansion of optics capabilities by investing in equipment, such as the PRO 160P. The machine allows ULC to focus on rapid prototyping at high volumes with multiple materials so that optics quality is quickly comparable across a variety of cost, quality, thickness and other specifications at fast production rates. ●

OptiPro Systems LLC →

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