

CYBER WORLD

Advanced Digital Manufacturing



Mazak iSMART Factory

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2016
No. 48



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Harness the Power of Advanced Manufacturing

Since the start of its Kentucky operations in 1974, Mazak Corporation, the North American manufacturing, sales and support subsidiary of Yamazaki Mazak Corporation, has maintained a "Rock Solid™" commitment to U.S. manufacturing that involves using the most innovative technologies available to continuously improve its production processes and machine tool designs. And, it is this unwavering commitment that has put Mazak at the forefront of advanced manufacturing, allowing both the company and its customers to stay strong in all economic climates.



03

In terms of its manufacturing operations, Mazak has expanded its Kentucky factory countless times over the past four decades to maintain the shortest possible delivery times and ensure every new machine coming off the line has the latest technology available.

Currently, Mazak Kentucky produces almost fifty machine models of turning centers, Multi-Tasking machines, vertical machining centers, including 5-axis models. A total of more than 32,000 machine tools has been produced there.

And Mazak Kentucky is implementing intelligent manufacturing initiatives that set the foundation for what will be the ultimate smart factory – the Mazak "iSMART Factory™". The completion of its first phase was introduced during the "Discover 2015" event held last Fall.

Complete Digital Factory Integration

The Mazak iSMART Factory™ uses advanced manufacturing cells and systems together with full digital integration to achieve free-flow data sharing in terms of process control and operation monitoring. Connectivity of machines and devices in the factory makes it possible to monitor and retrieve the machine data and analyze the information for optimum plant management. In Kentucky, both management and manufacturing easily access the same real-time manufacturing data to improve overall productivity efficiency and responsiveness to customer/market changes.

01-02. Advanced production equipment in the Kentucky iSMART Factory™
03. Mazak Corporation production facility in Florence Kentucky



