OPTICAL GLASS: ADVANCED ROTARY SURFACE GRINDERS DELIVER MORE POSSIBILITIES AND TIGHTER TOLERANCES

By Carlo Chatman, Power PR

To combat the loss of seasoned operators to retirement, glass job shops are turning to more modern automated surface grinders.

Older flat glass grinding equipment has limited mechanical controls and can require significant expertise, as well as time and labor to accomplish a task. For instance, such machines often use large wheels and dials to control the grinder's movement, meaning that the soft touch of an expert machinist is required to run them instead of programmable machine controls.

However, experienced operators who can successfully run such equipment are in increasingly short supply, and this shortage presents challenges to companies that rely on the older equipment.

"When I started almost 20 years ago, we were still using old, rotary surface grinders from the 1940s and '50s. They are tried-and-true, but not very accurate without an experienced machinist using them," says Brennan Cipro, chief engineer of Worcester, Mass.-based Howard Glass Company, which specializes in glass grinding and polishing for industries such as optics, biomedical, electronics, and aerospace.

Howard Glass focuses on 2D glass shapes, so factors such as thickness, parallelism, and surface condition are very important. Cipro notes that the glass materials provided by factories have varying degrees of standard thickness, meaning that glass materials often must be ground to smaller, precise dimensions. When using older grinding equipment, achieving such precision often requires the use of another machine to provide the final grind and polish, which adds hours to the fabrication process and contributes to inefficient production.

Modern automated rotary surface grinders offer advanced sensors and controls that can reliably achieve tighter dimensional tolerances, flatness, parallelism, and surface finish in much less time. The equipment can be used to grind flat glass to precise dimensions before polishing, significantly reducing intermediate lapping steps as well as preventing breakage of what is often a high-value product.

"The possibilities are endless with the new automated grinders," says Cipro. "Operators can enter the specific requirements, for example, 712 RPMs on the spindle, 22 RPMs on the table, with a down-feed rate of 0.003 inches a minute, with a certain dwell cycle. Essentially, operators can program the machine to do whatever they want."

Three years ago, Howard Glass had the opportunity to purchase a used, vertical spindle rotary table surface grinder from another shop that had completed a project and no longer needed it. The IG 280 SD from Winona, Minn.-based DCM Tech, a designer and builder of industrial rotary surface grinders, has a 24-inch, variable speed table and a 20-horsepower, variable speed grinding spindle motor.

Modern rotary surface grinders like those from DCM Tech offer advanced sensors and controls that can reliably achieve tighter dimensional tolerances, flatness, parallelism, and surface finish in much less time. *Credit: DCM Tech*

DCM Tech automated rotary surface grinders can be used to grind flat glass to precise dimensions before polishing, significantly reducing intermediate lapping steps as well as preventing breakage of what is often a high-value product. Above, glass discs before and after grinding. *Credit: DCM Tech*

In this machine, grinding is not performed by the peripheral edge of the wheel but rather by the entire diameter of the abrasive surface. In addition, digital technology allows for an interface with easy-to-use touchscreen controls. When combined with automation, the surface grinder operators no longer need to be highly trained individuals.

"The IG 280 from DCM Tech had a digital readout, memory, and could remember where 'zero' was, so it was an important upgrade that helped with efficiency, accuracy, and surface finish," Cipro says. "It enabled us to grind the glass very close to the final dimensions, so only a tiny bit had to be removed in the polishing process, which saves tremendous time."

After a decades-old traditional surface grinder stopped working, Howard Glass decided to invest in a new IG 280, and shortly thereafter a larger format IG 380, which comes with a 36-inch, variable speed table and a 30-horsepower spindle motor. Cipro says he was immediately impressed with the automation and refinements made by DCM since the early version of the IG 280.

One example of innovation involves the automation of the initial contact between the wheel and the part. Traditionally, this contact had to be finessed by the operator, but with the new machine, the advanced sensor technology senses vibration. In addition, it automatically fine-tunes not only the pressure of the spindle motor but also how quickly it moves the abrasive wheel down onto the part.

When the machine senses the abrasive wheel has contacted the part, it automatically begins the grind cycle, which helps to minimize the potential breakage of sensitive glass or crystal parts. This capability is important in loud manufacturing facilities where operators cannot rely on listening for the sound of initial contact between the abrasive wheel and the part. Given that many such parts are high value, an operator coming in too aggressively and breaking a part can cost the company hundreds or thousands of dollars.

"I was amazed at the refinements and tighter tolerances now possible," Cipro says. "Previously, when precision down to ten-thousandths of an inch was required, it could take three hours to remove the excess on our interim machine. Now, we can grind down to ten-thousandths of an inch quickly and effortlessly without extra steps."

In addition to reducing the needed number of finishing steps, the process repeatably achieves high throughput and eliminates variability, which enables job shops to achieve high-quality final parts, batch after batch.

Making parts in less time does no one any good if half of the parts do not pass the final inspection and cannot be used. So, the more job shops can optimize the upfront glass grinding process, the less polish time is required, thus improving not only the cycle time but also lowering costs and increasing revenue.

Perhaps even more important to Howard Glass were improvements in flexible processing that allow operators to enter virtually any requirement into a touch screen with programmable human machine interface controls. Cipro adds that, with this kind of flexibility, if a piece of glass breaks, it is easy to back any factor down a little to prevent the issue from reoccurring.

He points out that for routine processes, the use of different grind "recipes," with sets of parameters for specific parts, can further speed production, enhance quality, and aid in quick changeover.

"If the glass is a little off in the first pass, the DCM grinder can be programmed to take corrective actions on subsequent passes. There is no need to pick up the glass and measure it after every move, as with older machines," he says.

As the tolerances for glass and crystal grinding become stricter and production requirements more demanding, job shops that take advantage of advanced, automated rotary surface grinders will stay competitive even as experienced operators retire.

"Every day I hear my operators discussing ways to improve our glass grinding process because of the versatility of the advanced equipment. We are still discovering its potential," concludes Cipro.

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