KMM GROUP LTD.

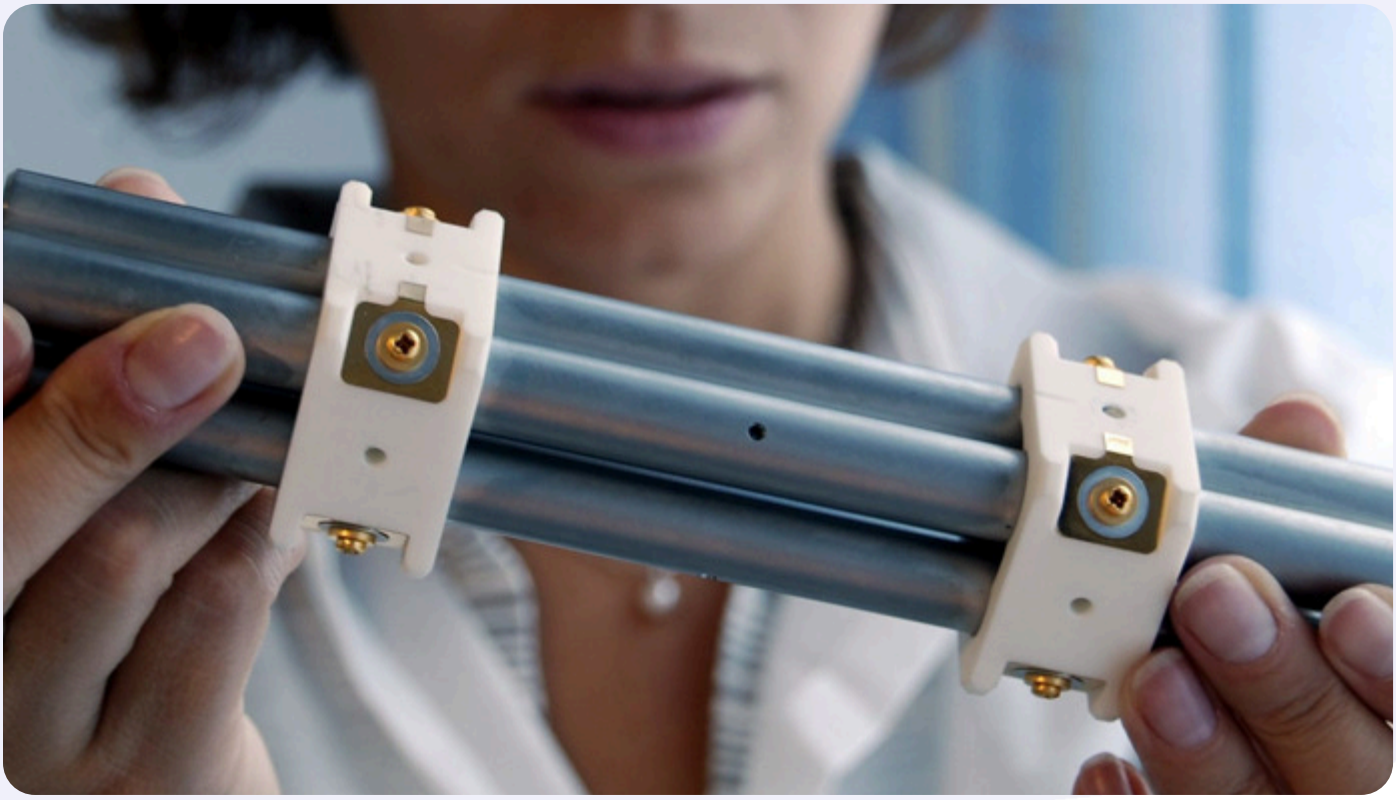
Case Study

Precision Centerless Grinding Results in Mass Spectrometry Magic

BACKGROUND

In 2020, a Waltham, MA-based global company acquired a small mass spectrometry component supplier we'd worked with for a decade because they wanted access to an advanced technology capable of measuring in parts per trillion, the most sensitive mass spectrometry in the world. They integrated the technology into a UHPLC mass spectrometer for a proprietary newborn screening system designed to accurately detect over 50 congenital disorders early enough to administer necessary treatments efficiently for better outcomes.

When the global company needed a high-tech component manufacturer to produce ultra-precise quadrupoles for this life-saving instrument, they leaned on the decade-long relationship we'd previously formed with the acquired company. But, only now, the stakes were even higher.



Mass spectrometer quadrupole Creative Commons Attribution-ShareAlike 3.0 Unported License

CHALLENGE

These extremely sensitive mass spectrometers contain eight quadrupoles measuring 3/8" in diameter and 8" long, all acting in unison. Each quadrupole must be as close to a perfect cylinder as possible to maintain the mass spectrometer's ultra-sensitive properties. If any quadrupoles fail to meet the incredibly exacting cylindricity specifications, the newborn screening system cannot detect congenital disorders as accurately as intended, putting lives and livelihoods at risk.

As a result, the high-stakes challenge of manufacturing the quadrupoles for the highly sensitive mass spectrometers focuses on achieving the tight tolerances of near-perfect cylindrical parts while maintaining diameter consistency on 8" long components. Any deviation exceeding .000020" throughout the entire length would render the part unacceptable.
In addition to cylindricity tolerancing and diameter consistency challenges, the grinding process stressed and destabilized the parts, requiring us to retain precise control over the process from start to finish.

Finally, production quantities have increased since the acquisition, applying even greater pressure to achieve results. Before the acquisition, we produced 50-200 pieces annually. However, quadrupole orders have increased substantially with the global company at the helm, now ranging from 1,500 to 2,000 parts per year.

SOLUTION

We started by determining a stress relief strategy to stabilize the quadrupoles to prevent stress and movement during the grinding process. Once we prepared the parts, we used a high-end Monzesi® Monza centerless grinding machine capable of producing parts with near-perfect cylindricity, allowing us to achieve the consistency required. This state-of-the-art equipment also added strength and support when grinding exceedingly small diameters to help stabilize the parts.

Beyond using the latest grinding technologies, we also used a profound understanding of the grinding process. Our experienced craftspeople maintained a steady pulse on the parts every step of the way, continually making minuscule machine adjustments to achieve the tight cylindricity tolerances and diameter consistency requirements.

RESULTS

Our ability to produce near-perfect cylindricity and achieve consistent diameters on the mass spectrometer's quadrupoles allow the global company to serve its customers in more than 100 countries. Their next-generation neonatal mass spectrometry instrumentation saves approximately 70 babies every day, and, to date, the company's newborn tools have screened more than 735 million babies globally.

In a proud moment, the acquired company's owner shared that despite searching the world for another component manufacturer that could achieve this extraordinary feat, they couldn't find one that could match our talent and capabilities.

"This is a super-specialized component manufacturing niche," said John Shegda, CEO, KMM Group, Ltd. "Our craftspeople are amazed to be among the only people in the world that can do this," he added.

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