

MECHATRO+ [PLUS]

ENGLISH EDITION

VOL. 1

Development Story

eX-F60

2D Fiber Laser Processing Machine

iQ Care Remote 4U

Remote Service

M800/M80 Series

Computerized Numerical Controllers

Solution Case Study / Interview

KYB Corporation

Ueno Tekko Co., Ltd.

NITTETSU Co., Ltd.

Hoden Seimitsu Kako Kenkyusho Co., Ltd.

Nichidai Corporation



MECHATRO+ [PLUS]

Cover photo:
Tokyo Station Marunouchi Station Building
(Chiyoda Ward, Tokyo)

Tokyo Station has entered its second century since opening in 1914. Designed by the acclaimed architect of the era, Tatsuno Kingo, the station building withstood the Great Kanto Earthquake but suffered major damage in air raids in 1945. The red dome roof damaged at the time was restored in 2012.

Today, the station is illuminated from sundown to around 9pm using LED light fixtures manufactured Mitsubishi Electric, enabling passersby to enjoy the beautiful night scenery created. A full-color LED light show is planned as a special event for the end of the year.

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Message Marking the Launch of MECHATRO+(PLUS)

I would like to take this opportunity to express my sincere appreciation for your ongoing support of Mitsubishi Electric and our affiliate companies.

On this occasion, we have redesigned the Japanese-language version of MECHATRO+, which has been highly regarded since first publication in December 2015, and now offer an English-language version.

Over the 43 years since the Industrial Automation Machinery Marketing Division was established, we have helped to increase the competitiveness of manufacturing companies through R&D and the commercialization of electrical-discharge machines, laser-processing machines, and computerized numerical control devices, just to name a few items.

Currently, our co-workers in all areas of operations at every manufacturing and research site are combining their strengths and constantly challenging themselves to develop products that can contribute to the monozukuri of the world by tapping into Mitsubishi Electric's overall potential.

At the same time, in terms of initiatives for supporting our customers with after-sales service, we will further enrich our overseas after-sales service network by increasing the number of bases, speeding up our response, and other efforts, in addition to constantly evolving the services we provide.

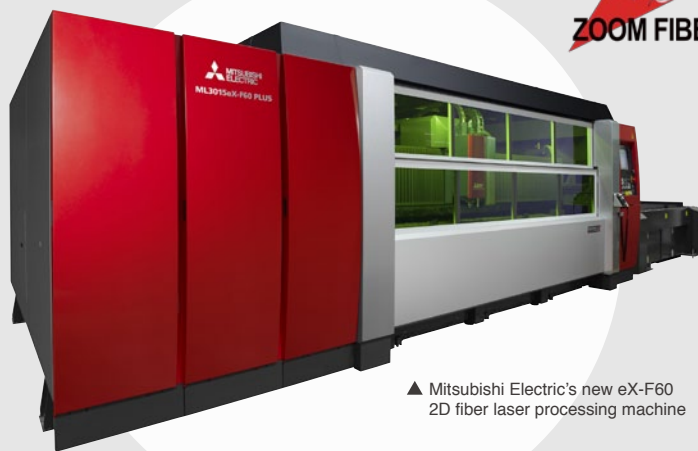
Mitsubishi Electric will continue exerting every effort to provide leading technological development and services as your monozukuri partner.

Amidst this, the MECHATRO+ is an important tool that provides our valued customers useful information to serve as hints for business success. Moving forward, we will continue to further enrich and evolve the content of this publication. We thank you for your ongoing support and patronage of our products and services.

eX-F60 2D Fiber Laser Processing Machine



In January 2016, Mitsubishi Electric released the eX-F60 two-dimensional (2D) fiber laser processing machine. Its improved power of 6kW, high-speed processing and ability to perform high-speed, high-quality processing of thick mild steel sheets were features that had been difficult to achieve with fiber lasers up to that time. Moreover, equipping the machine with a newly developed “Zoom Head” made it possible to eliminate the cumbersome task of set-up changeover each time various materials were processed, thereby significantly enhancing productivity.



▲ Mitsubishi Electric's new eX-F60 2D fiber laser processing machine

6kW laser processing machine equipped with new Zoom Head developed by Mitsubishi Electric

In January 2016, Mitsubishi Electric released a new lineup of 2D fiber laser processing machines consisting of six models, and now offers 10 fiber laser processing machine models. Of these, the eX-F60 has an improved power of 6kW and comes with Mitsubishi Electric's independently developed Zoom Head processing head.

Zoom Head controls the position of multiple optical lenses, and has an auto-adjust mechanism that enables the diameter of the focusing beam to be adjusted freely and the beam shape to be adjusted. In laser processing, the optimal beam diameter and shape differs depending on the thickness and material of the sheets being processed. On the heads used to date, it was necessary to change the cartridge-type optical lens in order to adjust the focusing beam diameter and beam shape. Zoom Head eliminates the cumbersome task of set-up changeover and greatly contributes to the improved productivity of processing lines.

Mitsubishi Electric improved the power of fiber laser processing machines to 2.5kW in 2012 and 4kW in 2014. If the power is raised, the

processing speed becomes faster, meaning that productivity is increased and it becomes possible to process thick mild steel sheets such as steel.

Accordingly, when Mitsubishi Electric completed the 4kW model in 2014, it was decided that the next model should achieve an even higher power of 6kW, which determined the direction for the FY2015 product release.

In actuality, Takayuki Hirano and his team from the Laser Application Technology Section of the Laser Systems Department at Nagoya Works began the fundamental research for 6kW processing technology in 2013. Hirano explains, “The aim of the fundamental research was to explore what type of processing would be possible with a 6kW machine.”

Based on this fundamental research, the Laser Processing Machine Design Section of the same department began establishing specifications for a processing head. Ryotaro Nagai stepped forward to take charge of this development. After consulting with Mr. Hirano and his team, Mr. Nagai reached a decision, “The processing head is a major factor behind product strength. If we are going to do it

anyway, we may as well make a Zoom Head so we can differentiate ourselves from our competitors.”

The rest of the development team agreed with Mr. Nagai's view and direction for the project was finalized as 2014 drew to a close. The problem was, however, that only one year had been allowed for development. For this reason, some members wanted to purchase a processing head from a parts manufacturer. But Mr. Nagai and Mr. Hirano were uncompromising in their stance of developing one in-house. Mr. Hirano commented, “I really wanted to enhance the brand strength of Mitsubishi Electric's laser processing machines by developing our own unique head.”

At the beginning of 2015, Mr. Nagai began developing a prototype together with a colleague from the same Laser Processing Machine Design Section. After the specifications were determined, including a zoom magnification 1.4 to 4.0 times greater than competitors' products, compatibility with the existing cartridge-type head, the ability to mount on other fiber laser processing machines as an option, and the ability to adjust beam shape to suit thick sheets among others, a drawing was prepared. It was just after the spring holidays that the first prototype was completed based on this drawing.

After actually performing processing work using the first prototype, Mr. Hirano gave the following assessment, “Great performance and much better than I expected from an initial prototype.” However, there were quite a number of issues to be resolved.

The main issue was the effect of dust particles. Fiber lasers have a short wavelength, and therefore even minute particles invisible to the naked



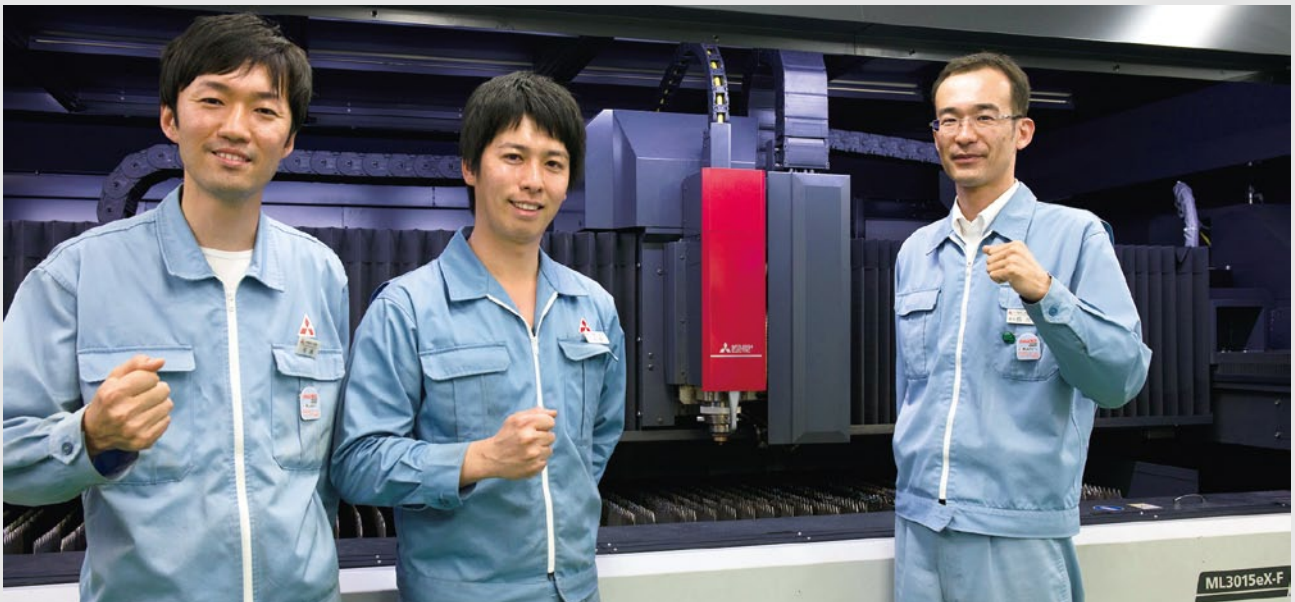
Ryotaro Nagai
Manager
Laser Processing Machine Design Section
Laser Systems Department
Nagoya Works, Mitsubishi Electric Corporation



Takayuki Hirano
Laser Application Technology Section
Laser Systems Department
Nagoya Works, Mitsubishi Electric Corporation



Shinji Hirabayashi
Laser Quality Assurance Section
Laser Systems Department
Nagoya Works, Mitsubishi Electric Corporation



Improving productivity through high-speed processing and significant reduction in changeover time

eye can cause the coating on the optical lens to deteriorate and adversely affect processing. It was more difficult than the development team expected to secure resistance of the Zoom Head against dust particles, which are undoubtedly present in environments where laser processing machines are used. Mr. Nagai recalls, "Conventional heads are assembled in general plants. However, the Zoom Head is assembled in a Class 1000 clean room to ensure thorough dust prevention in the production process as well. Despite this, if problems were discovered in assessment, the cause was identified and the design changed to prevent recurrence. That phase was quite grueling."