Mazak iSMART Factory™ booth in Kentucky factory

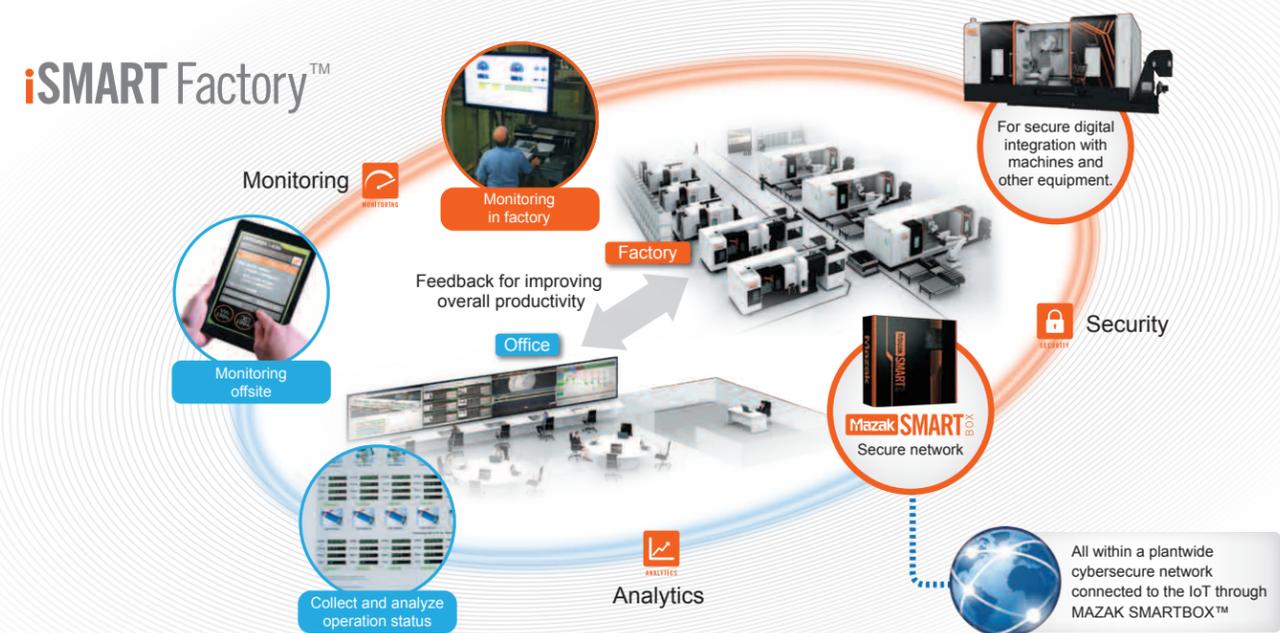


Robot demonstration during "Discover2015"

Operation Status monitoring for improved productivity

A series of 60-inch display monitors catch the eyes of visitors in the Kentucky iSMART Factory™. These monitors show real-time machine utilization data of the plant, allowing operators to know machine uptime and downtime by one glance. By monitoring and analyzing operation status, managers are able to make decisions for improved productivity.

Almost as soon as Mazak Kentucky produced reports on its plant floor, it experienced a six percent increase in utilization. Without any other actions taken, these immediate gains resulted from operators simply being aware of how their time management affected machine utilization. To date, efforts to reduce downtime – as based on factory-floor report data – has yielded a more than double-digit percentage improvement in machine utilization for the monitored machines. As a result of this windfall machine capacity, Kentucky factory reduced operator overtime by 100 hours per month and brought 400 hours per month of previously outsourced work back in house. By analyzing big data from monitoring sensors on machines and other equipment, predictive diagnostics will be performed that is expected to realize a large reduction in maintenance expense.



Large displays throughout factory show machine operation status

MAZAK SMARTBOX™ utilizing MTConnect® for secure digital integration

It is not easy to connect machines safely and to monitor all factory equipment with one system regardless of machine type, model, or age. The Kentucky iSMART Factory™ adopts the open, royalty-free manufacturing communications protocol "MTConnect®" which is offered by the US Association for Manufacturing Technology. The MTConnect® standard provides connectivity and the capability to monitor and analyze the entire production floor data; machines, test stands and other equipment with one system.

In an industry-first collaboration, Mazak partnered with IT leader Cisco Systems Inc. and achieved a significant leap forward with the successful digital integration of the Mazak Kentucky factory in order to establish a plant wide secure network. The Mazak and Cisco project also resulted in the development of the "MAZAK SMARTBOX™" for an easy and secure entrance into the digital integration of a factory.

Using MTConnect® technology as the foundation, MAZAK SMARTBOX™ connectivity of machines and devices allows for enhanced monitoring and analytical capabilities including advanced cyber security protection.

The MAZAK SMARTBOX™ is designed to help prevent any issues with unauthorized access to the machines and equipment within the network. The MAZAK SMARTBOX™ satisfies the highly critical security concerns of IT departments when connecting legacy equipment to a plant's main network for the purpose of gathering manufacturing data via the MTConnect® protocol.



Mazak iSMART Factory™ Evolution

"At the U.S. factory we have had a long commitment to growth and technological advancement, with a critical part of that strategy being such factors as plant-wide connectivity, automation and optimized production flow," said Brian Papke, president of Mazak Corporation. "As a result, we continue to experience significant increases in machine utilization, shorter throughput times, elimination of non-value added operations, Production-On-Demand capability and more efficient part machining." By integrating the iSMART Factory's concepts, Mazak is taking another positive step in further increasing the productivity of our North American operations and ensuring the strong competitiveness of our Kentucky manufacturing."

While this is just a glimpse into the Mazak iSMART Factory™, it is easy to see that the company is committed to redefining what it means to be productive and competitive in an industry that continues to evolve.

- 01. MAZAK SMARTBOX™ developed in collaboration with Cisco Systems Inc.
- 02. Mazak machine tool with MAZAK SMARTBOX™
- 03. The tablet display for factory tour
- 04. Factory tour in electric cart



01

COMPANY PROFILE

Customer Report 01

Japan Nikki Denso Co.,Ltd.



