Case study: Machine builders

DMNC-EDM

RENISHAW AGILITY

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Renishaw's AGILITY® 5-axis CMM advances EDM machine tool manufacture with streamlined, precision production

Background:

As the largest manufacturer of electrical discharge machining (EDM) machine tools in China, DMNC-EDM continues to develop high-end, high-quality EDM machines, and was looking for a versatile CMM to cope with their inspection needs.

Challenge:

Critical parts produced in-house must go through 100% inspection, but the traditional contact-measurement CMM system has insufficient capability to measure complex features such as small apertures.

Solution:

Renishaw's AGILITY CMM and REVO® 5-axis multi-sensor system provide flexibility with automatic switching between tactile scanning, touch-trigger, ultrasonic, vision and surface finish measurement.

The AGILITY CMM's 5-axis multi-sensor capability, decreasing average inspection time by 40%, has streamlined the inspection process and shortened the operation time.

The introduction of Renishaw's AGILITY CMM with REVO® 5-axis multi-sensor capability at China's premier EDM machine tool manufacturer, DMNC-EDM, has streamlined production, improved throughput and decreased average inspection time by 40%.

Electrical discharge machining uses sparks generated by rapidly pulsing high-voltage electrical discharges to shape parts. It is widely used on titanium alloys, tool steels, hard alloys, and other materials that are hard to machine with conventional cutting methods. EDM is also used to machine workpieces with complex geometric features.

Beijing Dimon Numerical Control Technology Co., Ltd. (DMNC-EDM) is the largest manufacturer of EDM machine tools in China and develops high-end EDM machines for domestic and international customers. It offers five ranges of machines, totalling nearly 50 models, providing core technologies in EDM and an extensive range of EDM equipment for mould manufacturing and the production of complex metal parts. The company is committed to advancing cutting-edge technology and superior quality machine production.

Designed to serve a wide range of applications, DMNC-EDM's ADI / ADV / SF series of high-end EDM machine tools are equipped with high-accuracy A / B / C axes. They enable 6-axis simultaneous machining and synchronised processing combined with industry-leading machining quality, automation, and intelligence.

Challenge

The manufacture of high-end, high-quality EDM machine tools does not rely on robust development and manufacturing capability alone. It also requires a comprehensive inspection and quality assurance process.

The advantage of CNC EDM machine tools lies in their ability to form complex surfaces and precise workpieces with small apertures. However, these same intricate parts present a quality assurance challenge.

Critical parts produced in-house by DMNC-EDM necessitate a 100% inspection rate, but measurement using traditional touch-trigger methods provides insufficient data to effectively inspect the contoured surfaces and the geometrical features of some complex profiles.

To maintain its reputation for high-end, high-quality EDM machine production, DMNC-EDM recognised the need for a more versatile and comprehensive inspection solution.

Mr. Ren Lian Sheng, the General Manager of DMNC-EDM, was already familiar with Renishaw's measurement technology. The shop floor has used Renishaw's machine tool probes, encoders, and other metrology solutions for a considerable time. It has also implemented a comprehensive array of Renishaw laser calibration solutions, including the XM-60 multi-axis calibrator, the XL-80 laser interferometer, and the QC20 ballbar, to enhance machine tool performance and establish preventive maintenance schedules.

Renishaw's AGILITY® CMM was suggested as an ideal solution for DMNC-EDM. Not only is it designed to deliver all the advantages of the REVO system's range of specialised sensors, but also because its unique 5-axis measurement technology and synchronised motion control deliver ultra-high measurement speed and increase inspection throughput.

Versatile, comprehensive inspection

"We first became aware of the 5-axis CMM in trying to solve the measurement needs of one of our customers. The application required the use of contact and vision probes to measure precise parts, as well as subsequent analysis of deviations, which numerous partners were incapable of supporting," explained Mr Ren.

"At that time, the sales and technical support team from Renishaw introduced us to the AGILITY CMM," he said. "After some discussions and experimentation, we found that the AGILITY CMM ultimately met our inspection requirements perfectly."

Offering both shop floor and laboratory model options, the full range of AGILITY CMMs combines the infinite positioning of the REVO-2 probe head with the most comprehensive range of sensors, including touch-trigger and contact scanning, surface roughness, temperature, ultrasonic thickness measurement and non-contact probes.