In this way, issues were resolved one after the other, and when the second prototype was completed in July, it also underwent stringent inspections. The team was still a long way from commercialization, but at the end of summer, a plan was raised that perplexed Mr. Nagai. It was decided that Mitsubishi Electric would participate as a reference exhibitor in FABTECH, an international machine

tool fair held in Chicago, that November. Mr. Hirano saw this in a positive light as a "good opportunity to be rated." But with only a few months to make improvements, Mr. Nagai was thinking to himself, "Hey, wait a minute! We're not ready"

Shinji Hirabayashi from the Quality Assurance Section of the same department began a full-scale evaluation of the second prototype. Unlike Mr. Hirano, who focused on performance aspects in his evaluation, Mr. Hirabayashi evaluated the product from the viewpoints of users and service personnel. While envisioning the actual environment the machine would be used in, Mr. Hirabayashi checked the user-friendliness from the user's perspective and the ease of maintenance from the service personnel perspective. Having once worked as a service engineer for laser processing machines at the affiliate company Mitsubishi Electric Mechatronics Engineering Corporation (formerly Ryoden Koki Engineering), Mr. Hirabayashi has a strict eye indeed. His verdict on the second prototype was that, "It is well done for a second prototype." However, there were still many improvements that needed to be made, particularly with regards to resistance against minute dust particles, which leads to displacement of the beam position at the tip of the processing head. Mr. Hirabayashi commented, "Using the evaluation criteria for conventional machines as the basis, I added additional criteria for this model, which

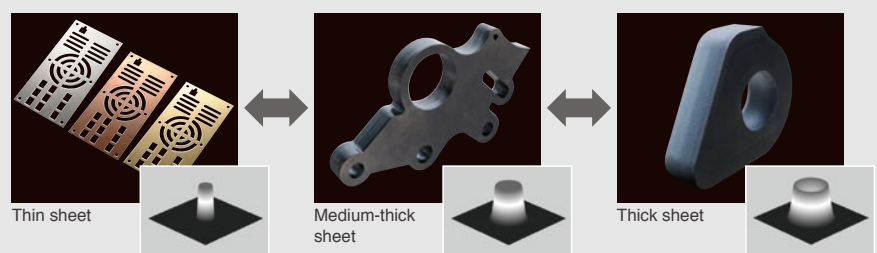
features the Zoom Head. I struggled in deciding how to best quantitatively evaluate these new criteria."

Through repeated improvements, the third prototype was completed in October, just before FABTECH. The machine was transported to the U.S., and Mr. Nagai and Mr. Hirano followed it to Chicago. While the known issue of beam failure occurred at FABTECH, it was dealt with using emergency procedures. With many exhibit-goers watching, the machine showed its flexibility, cutting a thin sheet of 1mm and a thick sheet of 25mm. It was evaluated highly and attracted several pre-release orders despite only being in a reference exhibit.

Further improvements were implemented and the fourth prototype was completed in January 2016. The team achieved their goal of releasing the machine to the market in FY2015. "We did absolutely everything we could. But there was still room for improvement," admitted Mr. Nagai. Mr. Hirano voiced his hopes, stating, "We want to utilize this Zoom Head and promote further development of processing technologies." Meanwhile, it seemed that, in a sense, Mr. Hirabayashi's role in this project had just begun, as he was heard saying, "I'd like to make the Zoom Head more intelligent, giving it higher functionality through the addition of a sensor function and other functions in order to further improve product appeal." It was apparent that all three of these engineers still had many busy days to come.



The newly developed Zoom Head can be mounted on the other five models of 2D fiber laser processing machines produced by Mitsubishi Electric as an option.



Supporting continuous machining through optimal control of the beam to suit material and sheet thickness

Remote Service

iQCare

Remote4U

“iQ Care Remote4U” is a remote service that makes it possible to assess the operating status and maintenance status of machine tools from a remote location using a computer, smartphone or tablet. This service was launched on April 1, 2017, initially for laser processing machines. This is a new service in this age of the Internet of Things (IoT), giving support personnel the ability to respond to malfunctions by making remote diagnosis.



Remotely confirming the operating status of laser processing machines from smartphones and tablets

If operational information and data during malfunction could be collected from machine tools via the Internet, it would be possible to swiftly carry out inspections, repairs and other tasks, and create potential for new business ...

This was the concept under which the cross-departmental team, Mechatronic Business Committee, was established in 2009 at Mitsubishi Electric Nagoya Works. However, this idea of a remote service was not considered by users as a proposal of value, so it was shelved as a mere paper plan. The idea was finally brought into the limelight not in Japan, but in the U.S. In 2011, Mitsubishi Electric’s U.S. counterpart, a laser processing machine dealer engaging in the sales and after-sales service of machine tools in North America, expressed an interest in the service and was the first to launch it in November 2014. Due to the sheer size of the U.S.,

visits by service personnel to customers’ sites are not an easy feat and travel takes time and money. This means it was a major advantage to be able to gather information from a remote location.

To fall in line with the U.S. during preparation to launch the service, in May 2012, the Laser Manufacturing Department of Nagoya Works took a leading role in establishing a project to once again offer the service in Japan as well. Once it was decided that the Laser Manufacturing Department would be in charge of platform construction, Mitsubishi Electric Mechatronics Software (MSW) would take care of software development and Mitsubishi Electric Mechatronics Engineering (MMEG) would be responsible for providing the service. A total of 15 members gathered from these three companies to form the development team. Development began with the goal of launching the service in FY2015.

Hiroko Takada, Manager of the Laser Processing Machine Design Section in the Laser Systems Department of Nagoya Works and the lead coordinator of the project, explained the background as follows, “We wanted a system to gather data in order to improve service quality. So we embarked on this project considering what information on laser processing machines we actually needed.”

Norihide Mikami, the Planning Section Chief and having 15 years of experience as Service Manager in the Laser Business Department of MMEG, was also enthusiastic about introducing the remote service. “Until now, consultations regarding inspections, repairs, and the like were all done by phone. We would have to ask the customer to investigate various numerical values themselves, identify the problem based on this, and then judge whether or not to send out service personnel or ask the customer to make adjustments themselves. It is time-consuming to investigate the numerical values as it involves complex processes, such as getting in behind the machine, removing screws and so on.”

The Laser Technology Section of the Engineering Department 1 at MSW’s Manufacturing Solutions Systems Headquarters was in charge of software development for this project. However, members had no prior experience of developing Web-related software focused on laser processing machines. Kenji



Hiroko Takada

Manager
Laser processing Machine Design
Section
Laser Systems Department
Nagoya Works, Mitsubishi Electric
Corporation



Kenji Soga

Group Leader, Laser Technology Section
Engineering Department 1
Manufacturing Solutions Systems
Headquarters
Mitsubishi Electric Mechatronics
Software Corporation



Norihide Mikami

Planning Section Chief
Laser Business Department
Mitsubishi Electric Mechatronics
Engineering Corporation



Remote diagnosis enables support personnel to respond swiftly at the time of a malfunction

Soga, Group Leader of the section, judged that, “It was a good opportunity because Web-related systems would become increasingly important in the future.” Mr. Soga selected a leader from the departments involved and trained him with the cooperation of other departments knowledgeable on Web-related matters. Mr. Takada was impressed by the swift development of that manager.

The cloud service provider to utilize for the service was selected at the same time. The team was inexperienced in this area too and therefore progress was slow. In the end, it took around one year before the decision was made to utilize the highly safe virtual private network (VPN) of NEC and collect information from processing machines using its IoT platform.

Even with all of the hardships the development team was experiencing for the first time, they managed to overcome them and complete a prototype system. Customer monitoring began in February 2015. There didn't seem to be any problems regarding information collection and operational status display functions, but as the number of customers being monitored

increased, Mr. Mikami pointed out one issue in particular. “The initial system collected processing machine information by connecting to the VPN via the customer's computer. But preparing the computer to do this is difficult and some service administrators can't accommodate such a request.” The team took Mr. Mikami's point seriously and changed to a system where the processing machine is connected directly to the Internet.

Another issue was pointed out in an internal review conducted by Mitsubishi Electric in February 2016, just before launching the service, and revisions had to be made. Having to deal with the problem, Mr. Soga and his team constantly put in overtime.