Nikki Denso Co.,Ltd.

CEO : Shigeru Kawamura
 Head office : 2-8-24 Arima, Miyamae-ku, Kawasaki-shi, Kanagawa
 Sakura Factory : 1-4-2 Ōsaku, Sakura-shi, Chiba
 Number of employees : 200
 www.nikkidenso.co.jp



Customer Report 01
Climbing to the top of the DD motor industry with originality

Japan Nikki Denso Co.,Ltd.

"We seek not only 'control of power' but also 'control of systems,' which aims to control machines and other devices themselves." — This is a future business goal set by Mr. Shigeru Kawamura, president of Nikki Denso Co.,Ltd. The company in Kawasaki, Kanagawa Prefecture manufactures direct drive (DD) motors and other Factory Automation-related equipment for industrial machinery, and has the top share in the DD motor market in Japan (in 2015). What is the secret of the strength of its products, which are used in a large number of industrial machines?



Nikki Denso was established in Tokyo in 1967 by the father of Mr. Kawamura, who earlier was an electrical engineer in a machine tool manufacturer. "The company name in Japanese represents a strong determination of my father to accept all jobs for mechanical and electrical equipment from across Japan," said Mr. Kawamura. After moving its head office to the current location in 1971, Nikki Denso developed DC servo drives in 1974. The company's unrivalled strength in control systems as well as motors has been cultivated since those days. It released the industry's first asynchronous induction AC servo system in 1984, and constructed the Sakura Factory in Chiba near Tokyo to set up a full-scale production system in 1986. When linear motors appeared on the market in the 2000s, the company developed disc servo motors ahead of the rest of the industry. The technologies accumulated in those years led to the development of the DD motor later.



INTEGREX 400 in operation

In-process time has been reduced by half with multi-tasking machines

"While the DD motor is a power source, it also has to support loads as a mechanical component," said Mr. Kiyoshi Araki, general manager of the production department. This feature encouraged the company to establish its basic stance to "pursue better performance perpetually" (according to Mr. Kawamura) through design and development appropriate to the purposes, uses and applications sought by customers. To supply products that satisfy super-high precision measured in microns required by customers, it is necessary to have equipment that can perform machining with even higher precision. Accordingly, based on Mazak's "DONE IN ONE™" approach to complete the whole process of machining from raw material to finished part in just one machine, Nikki Denso has set up a production system that centers on multi-tasking machines in the machining facility of the Sakura Factory. The production line composed of a large INTEGREX e-1060V multi-tasking machine, INTEGREX 400-III and 400-IV (3 units) multi-tasking machines, a VTC-300 vertical machining center and other machines has not only improved precision but also reduced the setup time. Mr. Katsuhisa Kawaguchi, section manager of the production

department, said "The in-process time was reduced by half after the introduction of the multi-tasking machines." In this way, Mazak machines underpin the high precision and high productivity pursued by Nikki Denso.

τ engine developed with environmental considerations

To assert its presence as a manufacturer dedicated to motor systems, Nikki Denso trademarked the "τ (tau) engine" as "a guideline for the development of industrial motors and drive systems that meet global environmental requirements" in 2010. The aim is to provide drive sources that are friendly to the global environment with features such as high performance, high efficiency, elimination of maintenance and silent operation. The company is also committed to new areas based on the concept of the τ engine, such as large DD servo drives for drive shaft testing equipment of a large automobile manufacturer. Mr. Kawamura says that he always tells himself "This is not enough." The attitude of not being satisfied with the status quo seems to be the very source of the company's strength.



Assembly area



Mr. Kawamura, president, explaining the company's concepts

"We can compete with large companies due to the customer focused policy we have utilized consistently since our start of business as well as our technical power." said Mr. Kawamura. His words are endorsed by the diversity of sectors where the company's products are used in industrial machinery, ranging from liquid crystal, semiconductors, automobiles, healthcare, construction, printing and food to transportation and logistics.