It allows manufacturers to carry out multiple measurement processes and report results on a single CMM. This integration reduced the amount of quality inspection equipment required and the time taken to prepare and handle workpieces. The result was an extremely streamlined inspection process and shorter operation time.

With the multi-sensor capability of its REVO® system, AGILITY® enables DMNC-EDM to conduct a variety of inspections, such as measuring the profile and form of critical parts using contact measurement and then inspect the geometric features of the parts' profiles using vision technology.

Mr. Zhang Xin Hui, Head of the Inspection Department at DMNC-EDM, elaborated on AGILITY's vision measurement capability, stating, "The AGILITY 5-axis CMM, combined with the MODUS software, provides a more comprehensive and powerful means of inspection."

Renishaw's MODUS software provides full compatibility with the AGILITY CMM and captures data collected from the multi-sensor REVO system. This simplifies data analysis and reporting, compared to combining data captured by different pieces of equipment. For instance, in measuring the part's thickness, surface finish or vision inspection, it allows the results to be compiled in a single report, for effortless analysis and evaluation.

Vision capabilities

"In particular, the RVP vision probe for the REVO system effectively measures the position and diameter of apertures machined on workpiece surfaces ranging from 0.3 mm to 0.5 mm in size, for which contact measurement is not suitable. Measurement with the RVP vision probe perfectly addresses and fulfils our requirements in this aspect," commented Mr. Zhang.

The RVP non-contact vision probe houses a 1.3 megapixel global shutter CMOS sensor and digital signal processor. The CMOS sensor inside the probe captures large amounts of light even with short exposure times, leading to quicker image capture and faster measurement times.

With the REVO 5-axis multi-sensor system on the AGILITY CMM, the efficiency of workpiece measurement is significantly improved

Mr. Ren Lian Sheng
General Manager of DMNC-EDM

Accuracy, speed and stability

According to Mr. Ren, the selection of CMMs relies on more than versatile and comprehensive inspection functions. “DMNC-EDM places great emphasis on a range of considerations including stability, accuracy and speed.

For an inspection tool like a CMM, stability is paramount, and everything would be meaningless without it,” he said.

Every component in the AGILITY® CMM from the machine frame and REVO® 5-axis multi-sensor probing system to the encoders, machine controller, linear motors, styli, part fixturing, MODUS™ measurement software, and even the laser-based mapping and verification systems, is designed and manufactured by Renishaw, ensuring reliability and consistent performance crucial for precision manufacturing.

“The next most important factor is measurement accuracy. Without accuracy, there is no way to meet our strict requirements for accurate inspections of mechanical workpieces.

However, speed is equally vital as it equates to cost. Equipment depreciation, floor space occupancy, personnel expenses, and per-unit consumption are all related to speed,” said Mr. Ren.