The next difficulty was deciding a name for the service. Void of any bright ideas themselves, the development team gathered ten young sales staff from across Japan. Consequently, “In just one hour” (Mr. Takada) a proposal to name the service “iQ Care Remote4U” was presented. The “4U” stands for unification of various elements in production and maintenance (Unified), and using the latest, up-to-date information (Update) from anywhere (Universal) to benefit the

user (Useful), while reflecting the spirit of “For you” (for our customers).

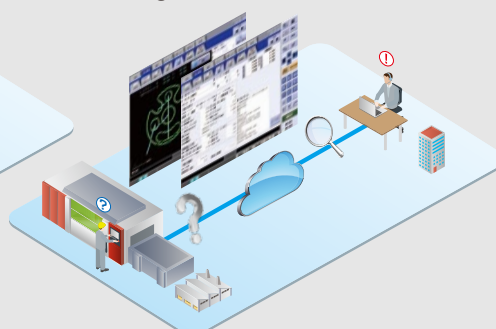
Mr. Mikami explains how they solved the issue of the user not seeing this service as a valuable proposal, which was the reason for it falling to the wayside initially. “We made it possible to confirm various elements, such as the operating status and remaining processing time, of the processing machines in real-time using smartphones and tablets, thereby making operating ratio and running costs visible. Additionally, processing machines installed in Japan originally come with two years of complimentary maintenance. In the past, service personnel would go directly to the machine to conduct diagnoses in that two-year period. But we were able to offer the added value of remote diagnosis using this service. We make the results of these diagnoses visual and submit them to customers as reports. Then, in the third year, we offer this service at less than 100,000 yen a year to customers who understand the value of the service.” Ms. Takada commented that this amount “was decided based on a questionnaire circulated at a 2015 exhibition.”

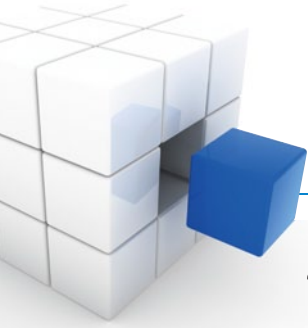
Fortunately, on April 1, 2016, iQ Care Remote 4U went online without a hitch. Ms. Takada reflected upon this milestone, “It began with the goal of wanting to improve the efficiency of maintenance service. But from some point, the top priority became the advantage to our customers, leading to a steady increase in functions that contribute to improved productivity and reducing running costs.” This “customer first” remote service has only just begun. Its true value remains to be seen.

■ Conceptual image of monitoring operational status



■ Conceptual image of remote diagnosis





Solution Case Study



KYB Corporation

(formerly Kayaba Industry Co., Ltd.)

Producing 200 concrete mixer trucks a month Third laser processing machine installed and scrap material processing automated, improving production efficiency

In October 2015, Kayaba Industry Co., Ltd. changed its name to KYB Corporation. In January 2015, the company's Kumagaya Plant introduced a Mitsubishi Electric ML4020RX 2D laser processing machine to its concrete mixer truck production process.

We made an inquiry directed to members in the Special-purpose Vehicles Division of the Manufacturing Department at the Kumagaya Plant to find out the aim and benefits of this decision.



Located a 30-minute drive from JR Kumagaya Station, the Kumagaya Plant is one of KYB Corporation's major production bases. Although the KYB flagship products are suspension systems for automobiles and motorcycles, and hydraulic equipment for automobiles, industrial use and aircraft, the Kumagaya Plant mainly manufactures concrete mixer trucks. KYB Corporation has over 80% of domestic market share and a long line of mixer trucks can be seen at the plant on shipment days.

KYB receives the body of the vehicle from a truck manufacturer, mounts the mixers designed and

manufactured at KYB, paints them and then ships the finished product. Currently, the Kumagaya Plant ships 200 concrete mixer trucks a month, and the plant has been working to maximum operational capacity for an extended period of time due to the increased demand stemming from reconstruction after the Great East Japan Earthquake and the recent construction boom. With orders looking likely to increase as construction demand continues to grow for the 2020 Tokyo Olympics, there is a risk of production personnel shortages.

welding or fastening with bolts. Mixer trucks are primarily made-to-order, and there are a truly diversified range of specifications depending on the ready-mix concrete company placing the order. The mixers themselves are made up of over 2,000 parts of many different varieties. For this reason, from the cost perspective, it is difficult to cut parts from sheet metal in a press. Previously, this was done using a plasma processing machine, but aiming to improve quality and reduce man-hours, the plant switched to laser processing machines around 20 years ago. This time, in addition to the laser

Automatic sorting of parts and scrap material halves cutting time

To prepare for this situation, Kumagaya Plant installed a Mitsubishi Electric ML4020RX 2D laser processing machine in January 2015 with the objective of further speeding up production and saving labor. In actuality, the plant started installing Mitsubishi laser processing machines two decades ago at a pace of one machine every 10 years. So, this latest machine was the third to be put into operation.

Mixers are made by cutting parts from the base material—high-tensile steel sheets—machining these into 3-dimensional shapes using a press, and then joining the components by



The laser processing machine installed has an output of 4.5kW and can cut sheet metal up to 25mm thick.



CNC unit of the laser processing machine. Customers report that data can be loaded with greater ease than previously possible.



The laser processing system installed this time. The ML4020RX is shown to the left as sheet metal is automatically carried to the work area from the storage racks using the special-purpose feeder.

processing machine itself, KYB installed a unit that have an integrated system capable of automatically sorting parts and scrap material after cutting. The two laser processing machines used to date required this sorting to be carried out manually. But the work is labor intensive, so the automatic sorting unit will assist in cutting out manual tasks and save on labor, which is ideal in preparation of further production increases.

At the cutting site, metal sheets are transported to the work area of the laser processing machine from the storage shelves built into the machine using a special-purpose feeder. Each sheet takes around 10 to 15 minutes to process. After being cut in the laser processing machine, parts are placed on a pallet by over 200 suction pads and the remnant material is carried back to the stock shelves using a special-purpose forklift. By selecting suction pads to suit part shapes, handling errors are practically non-existent.

The installation of this third laser processing machine has reduced cutting time by approximately half. Takahiro Kobayashi, who was in charge of installing the third laser processing machine as a member of the Production Engineering Group in the Manufacturing Department of the Special-purpose Vehicles Division at Kumagaya Plant, thinks highly of the machine, saying, "Not only has it reduced cutting time, it has also helped to reduce the scrap metal processing time."

Helping to improve machining accuracy and production efficiency

The recently installed ML4020RX laser processing machine is equipped with a 4.5kW CO₂ gas laser capable of cutting sheet metal up to 25mm thick. According to Mr. Kobayashi, "Currently, the thickest sheets we cut are around 9mm, but we plan on cutting thicker ones in the future. That is why we chose a high-performance machine."

Furthermore, compared to conventional models, the ML4020RX has a thinner laser beam, which achieves higher machining accuracy. Mr. Kobayashi commented, "Higher machining accuracy has, in turn,

increased production efficiency."

The cut parts are machined into shape in a press, welded or bolted together, and then assembled on the mixer. If the machining accuracy of the parts is high, they can be fastened with bolts. But if machining accuracy is low, manual welding is required, and that is time-consuming and costly. Mr. Kobayashi added, "Welding requires experience. The number of orders we are taking on is increasing and it is getting harder to find experienced welders. By increasing part machining accuracy with a laser processing machine, it is possible to assemble more parts using bolts, and this reduces the need to rely on welding. That was the aim behind the installation of this third laser processing machine."



After cutting, parts are placed on a pallet by over 200 suction pads, and the scrap is carried back to stock shelves using a special-purpose forklift.

KYB KYB Corporation

Our Precision, Your Advantage

Jun Katsuki,

General Manager, Manufacturing Department, Special-purpose Vehicles Division, Kumagaya Plant

Further Strengthening Our Production System as a Leading Mixer Truck Manufacturer



— **KYB has an extremely high share of the concrete mixer truck market, doesn't it?**

Katsuki : KYB mainly manufactures parts for manufacturers, such as suspension systems and hydraulic equipment, but the concrete mixer trucks are sold directly to a small number of end-users. We began this business in 1953 when we imported a mixer from a U.S. company, Concrete Transport Mixers, and

mounted it on a truck. We started manufacturing mixers in Japan in 1955.

Back then, the high-low-type mixer was used, whereby concrete was mixed inside the mixer using blade. Then, from the late 1960s, the tilting mixer, where a tilted drum rotates, became mainstream.

— **What are the challenges involved in manufacturing concrete mixer trucks?**

Katsuki : There are a lot of different customization requirements depending on the customer. Each ready-mix concrete company has different mixer specifications and requests different colors of paint for the mixer and truck. Some customers even request trucks to be painted an original custom color.

The deciding factor for processing machines is reliability. Compatibility with control programs is also important.



Profile

Jun Katsuki

Joined Kayaba Industry Co., Ltd. (present day KYB Corporation) in 1990. After serving in various roles including Accounting Manager and Special-purpose Vehicle Sales Manager at the Kumagaya Plant, he assumed his current position in August 2015.

— **KYB just installed a new laser processing machine for the first time in around 10 years, didn't it?**

Katsuki : Recently, there has been an increase in mixer truck demand and we currently have a backlog of orders. As a leading manufacturer in this field, we want to avoid inconveniencing our customers, therefore we must improve our production capacity.