Products in the NIKKI τ series, τ DISC, τ iD roll



01



02



03

- 01. Precision τ DISC components machined on a Mazak machine tool
- 02. Many Mazak machines are in use in the machining area of the No.3 Plant
- 03. Mr. Kiyoshi Araki, general manager of the Production Department.
- 04. Employees in the machining area



01



GE Hungary Kft-Power

President : Joerg Bauer
 Head Quarters : 1138 Budapest, Váci (Váci Greens Office Center) ut 117-119. A.5
 Factory : 2112 Veresegyház Kisret utca 1. Hungary
 Number of employees : 1,500
 www.ge.com



GE imagination at work

Customer Report **03**

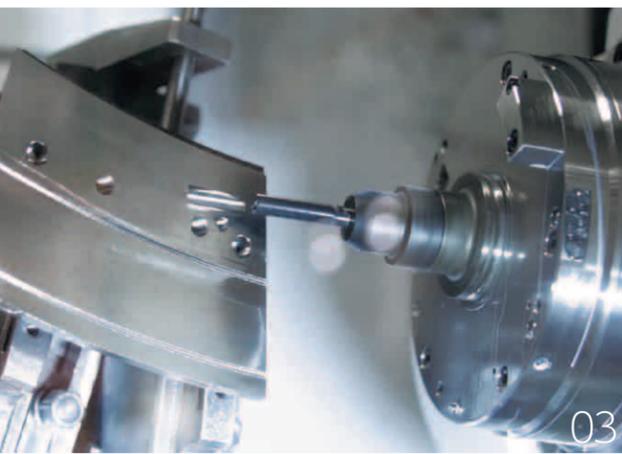
A powerful partnership with Mazak

Hungary GE Hungary Kft-Power

GE Hungary Kft – Power is the Hungarian subsidiary of GE Power. GE Power is a world leader in power generation. What is less known, is that many of GE Power's products are built at its plant in Veresegyház, near Budapest in Hungary. This plant was built in 2000 and today employs 1,500 employees in manufacturing as well as service and support.



02



03

01. Mazak machine tools in the GE Hungary factory
 02. 3 INTEGREX i-630V/6 multi-tasking machines in production line
 03. High-accuracy complex 5-axis machining by INTEGREX i-630V/6

GE Power is one of the world's largest suppliers of gas turbines which are used across industry. Their product range has a wide range of heavy-duty gas turbines, as well as gas turbines derived from jet engines and reciprocating engines. "All of our machines were completely new, but no manufacturing plant can stand still, you have to continue to invest." says Róbert Hegyi, Director of Production for GE Hungary. When they wanted to upgrade the machining technology at their plant ten years after opening, they decided to choose Mazak as their preferred supplier among the many machine tool manufacturers.



First Mazak HORIZONTAL CENTER NEXUS 8800-II s installed in GE Hungary

The first machines, HORIZONTAL CENTER NEXUS 8800-II machining centers, were installed in 2012. "We wanted to use the new machines for the production of turbine stator blades, but it was crucial for us that we received a great deal of support in the initial stages from Mazak, particularly with programming." He continues: "The MAZATROL control was new for us, but the Mazak team were very helpful in preparing machining programs for us, which made it much faster for us to fit them into production and integrate them into the whole machining process."