Efficiency and savings

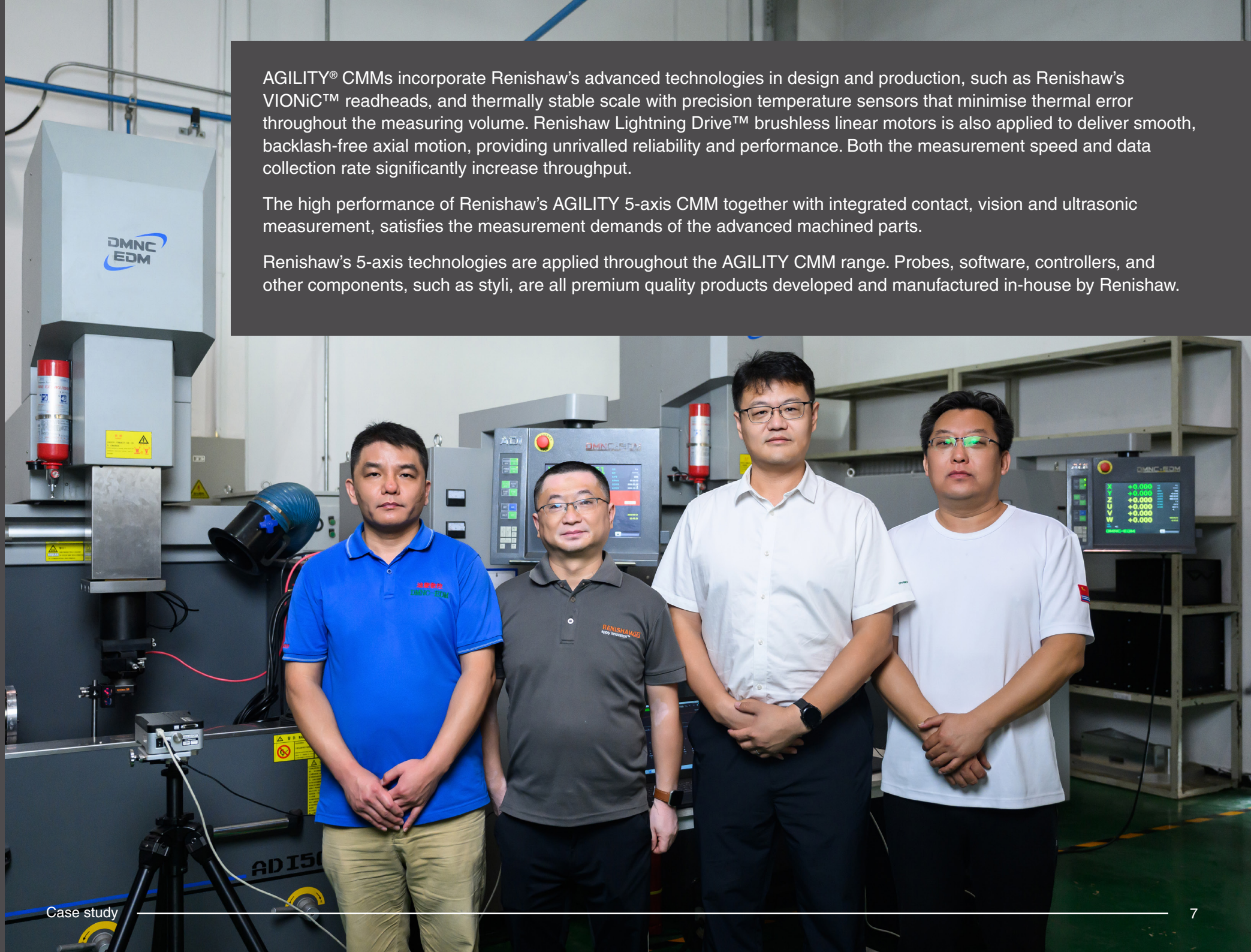
> **“The AGILITY CMM’s 5-axis technology improves measurement precision and significantly boosts throughput. The combination of AGILITY and the REVO multi-sensor system has enabled us to improve the efficiency of our workpiece measurement and we have realised an average time saving of 40%.”**
>
> **DMNC-EMD (China)**

Results

AGILITY® CMMs incorporate Renishaw's advanced technologies in design and production, such as Renishaw's VIONiC™ readheads, and thermally stable scale with precision temperature sensors that minimise thermal error throughout the measuring volume. Renishaw Lightning Drive™ brushless linear motors is also applied to deliver smooth, backlash-free axial motion, providing unrivalled reliability and performance. Both the measurement speed and data collection rate significantly increase throughput.

The high performance of Renishaw's AGILITY 5-axis CMM together with integrated contact, vision and ultrasonic measurement, satisfies the measurement demands of the advanced machined parts.

Renishaw's 5-axis technologies are applied throughout the AGILITY CMM range. Probes, software, controllers, and other components, such as styli, are all premium quality products developed and manufactured in-house by Renishaw.



DMNC-EDM

DMNC-EDM aspires to become a comprehensive supplier across the entire electro-machining sector. In addition to its ongoing intensive research in the field of EDM machine tools, it has also introduced new products in its EDM drilling machine portfolio while continuously developing EDM wire-cutting equipment. The addition of the AGILITY® CMM, demonstrates DMNC-EDM is fully committed to rigorous quality inspection.

About DMNC-EDM

DMNC-EDM is a national high-tech enterprise in China that integrates scientific research and production, specialises in manufacturing high-accuracy CNC EDM machine tools, and boasts a domestic market share exceeding 20%.

Catering to high-end domestic customers, DMNC-EDM has established sales showrooms in 13 key industrial regions, including Shanghai, Ningbo, Shenzhen, Dongguan, Chengdu, and Chongqing. The company is also proactively expanding into international markets such as Canada, Italy, Malaysia, Mexico, India, and Vietnam, providing comprehensive EDM manufacturing solutions that are intelligent and flexible.

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Issued: 03.2025