But, at the same time, we need to keep production cost down as much as possible. To date, the only way to increase parts production was outsourcing. However, that always led to higher production costs and



Team members of the Production Engineering Group, Manufacturing Department, Special-purpose Vehicles Division, Kumagaya Plant, in charge of installing the third laser processing machine. From left, Group Leader Takeshi Yatsuda, Takahiro Kobayashi and Kyoya Kuroda. The team member on the far right is Section Chief Shunsuke Watanabe of the Laser Device Section, Industrial Mechatronics Sales Department, Factory Automation Systems Group, Mitsubishi Electric.

inconsistent machining quality. This time, we choose to install a system capable of automatically processing scrap material. This has allowed us to significantly improve production efficiency, and the plan is to continue further strengthening the production system.

— **The laser processing machines you installed in the past were also made by Mitsubishi Electric. Is there a reason why you chose this company?**

Katsuki : Because the after-sales service over the past 20 years has

been fantastic. Of course, we request quotes from other companies when considering installation of a new machine. But ultimately, reliability is the deciding factor.

Another reason is the compatibility with past control programs. Some customers have been using their mixer trucks for over 20 years. For this reason, we need to have a system that enables us to supply after-sales parts over the long-term. Even so, mixers are customized to suit each individual customer, so a major condition is being able to use

older control programs for parts machining.

— **What type of needs do you foresee emerging for mixer trucks in the future?**

Katsuki : I think customers will start seeking lighter mixer trucks. In terms of environmental measures too, it is necessary to reduce the weight of the mixer truck overall, so KYB is working on lightening the mixer. The lighter the mixer, the more concrete that can be carried. This translates to higher profits for our customers.



Kumagaya Plant, KYB Corporation. A row of nearly complete concrete mixers.

Corporate Data

KYB Corporation

Net sales

¥370.4 billion (consolidated, term ending March 2014)

No. of employees

13,732 (consolidated, as of March 31, 2014)

Main Products

Suspension systems for automobiles and motorcycles, hydraulic equipment for industrial use, automobiles and aircraft, concrete mixer trucks, etc.

History

1919 Kayaba Research Center founded
1935 Kayaba Manufacturing Co., Ltd. established

1948 Kayaba Industry Co., Ltd. established
1985 Company name "KYB" changed from kanji to katakana

2015 Company name changed to KYB Corporation



Ueno Tekko Co., Ltd.

Laser processing specialist Aggressively introducing state-of-the-art processing machines to support all forms of laser processing

Ueno Tekko, located in Settsu, Osaka Prefecture, is a manufacturer specializing in laser processing and machines various types of machinery parts. Using four laser processing machines, the company produces various parts from a variety of materials, including iron, stainless steel and aluminum. We asked them about their thoughts on laser processing.

Yoichi Ueno, CEO of Ueno Tekko, commented on the company's policy, "We go about our work with the spirit that there is nothing that can't be cut by a laser."

Ueno Tekko currently uses four laser processing machines to provide contract-based parts machining work, such as for industrial machinery and food processing machinery.

The company was established as a metal machining company in 1965 by Mr. Ueno's father. At the time, the main business was concrete formwork used in the construction of buildings and other structures. In those days, formwork was

manufactured by cutting steel sheets by hand and then bending and welding. But, over this years, consumers began seeking higher accuracy. To deal with this, the company outsourced the work to laser processing businesses. But the percentage of requests gradually grew higher.

After the collapse of Japan's bubble economy, the demand for formwork remained strong in the Kansai region due to reconstruction work following the Great Hanshin Earthquake. However, when the reconstruction work ended, Ueno Tekko's founder was in an accident

that resulted in long-term hospitalization, causing the company to fall into a crisis situation. The eight remaining employees gradually left until, ultimately, the only remaining members were the founder, his son, Yoichi, and Yoichi's younger brother, Yuzo Ueno, who currently serves as Senior Managing Director of the company.

Boldly introducing laser processing machines to increase work with high-added-value

In the midst of this adverse situation, in 2002, Yoichi and Yuzo made a bold decision. They invested approximately double the company's annual sales (at the time) to purchase a 2.5kW laser processing machine. The aim was to significantly decrease outsourcing costs and expand their services to offer more than concrete formwork.

Both Yoichi and Yuzo were amateurs when it came to laser processing, but as Yuzo revealed, "As if it was our last stand, we put everything we had into researching original machining conditions with the goal of enhancing machining accuracy, cutting performance and speed." Their struggle paid off when, six months later, orders for laser processing slowly started coming in. Eventually, the high quality of their work was recognized and they were



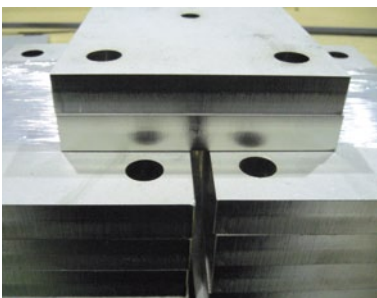
The Mitsubishi Electric eX-F60 2D laser processing machine installed at the end of 2015. With an output of 6kW, it can cut brass, copper and aluminum, which had been difficult using CO₂.



The employees of Ueno Tekko. There are many young employees due to the company's recent rapid growth.

unable to keep up with orders, even when operating at full capacity. Yoichi commented, "Midnight was our normal finish time. Then, we'd even have to do overtime after that."

In 2004, the brothers purchased their second laser processing machine. The first machine was made by another manufacturer, but the second time around, they chose a Mitsubishi Electric HV Series 4kW 2D CO₂ laser processing machine. By installing this processing machine, it became possible to cut stainless steel with thicknesses ranging from 12 to 1 mm, which was previously difficult to achieve. This broadened the scope of work the company could accept. Machining accuracy also improved by an average of 2.5 times, which in turn, resulted in more efficient work. Thanks to higher machining quality, Ueno Tekko achieved its aim of steadily broadening the work it could handle from industrial machinery parts such as machine frames and food processing brackets to elaborately designed signs.



As a result of research into laser processing technology primarily driven by Yuzo, Ueno Tekko became able to perform the cut known as "brilliant cut," where the cross-section shines, on stainless steel as well.

Installing a high-performance laser processing machine and rapidly expanding work scope

In 2007, Ueno Tekko relocated its head office and main plant to its current location due to space limitations. At the same time, the company purchased a laser processing machine with a maximum output of 6kW from the lineup of Mitsubishi Electric NX Series 2D CO₂ laser processing machines. This made it possible to cut stainless steel sheet up to 25mm thick, whereas 16mm was previously the limit. Subsequently, it became possible for the company to cut the bases of industrial machinery, and it soon started receiving orders for the machining of thick sheets from other companies in the industry. Machining

accuracy increased even further. For example, in the case of stainless steel, Ueno Tekko was able to perform a cut known as "brilliant cut," where the cross-section shines. Then, at the end of 2015, Ueno Tekko installed the Mitsubishi Electric eX-F60 2D laser processing machine equipped with a 6kW fiber laser oscillator. Using a fiber laser, which has a wavelength one-tenth that of a CO₂ laser, the energy absorbance rate of material is increased, making it possible to cut brass, copper and aluminum, which had been difficult using CO₂.

Yuzo had this to say on the matter, "Regarding laser processing, I believe our role is to identify what issues our customers face and what needs they have, and then do our research and provide solutions."



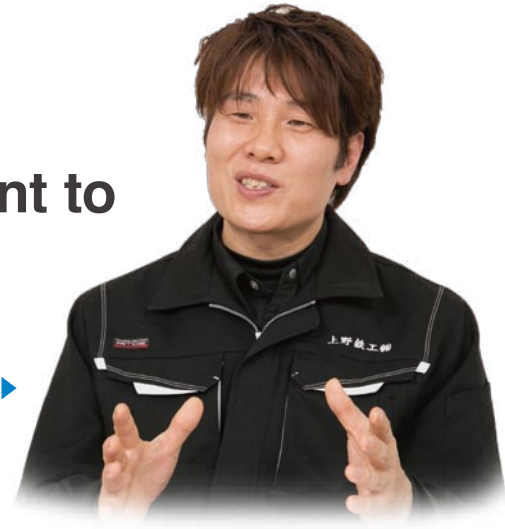
When Ueno Tekko installed the eX-F60, it also installed the 30SCX-eX-F, a stocker capable of high-speed sheet changing. This significantly improved work efficiency as material can be automatically loaded into the machine.



If it's related to laser processing, we never want to say, "We can't do it."

◀ **Yoichi Ueno**
CEO

Yuzo Ueno ▶
Senior
Managing Director



— It has been said that Ueno Tekko is rapidly improving business performance armed with high-accuracy laser processing as its weapon. Is this true?

Yoichi : The words "impossible" and "can't do it" don't exist in Ueno Tekko's vocabulary. As long as it has to do with laser processing, if a customer asks us, "Can you do it?" we never want to answer "No, we can't."

Yuzo : "I have spent so much time on these machines pursuing the optimal conditions for all kinds of processing to the point where people can be forgiven for calling me a laser processing machine geek. There are still many issues that remain unsolved, such as how to get the same size entrance and exit holes when you create a hole with a laser, how to get the smallest, most flawless hole, etc.

Some may think that the latest

laser processing machines can cut highly accurate parts from sheet metal with ease. But the processing sequence needs to be changed to suit the material or it will warp and accuracy will not be achieved. Unless we acquire this know-how, it will be difficult to provide the kind of high-accuracy processing our customers seek. At one exhibition, we displayed the ingredients of "oden" (Japanese-style stew) processed using a laser. This was proved to be difficult too. For example, we had to try to open a hole on the front an egg shell but not pierce the back, and so on.

Buying the first machines led to an advantage over other companies in the industry

— Apparently, of the four laser processing machines you

purchased, from the second one onwards, they are all made by Mitsubishi Electric, correct?