Easy operation by conversationally programmed Mazatrol CNC system

Elimination of 1,800 hours of handling large components by overhead crane annually

GE Power continued its investment with Mazak, by ordering 5-axis machines for the process of machining a very large component. Three INTEGREX i-630V/6 machines, which have a very large machining area, were installed in early 2015. Róbert has been particularly impressed with the INTEGREX's multi-tasking capability. "Due to the 5-axis machining process we were able to design a new fixture which has made it possible to finish the component in a single workpiece set-up, whereas previously we had to use three fixtures and three separate set-ups," he says. The result has been a dramatic production improvement. "Due to this improvement we have been able to eliminate 1,800 hours of handling large components by overhead cranes annually which has, in turn, shortened cycle times and made the production environment much safer, which is very important for our company." GE Hungary has been satisfied with Mazak's flexible arrangement to one specific customer request in regard to the tool magazine. "The black color of the tool magazine was not the most appropriate for us, so we asked the Mazak team to paint it white during

manufacture in the Mazak factory. The change has meant that we have a much brighter work area with good visibility and safety at all times. The last machines were installed with white tool magazine, and because of that our employees were really pleased."



All operations complete in a single workpiece set-up

High expectations for the new Mazak Hungary Technology center

Going forward, Róbert expects the partnership with Mazak to continue, in large part due to the excellent application support and advice he receives. "The Mazak team helps us a lot, in terms of choosing machines from their wide product range which match our machining requirements and to ensure that we obtain the most suitable and effective machines for our production." He was also especially looking forward to the opening of the new Mazak Technology Center near Budapest in Hungary on May 11th. "We always participate in the events organized by Mazak. In fact, we were delighted that one of our gas turbine generator components was on display at the Grand Opening." Their participation enhances the long-term partnership between GE Hungary and Mazak.

► Gas turbine diaphragm component





01



Senior Aerospace (Thailand) Limited

Chief Executive Officer : Jamie Looker
 Address : 789/115-116 Moo 1, Pinthong IE, Nongkham Sriracha, Chonburi, 20230, Thailand
 Number of employees : 350
 www.seniorplc.com



Customer Report 04

Making a leap with the production of parts that support the aerospace industry in Thailand

Thailand Senior Aerospace (Thailand) Limited

In the context of the worldwide growth of the aerospace industry, Thailand also plans to launch a project to vitalize its aircraft industry in collaboration with leading aircraft parts manufacturers in the world under the initiative of the national government in 2019. Targeting this industry, Senior Aerospace (Thailand) Limited (SAT) manufactures aircraft components such as compressor blades and sophisticated seat components.



02



03

01. QUICK TURN SMART and many other Mazak machines are installed in the plant
 02. Components that "always surpass the quality standards of customers."
 03. Engineers who work with pride and enthusiasm

SAT was originally established as Weston (SEA) Co., Ltd. in 2005, and affiliated with Senior plc in 2011 to change the corporate name to the current one in January 2014. In the group, SAT serves as a business unit dedicated to aircraft to process precision parts made of aluminum and difficult-to-cut materials such as inconel. "We are committed to the supply of cost effective technical solutions that always surpass the quality standards of customers," says Mr. Jadsada Kingkaew, the engineering manager. The aerospace industry is gaining momentum on a global scale as the demand for aircraft bodies is increasing. In this context, the rapidly growing Asian region is receiving attention as an effective place for the production of aircraft parts. In particular, the Thai aircraft industry is growing significantly in the world with the promotion of an aircraft industry development project by the Thai government. A company on the frontline is SAT. "Through the project, Thailand will be the core of the aerospace business in the Asia Pacific region. We believe that it will attract investment in Thailand from many aerospace-related companies."

Targeting 1 million compressor vanes a year

While supplying parts for the engines and bodies of the Airbus A320, A330, A350 and A380 as well as the Boeing 787, SAT is also committed to the development of new plants in anticipation of business expansion in the future. Following the new plant phase 1 completed in February 2015 with an area of 8,621 m² (92,800 ft²), the construction of phase 2 with an area of 7,600 m² (81,800 ft²) was completed in April 2016. The new floor space allows expansion of aerofoil production in excess of 1 million blades per year and will provide space for further growth in aeroframe structures component manufacture. In addition, while the company now produces sophisticated seat components for 2,592 aircraft a year, the production level is expected to rise to 3,600 aircraft in accordance with the increase in the number of aircraft produced by aircraft manufacturers.

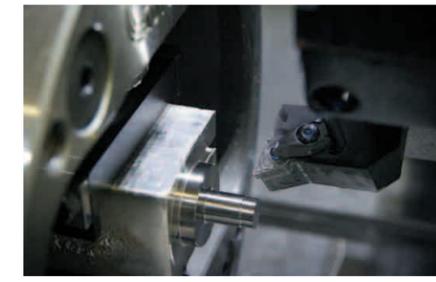
It seems that manufacturers select machines for the processing of the parts used in aircraft, which carry people, not only based on the performance but also in consideration of the attitude of the manufacturer including the support system. As a result, a total of 42 Mazak machines are now in full operation in SAT.



Concept drawing of new plant.

The reliable technical capabilities also help SAT fly high

Mazak opened its Si Racha branch as the second service base in Thailand in August 2014 ahead of the competitors. With the two Thai bases including the headquarters in Bangkok, Mazak provides quick and customized services that contribute to SAT's production. The Mazak machines that occupy the vast majority of machining tools owned by SAT certainly underpin the local aircraft parts industry. SAT's technical abilities cultivated through machining of parts that are difficult to process will help the company, as well as airplanes, fly high.



High precision machining by the QUICK TURN SMART



Mr. Theerayut Losathien from the Aeroengines department

Parts machining in SAT is overwhelming in both terms of quality and quantity, which is supported by 42 Mazak machines including the VERTICAL CENTER NEXUS 410A delivered in November 2005. "In addition to the balance between price and quality, we are also satisfied with Mazak's daily service and quick support in case of a problem. We were very grateful when the support staff worked patiently to solve problems from early morning to late at night even though it was Saturday."



▶ Jet engine compressor variable vanes

MAZAK PEOPLE

Mazak Sulamericana Ltda.

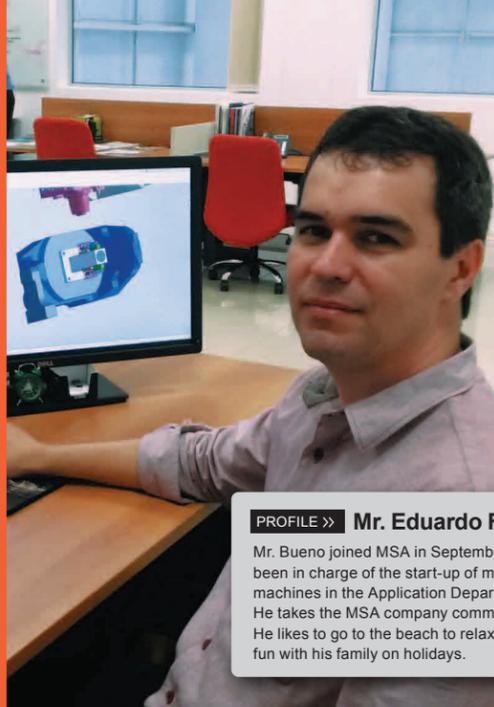
 **Mr. Eduardo Felipe Bueno**

Working to improve customer satisfaction by building a good relationship of trust and partnership with customers

Yamazaki Mazak operates many bases in Japan and other countries for various functions such as production, sales and before and after-sales service and support. MAZAK PEOPLE introduces employees who are active in the forefront of the Group companies. This issue features Mr. Eduardo Felipe Bueno, who is working for Mazak Sulamericana Ltda. (MSA), Mazak's sales and service base in Brazil. He has worked in the Application department as a mid-level manager involved with many important projects.

PROFILE >> Mr. Eduardo Felipe Bueno

Mr. Bueno joined MSA in September 2001, and has been in charge of the start-up of multi-tasking machines in the Application Department since 2004. He takes the MSA company commuting bus to work. He likes to go to the beach to relax his mind and have fun with his family on holidays.