Yoichi : "When we purchased our first laser processing machine in 2002, we broadened our customer base and took on so much work, to the point where we literally only went home to sleep. We hired more personnel and decided to install another laser processing machine. After an online search, we called the Kansai branch of Mitsubishi Electric and a sales representative with a design background immediately came to see us. He answered our many technical questions with sincerity, and that was the main deciding factor for us.

The after-sales support is fantastic, and if there is ever something we don't know, we get answers immediately. So all of our machines ever since have been Mitsubishi Electric."

Yuzo : I like how Mitsubishi Electric machines have functions that really benefit Ueno Tekko. For example, with the first processing machine we purchased, it was taking 10 to 20 minutes to adjust focus and other settings each time the material to be processed was changed. In contrast, Mitsubishi Electric laser processing



Processing using the eX-F60.



The laser-processed oden exhibited at the Mechatronics Fair in Western Japan attracted much attention.



Profile

(Photo left)

Yoichi Ueno CEO

Born 1967. His sincere efforts towards his work have resulted in a superior level of skill and ability, leading to the high-quality and unshakable trustworthiness he is now known for. CEO since 2003.

(center)

Yuzo Ueno

Senior Managing Director

Born 1970. Believes in the philosophy "The number of failures is equal to the number of successes" and always challenges himself to achieve higher levels of skill and quality. He also coaches a local boys' basketball team. Senior Managing Director since 2003.

(right) Shinji Hattori, Section Chief, Laser Processing Section, Industrial Mechatronics Department, Kansai Branch, Mitsubishi Electric Corporation

machines have a function that automatically adjusts the focus position, therefore significantly reducing set-up changeover time. Our factory often receives urgent requests for parts. So sometimes we need to perform set-up changeover 10 or 20 times a day, meaning that having this function helps us to increase our actual operating time by several hours a day.

— **In the case of both your second machine, the 6kW NX Series, and third machine, the 6kW eX-F60, the machines you purchased were the first of their kinds to be made, correct?**

Yoichi : If we had machines no one else had, we could offer processing that our competitors couldn't perform. That is the reason we purchased the

very first ones of that rank. To give us the advantage over other companies in this industry.

Yuzo : Another benefit is that we are able to start accumulating processing know-how earlier than anyone else. Ueno Tekko constantly pursues optimal processing conditions to achieve high accuracy and high efficiency by changing parameters such as gas pressure, laser beam focus, nozzle diameter, beam diameter and so on.

For this reason, by the time other companies have purchased the same machine, we can leverage our advantage of being the pioneer and have already acquired a high level of processing skill.

— **What type of training do you focus on to help your employees**

acquire a high level of know-how?

Yuzo : We tell them not to see work as just a set of tasks, but to always think and act from our customers' standpoint and provide the best possible results. If you challenge yourself to do something for the first time, there will always be failure. But one must never get frustrated or mad. Instead, we must ask the question, "Why" as much as possible. By thinking hard about why something does not succeed, it is possible to use this to prevent repeated failure.

— **Recently more and more small- and medium-sized companies are expanding overseas. Is Ueno Tekko considering going global too?**

Yoichi : Actually, we plan enter Vietnam within the next year. To achieve this, we already have a number of Vietnamese working for us here at our plant. Through them, we'd like to transplant our high-level laser processing skills to Vietnam.



Ueno Tekko head office and main plant. eX-F60 processing work was conducted in limited space here. Accordingly, the company built a new plant nearby in 2015.

Corporate Data

Ueno Tekko Co., Ltd.

Head office

5-1-45 Torikaihonmachi, Settsu, Osaka Prefecture

Main Products

2D laser processing of iron, stainless steel, aluminum, brass, titanium and other metals

History

1965 Ueno Tekko founded

1968 Established as limited company

1989 Changed to stock company

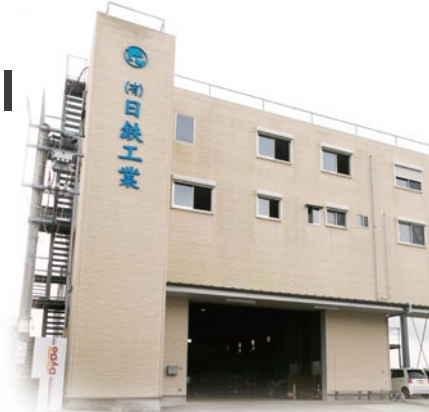
2007 Head office moved to current location



NITTETSU Co., Ltd.

Complete confidence in laser cutting of thick plates Specializing in extremely difficult processing and refining technical skill

Nittetsu is one of the leading laser processing companies in the Shikoku region, and is headquartered outside Kochi City, Kochi Prefecture. Possessing superior skill in the area of laser processing for thick plates not found in other companies, Nittetsu receives endless orders from not only local companies, but companies outside the prefecture as well. We inquired Nittetsu about its uncompromising stance toward laser processing as it continues to strengthen its reputation for reliability and performance backed by high technical skill.



Kochi is a coastal city. Nittetsu's head office and factory are located in a corner of an industrial park lined with shipyards. Established in 1968, Nittetsu started out as a welding contractor that assembled steel frames for the ship-building industry. However, from 1985 onwards, the sharp appreciation of the yen threw the ship-building industry into a serious recession and Nittetsu's business partners began closing their doors. In 1987, Nittetsu had no choice but to enter another industry.

The company's founder and first president, Mr. Kazuo Okamoto, was lost as to which direction to take, but an acquaintance recommended he enter the signboard manufacturing business and try cutting the lettering for signboards. Cutting lettering for signboards is order-specific work, complex and requires an immaculate aesthetic finish. Therefore, laser processing is the optimal method to apply for such precise work. Mr. Okamoto made the bold decision to

move into this business, but he was a complete novice when it came to laser processing. Despite this, he purchased a 1.2kW laser processing machine in 1989 and established a laser cutting plant.

At the time, there were hardly any companies in that owned laser processing machines in the prefecture, so signboard manufacturers generally placed orders with service providers in other prefectures. However, when Nittetsu began offering laser processing, work that had been leaving the prefecture began to return. Then, as the company attempted making various signboards, such as animal-shaped signs for zoos, it began receiving requests for other work too. Nittetsu took on any form of laser processing it was asked to do, including cutting plates for construction and mechanical parts. It built up a reputation for its careful and highly accurate work and gradually began receiving more and more orders.

However, the laser processing machines used at that time had many issues. They lacked stability due to using foreign-made oscillators and repair work took much time when breakdowns occurred. Sometimes operation had to be halted for prolonged periods.

Specializing in thick plate processing Four laser processing machines in operation

In 1997, Nittetsu purchased a "HD" 3kW CO₂ 2D laser processing machine made by Mitsubishi Electric to replace its old processor. The current CEO, Mr. Yoshito Okamoto, reflected on the purchase, "The oscillator was made by Mitsubishi Electric, so we could expect swift maintenance response. Other major reasons for choosing the Mitsubishi Electric laser processing machine were the flawless condition of the cut face and high processing quality.

In line with the installation of the HD, Nittetsu installed laser cutting equipment that used nitrogen as the assist gas. If nitrogen is used instead of oxygen, a black oxidized membrane does not form on the scored face, making it easier for customers to perform welding. "Considering the scale of Nittetsu's business at the time, this was a daring investment." (Mr. Okamoto) But this decision was rewarded, as orders increased instantly.

Later, the company consecutively



ML3015eX-F40 2D fiber laser processing machine by Mitsubishi Electric purchased by Nittetsu in July 2016. 4kW power



Nittetsu's head office and factory located in Kochi City. A total of four Mitsubishi Electric laser processing machines are in operation here.

installed two Mitsubishi Electric 2D laser processing machines: the LZP 2kW LZP processor capable of high-speed processing, in 1999, and the HDIIP 4.2kW processor in 2001. By installing the HDIIP, Nittetsu was able to process thick plates and immediately began receiving orders to cut mild steel with a thickness of 19mm. Due to performing this job, the high quality of Nittetsu's processing began to spread via word-of-mouth and the company started receiving request after request from companies in the industry that previously placed orders for thick-plate processing with companies outside of the prefecture. Nittetsu refined its business to focus on thick-plate processing with high added-value and enhanced its technical skill by taking on more

difficult jobs. It built a solid reputation for itself to the point where people immediately associate Nittetsu with high-quality laser processing of thick plate.

Currently, Nittetsu handles orders with four Mitsubishi Electric laser processing machines; specifically the ML3015LVP-45CF-R 4.5kW machine installed in 2009, two ML3015eX-45CF-R processors installed consecutively in 2014 and 2015 (CO₂ 2D laser processing machines with the same power), and the ML3015eX-F40, the first 2D fiber laser processing machine to be installed by Nittetsu, in July 2016 (4kW power). According to Mr. Okamoto, the company installed a fiber laser processing machine "in order to perform processing of material difficult to do with CO₂, such as copper, brass and aluminum."

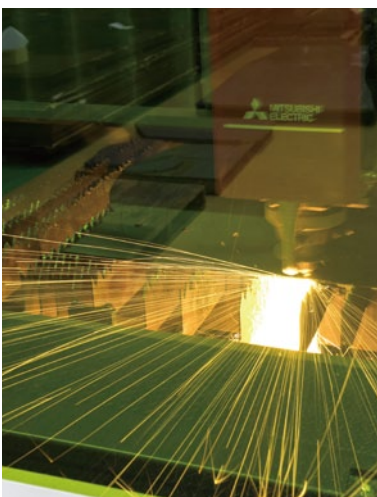
'A company trusted by customers' cannot compromise on quality

Nittetsu installed its first Mitsubishi Electric machine, HD, in 1997, and despite this being the first time the company had attempted processing using nitrogen as the assist gas, it took the approach of trial-and-error to acquire skills, even though it completely lacked know-how. Mr. Okamoto recalled the difficulties, "When processing using nitrogen, many aspects differ to processing when using oxygen as the assist gas,

such as the fact that burrs will occur if the nozzle is even the slightest bit damaged, gas pressure adjustment is difficult, among others. So Nittetsu had to accumulate know-how while consulting with Mitsubishi Electric personnel time and time again.