— What is your current job ?

I am very focused on customer workpieces for runoffs and turnkey projects. In addition I support the local sales staff in defining best machining solutions for customers. At the same time supporting my application department and sales colleagues with demonstration cutting and technical solutions during MSA events and exhibitions. I can quickly obtain large experience in many areas, although it is very tough work for me.

— What do you value when you are working?

Above all - customer satisfaction. In my job, I give priority to quality, integrity, and efficiency. It is rewarding to see a customer's reaction after successfully solving his problem.

— What is the happiest thing you have experienced during work?

When I worked in the customer support department, I travelled to the South Region to start up a VARIAXIS 630 II 5-axis machine. The customer was so pleased with the support and machine performance, the company owner assigned a person to host me during the weekend, showing me nice tourist places and typical local food restaurants. I am sure success in working together establishes a long term relationship.



Mr. Bueno working in MSA showroom

— What is the main difference between Brazilian customers and those of other countries?

Brazil has a large number of small and medium size companies. Due to their size they lack engineering people and manufacturing expertise. Providing these kinds of customers with application and engineering support is key for their success and customer satisfaction.

— What is your most favorite Mazak machine and why?

My favorite machine is the INTEGREX i series. I have had opportunity to work recently with these machines, doing test cutting. I have been impressed with the accuracy, robustness and speed of these machines. It's easy to work with them due to the ergonomic design such as easy accessibility to workpieces and the amazing windows, making operation pleasant.



Lunch at MSA cafeteria

— Do you have any future goal for your work?

For me my major challenge in the future is to become a professional specialist in 5-axis CAM. I realize that I am still in the early stages, but my dream is to become a trainer in 5-axis processing in the future. Working in the application department, gaining experience with our INTEGREX, VARIAXIS and VERSATECH machines and some additional training will help me become a qualified specialist'.

When Mr. Bueno started at MSA, he was in charge of customer training for the Mazatrol control as a teacher and was a mechanical engineering student going to school in the evening at the same time. After a few months, he was given the opportunity to handle a runoff of a FH-4000 horizontal machining center, his first significant task in the company when he was only 20 years old. He said it was my first challenge at the company. Utilizing his innate talent, courage and everyday effort, he will surely be a 5-axis processing specialist in the near future.

The most important items for me

Family photo

I usually go out with my family on weekends, because my family is a crucial part of my life. For me to spend time with my family is the most pleasant. When I get tired from work or confront a problem, this photo encourages me and makes me feel that I can tackle any difficulty.



News & Topics

Opening of the Setouchi Technology Center



Setouchi Technology Center



Okayama, Japan

The new Setouchi Technology Center was opened in Okayama Prefecture in April. This facility with a land area of 9,300 m² (100,000 ft²) and total floor space of 2,700 m² (28,300 ft²) is Mazak's seventh technology center in Japan. The center will provide enhanced before and after sales service and support to customers in South Central Japan.

The showroom in the Technology Center, which is one of the largest in Japan, is currently displaying 11 of the latest Mazak machine tools, including large machining centers, multi-tasking machines and a 3D laser processing machine. The highly skilled staff will propose the best solutions for the shipbuilding, aerospace, industrial machinery and other heavy industries, which are the principal sectors in the region.