Nittetsu's relationship of trust with Mitsubishi Electric deepened through these consultations. Mr. Okamoto praised Mitsubishi Electric's approach to work, saying, "Sometimes we would propose something, and if it wasn't possible, Mitsubishi Electric would be frank in saying so. But if they were convinced our proposal was a good one, they would spend years trying to make it come true and reflect it in their new products."

High-level requests and demands arose because Mr. Okamoto strongly wanted to achieve even more highly accurate processing. "I want to improve processing quality even further and become a company trusted by its customers. I will not compromise on processing quality one bit."



A fiber laser has one-tenth the wavelength of a CO₂ laser, thereby enabling processing of copper and brass.



Stainless steel with a top section processed in oxygen and bottom section processed in nitrogen. The difference between cross-sections is clear.



NITTETSU Co., Ltd.

Uncompromising when it comes to “job shop” and challenging highly difficult thick-plate laser processing

◀ Yoshito Okamoto

President & CEO

— Are there only a handful of companies that specialize in laser processing of thick plates?

Okamoto : Generally speaking, most laser processing companies only process plates of medium thickness, between 4.5 and 12mm. However, Nittetsu specializes in processing materials of greater thickness. We can process mild steel up to 28mm thick, stainless steel up to 22mm thick and aluminum alloy up to 20mm thick.

We have established a reputation where people now think, “If we are in trouble, we can count on Nittetsu,” meaning that we receive orders for otherwise troublesome, extremely difficult laser processing of thick plate from not only within Kochi prefecture, but also from all over Shikoku. We also receive many orders from companies in the same line of business as us. Our founder always placed emphasis on being a “job shop.”

In the past, we used to mass-process thin plates. However, mass-production parts meant quantitative work. So sometimes we had to reject thick-plate processing orders. We believe our company can

demonstrate its real value by performing extremely difficult processing of thick plate. Therefore, we now specialize in extremely difficult thick-plate, and some thin-plate, processing.

The thicker the plate, the more precise the cutting conditions need to be

— What is difficult about laser processing thick plates?

Okamoto : The thicker the plate becomes, the more precise the cutting conditions (e.g., power, speed, and gas pressure) need to be in order to cut it. If even one condition is wrong, cutting is not performed to standard.

I have been involved in the processing of thick plate using lasers for around 20 years. Over the years, I have completed numerous difficult orders for a wide variety of customers. Based on this experience, I have steadily accumulated know-how on which cutting conditions are best for what material and which processing method to apply to obtain a nice cross-section. Nowadays, from the

Profile

Born 1976. Based on the technology and reliability left behind by his father, Nittetsu's founder, Mr. Okamoto upholds the slogan, “Nittetsu can do the processing that other companies can't.” He strives to achieve new heights daily using Mitsubishi Electric's latest laser processing machines and highly skilled operators.

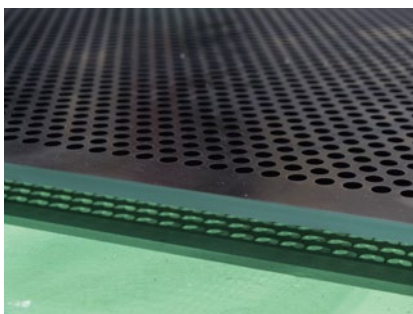
second the laser cuts into a thick plate in a trial cut, I know how to properly adjust the conditions.

We are also particular about the material used in order to achieve stable machining accuracy. Companies normally purchase standard-size material, however, we stringently hand-pick materials in good condition, then order it by the roll and store it. Even the slightest discrepancy in material quality can have a large impact on high-accuracy processing of thick plate. Moreover, by purchasing rolls of material, we are always able to ensure stable materials supply and provide whatever amount of processing the customer needs.

— How do you pass this kind of processing know-how on to your employees?

Okamoto : My employees know that, until recently, I myself took on the challenge of difficult laser processing and producing results. But no matter how difficult the order I received, I never gave up. We work together with our customers to find solutions by considering alternative materials, slightly different shapes and so on. I personally provide advice to employees who are experiencing difficulties while carrying out processing work and pass on the knowledge we have accumulated on these occasions.

For example, one time we received an order to bore 5,040 holes with a diameter of 12mm in a thick plate measuring 1m x 1.5m x 12mm. Normally, holes are made using a punching process; however, this was not possible as the interval between the holes on this thick plate would be



The left part is a part cut out from a thick plate of mild steel of 25 mm with a laser. On the right is a thick plate of 1 m x 1.5 m x 12 mm with 5040 holes with a diameter of 12 mm opened with a laser.



Left is Mr. Yusuke Machida of laser machining section of industrial mechatronics department of Mitsubishi Electric Kansai Branch Office. Right is Tachibana Eletech Shikoku Branch Yamadori branch manager.

a mere 6mm. Faced with this dilemma, the customer turned to us to help. It was a job that would normally lead to many problems during processing. On this occasion, I first confirmed that using laser processing to complete the order was possible, and then left it up to my employees to carry out while giving advice on the conditions required. The employees were able to finish the three sheets ordered without any issues, and I believe this boosted their confidence.

— **How long does it take to master laser processing?**

Okamoto : These days, laser processing machines are easier to use, so I think it is possible to become a craftsman at the standard level within three months. However, it takes around two to three years to be able to perform the services Nittetsu offers.

New processing machines invite new work

— **Nittetsu installed its first**



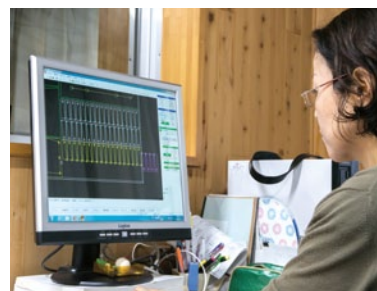
Head office factory office. Currently, the Nippon Steel Industry has 18 employees working.

Mitsubishi Electric laser processing machine in 1997, and less than 20 years since, has purchased and installed another eight. That is roughly one every two years, right?

Okamoto : When we install a new machine, we are able to cut plates we couldn't cut prior to that. Nittetsu's distinguishing feature is that we can cut plates that other companies can't, and doing so with a flawless finish. So, for us, new machines are essential tools that attract new business.

In July of this year as well, we purchased a new fiber laser processing machine and held a private show to unveil it in September. This attracted customers from not only all over Shikoku, but also as far as the Kansai region of Japan. It turned out to be an even livelier event than we'd anticipated. Now, word will spread that Nittetsu has installed a fiber laser so we can be relied on to cut brass and copper too. New machines literally do translate into new work for us.

— **Mitsubishi Electric launched iQ Care Remote4U in April, a**



How to prepare a program for laser processing by CAD also needs know-how unique to thick plate laser processing.

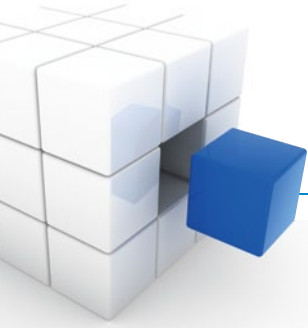
remote service to check the operating and maintenance status of laser processing machines via computer, smartphone, or other mobile devices, and Nittetsu adopted the service without delay, didn't it?

Okamoto : We requested the remote service when we purchased the fiber laser processing machine in July. Actually, we had been using the service on a trial basis for customer monitoring purposes while it was still under development, so we knew how convenient it is. It is possible to instantly determine the operating status or maintenance status of a machine on a computer or smartphone, which makes it easy to plan machine management. For example, "Once machine X is done, we'll perform maintenance on machine Y, and so on."

Corporate Data

NITTETSU

- Head office
4665 Niida, Kochi City
- Main Products
Laser cutting, cut plate processing
- History
 - 1968 Began providing welding services to shipbuilding companies
 - 1987 Discontinued welding service
 - 1989 Purchased a laser processing machine and began providing laser cutting services
 - 1997 Purchased first laser processing machine made by Mitsubishi Electric
 - 2003 Relocated head office and factory to current address
 - 2016 Yoshito Okamoto appointed CEO

**HSK** Hoden Seimitsu Kako Kenkyusho Co., Ltd.

Electrical-discharge pioneer achieves highly accurate special processing leveraging proprietary technologies accumulated over many years

Hoden Seimitsu Kako Kenkyusho Co., Ltd. (HSK) was established in 1961 and led the industry as a pioneer of electrical-discharge machining. HSK has approximately 180 EDMs and uses these to process various metal products, including its flagship product - dies for aluminum extrusion. We asked HSK about its strengths, etc. in the electrical-discharge machining field.

Electrical-discharge machining is a technology invented by a husband and wife team, B. R. and N. I. Lazarenko, of the former Soviet Union in 1946. Research in this field began in Japan shortly after the end of World War II, and in March 1954, the first EDM was manufactured in Japan.

HSK founder and present-day adviser, Shoji Futamura, was involved in the development of Japan's first machine. Mr. Futamura established HSK in 1961 with the aim of using Japan's first EDM for manufacturing applications.