Opening ceremony ribbon cutting

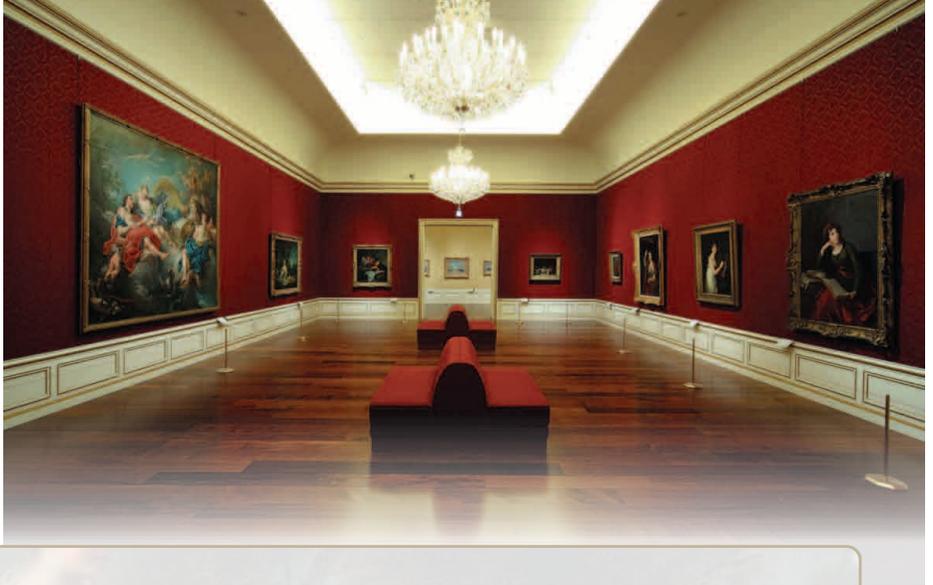


Showroom



Solution corner exhibiting various components produced by Mazak machines

The Yamazaki Mazak Museum of Art was opened in April 2010 in Aoi-cho, the heart of Nagoya in order to contribute to the creation of a rich regional community through art appreciation and, consequently, to the beauty and culture of Japan and the world. The museum possesses and exhibits paintings showing the course of 300 years of French art spanning from the 18th to the 20th centuries collected by museum founder and first museum director Teruyuki Yamazaki (1928 - 2011), as well as Art Nouveau glasswork, furniture, and more. We look forward to seeing you at the museum.



LANCRET, Nicolas
“The Tease”

THE YAMAZAKI MAZAK MUSEUM OF ART
Collection Showcase 1



LANCRET, Nicolas [1690-1743]
 “The Tease” 1736
 Oil on canvas

Lancret was a genre painter active in the early 18th century. His patrons included European royalty such as Louis XV of France and Frederick II of Prussia as well as great collectors from the financial circles of Paris such as Pierre Crozat. In this painting, made for the queen, Marie Leszczyńska, a village girl tickles the face of a young man taking a nap with a stalk of wheat. Lancret and other Rococo painters were fond of this sort of innocent pastoral theme. Marie Leszczyńska was a daughter of the king of Poland. She married Louis XV in 1725 and was six years older than the king. After giving birth to three future queens and the crown prince, she retired from court life and stayed in private apartments at Versailles set aside for her, spending her days at prayer in the chapel. When paintings were ordered during a remodeling of the queen's apartments in the 1730s, Lancret did two genre paintings, this work and Turtledove (London, Harari and Johnes Ltd.). Both are pastoral scenes depicting lovers and were placed in oval carved wood frames as part of the interior décor. It is interesting that this sort of fashionable subject was chosen for the private rooms of the pious queen.

THE YAMAZAKI MAZAK MUSEUM OF ART
Collection Showcase 2

GALLÉ, Émile “Marquetry and applied vase with columbine design”

The main form of this vase, with thirteen vertical striations, was produced with a mold. Columbine motifs are applied to the surface. Four legs of semi-transparent violet glass are fused to the lower part of the vase so that they hang down, and their ends are curved back and attached to the base. They have the form of the long spurs that grow from the backs of columbine petals. These varied elements produce an overall image of columbine buds just beginning to bloom. Flowers in full bloom and luxuriant leaves are depicted on the body with marquetry. The unity of the decorative motifs and the overall form of the vase is achieved with techniques that became prominent in Gallé's work in the 1890s, showing the inventiveness that led to the Art Nouveau style.



GALLÉ, Émile [1846-1904]
 “Marquetry and applied vase with columbine design” 1898-1900