HSK initially leveraged the features of electrical-discharge machining to manufacturing dies for aluminum extrusion, targeting the manufacturers of aluminum sash used in window frames and other

products. Molds that apply a pressure of 5t/cm² or higher to extrude the sash frames use high-strength steel. Therefore, wire electrical-discharge machining was ideal for the micromachining that was needed. HSK has maintained Japan's top share of the dies used in the aluminum extraction market for over 50 years.

Later, with electrical-discharge machining technology at its core, HSK expanded its business to various special precision machining and surface treatment processes to achieve the heat-resistance and corrosion-resistance of metal, and design and manufacture high-accuracy presses among other applications. Today, HSK operates its business on a global scale, with nine bases including affiliate companies in

Japan and two bases overseas.

**In-house development of jigs, tools and electrodes
Capable of micromachining at the nanometer level**

HSK strengths in the field of electrical-discharge machining are that it possesses the technical ability to develop its own jigs and tools, the electrodes needed for sinker electrical-discharge processing, the technologies required for optimal control of electricity flow, other functions needed to achieve electrical-discharge machining matching its customers' needs, sludge processing technology, and more. HSK's major distinguishing feature is that it utilizes the above-mentioned technical strengths to perform special machining unachievable by its competitors, such as micromachining metal with precision at the nanometer (nm) level and highly accurate drilling in steel several meters long.

An example of metal machining leveraging these proprietary technologies is the molding of the roll dies used to make patterns on metal surfaces, such as the side panels used for exterior walls of houses and high-tensile steel sheets. As the name suggests, a roll die is circular in shape and is, in fact, a set comprised of a convex die and a concave die. A pattern is applied to the surface of the die using a sinker EDM. The molding of a roll die requires the technology to design the



MV Series – The wire-cut EDM made by Mitsubishi Electric installed in the fall of 2015.



HSK's main plant for dies for aluminum extrusion, Atsugi Plant (Atsugi, Kanagawa Prefecture). A row of 40 EDMs.

die in a 3D form so that the correct pattern can be achieved in addition to high-accuracy machining that ensures the convex and concave dies engage with an accuracy of 10 μ m.

In 1997, HSK began purchasing Mitsubishi Electric-made EDMs on a constant basis. Toshiyuki Yagi, Executive Officer and General Manager of the MP Solution Business Department, reflected on what led to this decision. "At the time, a large-scale project to install a manufacturing line to make dies for aluminum extrusion was being launched. The decision was made that HSK would purchase a large quantity of EDMs. I was in charge of production engineering at the time, so it was up to me to select the machines we would buy. As a result of various studies, we narrowed down the candidates to Mitsubishi Electric and one other company, and installed three or four test machines from each of the companies to make a comparative study. After performing ongoing tests for some time, one day

a machine just stopped. That was when the developer of the Mitsubishi Electric EDMs immediately came to the plant and spent two full days with us trying to find the root cause. It was eventually revealed that the problem was not the machine at all, but rather the type of machining oil being used. In consideration of this issue that had arisen, however, Mitsubishi Electric's engineer newly proposed that machining speed could be raised even further if the power source was improved.

At the time, there wasn't much difference in regards to product specifications with the other company. But we decided to purchase Mitsubishi Electric's machine due to the fantastic technical support we received."

This was the springboard for introducing Mitsubishi Electric EDMs to make not only dies for aluminum extrusion, but also for other machining tasks. Currently, HSK has a total of 180 machines counting both wire-cut EDMs and sinker EDMs, and many of these are made by Mitsubishi Electric.

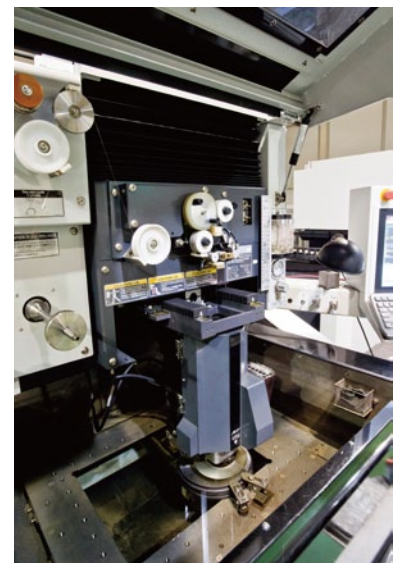
high-level technical skills. The HSK Philosophy Handbook, which sets out the HSK concept regarding management, stance towards work, judgment criteria, stance towards customers and an uncompromising position towards products and services, was "mainly compiled by younger project team members," explained Akihiko Kosako, Assistant Manager of the Human Resources and General Affairs Management Department. He went on to say, "I believe the fact that our employees are always conscious of this management philosophy as they go about their work is the reason why we can maintain and enhance our technical skill."



Die for aluminum extrusion. This die is subjected to over 5t of pressure to extrude aluminum sash frames.

Establishing the HSK Philosophy and maintaining and enhancing high-level technical ability

In 2012, HSK formulated the HSK Philosophy Handbook to provide specific explanations of its management philosophy (concept, stance and conduct) in order to continue nurturing employees with



A wire-cut EDM processing dies for aluminum extrusion. HSK has top share of the market for this type of die.

HSK MP Solution Business Department,
Hoden Seimitsu Kako Kenkyusho Co., Ltd.



We are promoting manufacturing craftsmanship reform in a broad range of fields with electrical-discharge machining as our core technology

◀ Toshiyuki Yagi

General Manager,
MP Solution Business Department
Executive Officer

Profile

Born 1958. Joined HSK in 1977. Served as Electrical-Discharge Manager at Atsugi Plant, Production Engineering Group Leader, Deputy Manager (Plant Manager) and Business Department Manager (2014) until being appointed to his current position in September 2015.

— HSK currently operates around 180 EDMs, correct? Are there any other companies that have as many of these machines as you?

Yagi : We probably have the highest number. HSK was established over half a century ago. As the pioneer of electrical-discharge machining, we have continuously challenged ourselves to develop new technologies and break into new business territory. The feature of electrical-discharge machining would have to be that it can be performed with high accuracy on materials of any hardness or shape. I personally have been involved in electrical-discharge machining for 30 years and I'm still impressed by it.

— What areas are you currently challenging yourselves in?

Yagi : In the area of extrusion dies, we are working on achieving a "correction-free die". This means when a die designed and fabricated by HSK is loaded into our customer's

press, it is capable of machining at the expected accuracy from the first batch of parts.

If I put it that way, some may think "Of course machining should be as per the specified accuracy." But in the world of extrusion, this is actually quite difficult. No matter how accurately we manufacture a die to meet specifications, each customer's press has its own little quirks, so dies have to be corrected through a process of trial and error in the actual press in order to increase machining accuracy.

In order to solve this issue, we introduced a simulator to simulate the same machining environment as our customer's press and are attempting to develop a correction-free die.

— What points do you pay attention to in order to train employees with such skills?

Yagi : On-the-job training is essential to acquiring electrical-discharge machining skill. We also recommend our employees to participate in the

National Skills Competition. Obtaining this qualification helps employees refine their skills and provides motivation.

In addition to Mitsubishi Electric's technical support strength come being evaluated highly for good surface properties and more

— Most of your EDMs are made by Mitsubishi Electric. What do you think of these machines?

Yagi : In terms of performance, Mitsubishi Electric machines provide excellent surface properties. In the extrusion of aluminum sash, the molded surface becomes the product's skin, so having a high-quality finish is a must.

In addition, Mitsubishi Electric EDMs stand out from the rest owing to their operability. They feature special-purpose software so the operator only has to input the machining conditions. After that, the machine automatically adjusts the amount of electricity and waveform. This means anyone, not only highly experienced operators, is capable of high-accuracy electrical-discharge machining. HSK is pleased with Mitsubishi Electric machines due to this aspect of taking user-friendliness into consideration.

In addition to that, Mitsubishi Electric's technical support is just as high-level as the performance elements I have mentioned. To provide a concrete example, normally when you contact a machinery manufacturer regarding a breakdown, you have to wait until they come to provide support, and



Iiyama Plant with Mitsubishi Electric sinker EDMs. (Iiyama, Kanagawa Prefecture)



(left) Akihiko Kosako, Assistant Manager, Human Resources and General Affairs Management Department.
 (right) Haruka Ideno, Sales Manager, EDM Section, Industrial Mechatronics Sales Department, FA Systems Group, Mitsubishi Electric.

there is no choice but to halt operation of that machine in the meantime. But, Mitsubishi Electric's call center provides phone-based support by asking for details on the type of symptoms, and then explains a countermeasure to that may help. This means we can continue production using that machine, which something we are very grateful for.

Furthermore, if on-site support is required, engineers are dispatched in no time at all. Not to mention, we are extremely grateful to Mitsubishi Electric for always performing maintenance during periodic inspections before breakdowns occur, which contributes to increasing operating rate.

However, even though most of the EDMs currently in operation are from Mitsubishi Electric, it is not as though we completely rule out other manufacturers. Even now, in accordance with our company rules, whenever we plan on purchasing a new machine, we always request quotes from a number of manufacturers, run trials, and then decide which model to install. However, the fact we keep coming back to the Mitsubishi Electric EDMs is, I believe, due to the high-level of technical support.

Expand businesses producing dies and parts in one-stop

Moving forward, what areas

does HSK plan on challenging itself in?

Yagi : Ever since establishment, HSK has developed its businesses with electrical-discharge machining as its core technology. But another significant feature of the company is that it also possesses all of the functions necessary for industrial parts production, from electro-chemical machining and surface machining to the design and development of equipment and parts assembly.

Moving forward, HSK will combine its various technologies to expand upon the existing businesses of consignment-based machining and die fabrication leveraging electrical-discharge machining to become a one-stop provider of everything required for parts



Sinker EDM in operation. The secret to highly accurate machining is electrodes, jigs and tools developed in-house.

production, from materials procurement to cutting, machining, heat treatment and assembly.

We have already established an integrated production line at our Komaki Plant (Komaki, Aichi Prefecture), where we began manufacturing key components of aircraft engines in August 2015.

HSK's mid-to-long term growth strategy is to leverage electrical-discharge machining in order to manufacture various industrial products with high added-value and advance our businesses even further.

Corporate Data

Hoden Seimitsu Kako Kenkyusho Co., Ltd.

Net sales
 ¥10 billion (consolidated, term ending February 2015)

No. of employees
 478 (as of February 2015, incl. part-time employees)

Main Businesses
 Consignment-based machining of various metal products using primarily electrical-discharge, consignment-based manufacturing of various dies and metal surface treatment processing, development and fabrication of mechatronics products, parts processing, press composite systems, etc.

History
 1961 Hoden Seimitsu Kako Kenkyusho Co., Ltd. established and consignment-based electrical-discharge machining started
 1963 Manufacturing of aluminum extrusion started
 1999 Registered as over-the-counter stock with Japan Securities Dealers Association (present day JASDAQ Securities Exchange)



Nichidai Corporation

Growing from a garage factory to a world-class cold-forging die manufacturer

Nichidai Corporation is a world-class precision die manufacturer for cold forging. Utilizing EDMs and other devices, it manufactures cold-forging dies primarily for automotive parts and forged parts, and has expanded its business to the assembly of automotive parts and manufacturing filters for industrial use. Nichidai was asked about its features and thoughts on technical development.

Nichidai was founded in 1959. The company's founder and first president, Yoshiaki Tanaka, rented a garage in Tenmae, Osaka and established Tanaka Gokin Seisakusho (Tanaka Alloy Works), where three employees manufactured drawing dies for drawing wires. It was literally a "garage factory" beginning for the company.

Mr. Tanaka strongly believed in technical development from the time the company was founded. Japan's first EDM was developed in 1954, but Mr. Tanaka wanted to process cemented carbide, the material from which drawing dies are made, so he studied the literature of the inventors of electrical-discharge machining, the Russian engineers, B. R. and N. I. Lazarenko. He then modified a drilling machine and built his own EDM. This machine offered

performance superior to the machines sold commercially at that time, and contributed significantly to increasing the company's sales of wire drawing dies

In 1967, the company relocated its head office to a newly constructed plant with a floor space of approximately 660m² in Neyagawa, Osaka Prefecture, and the name was changed to Nichidai Corporation. The name "Nichidai" incorporates the founder's goal of being the "Number one die manufacturer in Japan."

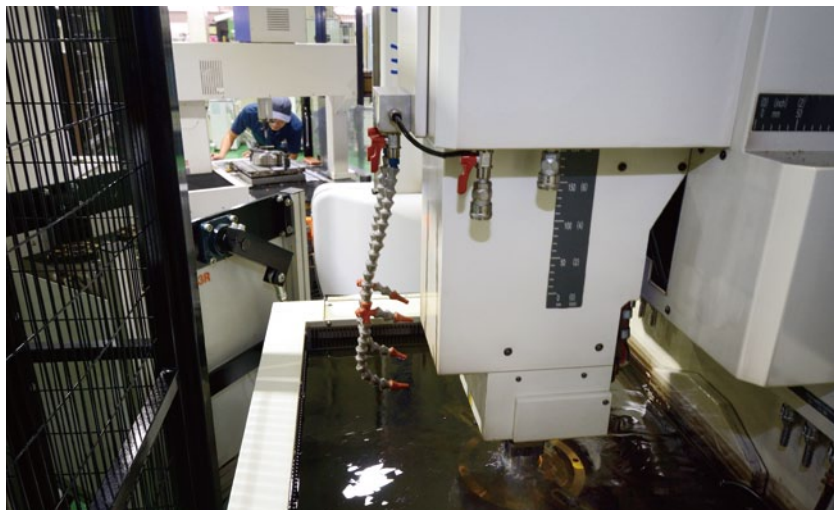
At the time, cold-forging technology was just starting to be introduced into Japan's industry for automotive parts manufacturing. However, the cemented carbide dies for cold-forging were all expensive imports, so automotive and parts manufacturers were looking for a domestic company capable of manufacturing cold-forging dies. This

was how Nichidai, with its cemented carbide machining technology, was singled out from the rest. In this way, the company shifted its focus to dies for cold-forging of auto parts and expanded business rapidly in line with automotive industry growth.

Launch of a precision forging business Deepening and broadening the technological base

In 1971, the company's head office and factory moved to the current location in Tanabe-cho, Kyoto. In 1988, the Ujitawara Factory was completed in Ujitawara-cho, Kyoto. Here, a hydraulic 3-axis double-action press was installed, marking the company's entrance into precision forging, with the company preparing a system to research forging technology itself. President and CEO, Corporate Officer Motonobu Furuya explained, "By handling everything from the upstream processes to the downstream processes of cold-forging, we became able to engage in technical development hand-in-hand with our customers, thereby deepening and broadening our technological base. This was a turning point for the company."

Now the company responds to requests from automotive and parts manufacturers by manufacturing dies for a diversity of forged parts, such as suspension systems and engine components, as well as manufacturing prototypes and mass production forged parts. Over the



A 24-hour robot cell system with three Mitsubishi Electric DIAX EA12V EDMs, a robot conveyor made by Nichidai and a CMM.



A row of EDMs at the No. 3 Ujitawara Factory.

years, the cost of manufacturing automotive parts has gradually fallen owing to the shift from machining to forging. Nichidai has also contributed significantly to achieving this cost reduction. President Furuya stated proudly, “In the past, expensive, special-purpose machines were needed for cutting bevel gears and cross joints. But today they can be mass produced with cold forging.”

In addition to the “net shape business” of manufacturing cold-forging dies and precision forged parts, Nichidai is currently expanding into the “assembly business,” involving the assembly of components for turbochargers used in diesel engines, and the “filter business,” involving the production of sintered wire mesh filters with Nichidai’s proprietary sintering technology. Total net sales of 14 billion 264 million yen was comprised of 51.2% net-shape business, 34.2% assembly business and 14.6% filter business (consolidated, term ending March 2016).

Drawing out the ultimate performance together with EDM manufacturers

When Nichidai was founded, it made its own EDMs. But, as production increased, it ultimately shifted to a policy of purchasing commercially available units. The company began installing Mitsubishi Electric EDMs in the late 1960s when operating the Neyagawa Plant, and today has several dozen operating, including

both wire-cut and sinker EDMs.

Corporate Officer and General Manager of the Production Headquarters, Masato Ito, expressed his satisfaction with Mitsubishi Electric, saying, “In order to provide the high quality our customers seek, we have to draw out the ultimate performance from our EDMs. This cannot be done without the cooperation of processing machine manufacturers. We often ask the impossible of Mitsubishi Electric, but they always do their absolute best to support us.”

In 2005, Mr. Ito worked together with Mitsubishi Electric and other companies to develop a 24-hour operating robot cell system incorporating three DIAX EA12V EDMs, a robot conveyor made by Nichidai and a 3D coordinate measurement machine (CMM). The die for manufacturing is selected from electrodes of various shapes and then the robot sets it in the EDM. After electrical-discharge machining is completed, the robot transports the processed die to the CMM to be measured. This system confirms the part is within tolerance before proceeding to the downstream process.



Final CMM measurement inspection of a cold-forging die manufactured in an EDM.

However, there was no precedent for this type of technical development and difficulties emerged. Mr. Ito commented, “We have actually called Mitsubishi Electric and the 3D CMM manufacturer at midnight during trial operations and requested their presence. The development took time, but the Mitsubishi Electric members persevered to the very end. Thanks to them, everything is running smoothly now and production has significantly improved.”

In 2015, Mr. Ito installed the Mitsubishi Electric MX-600, the first EDM for oil-submerged processing, and saw an influx in orders. Normally, wire-cut electrical-discharge machining is performed while submerged in water, but using oil results in a better quality finish. The issue is that electrical-discharge machining in oil takes around two or three times longer than water, thus productivity is low. As such, Mr. Ito made some outrageous requests of Mitsubishi Electric, such as “Double the processing time! But as a result, they made us machines with the same high processing accuracy and a processing speed improved by several percent.”



In 2015, Nichidai installed a Mitsubishi Electric MX-600 oil-based processing EDM.



Nichidai Corporation



Nichidai is a company that exists because of technology

Aiming for the cold-forging die frontier based on the spirit of VSOP

◀ Motonobu Furuya

Corporate Officer
President and CEO

Profile

Born in Yamanashi Prefecture in 1955. Joined Nichidai in 1998. Served as Director in 1999, Vice-President in 2001, and President and CEO since 2002.

— What are Nichidai's distinguishing features?

Furuya : Nichidai is a company that exists because of technology. The majority of dies manufactured around the world are for sheet metal or plastic forming, but dies for cold-forging only account for a mere 3 to 4% of Japan's die production. However, cold-forging dies are subjected to high stress, and therefore require a high level of technology. Nichidai will continue refining its technologies and challenging itself to be the world's best.

Our founder, Yoshiaki Tanaka, made a pun related to brandy grades with "VSOP." This is a term coined by Mr. Tanaka standing for "Vitality, Speciality, Originality and Passion." "VSOP" is the origin of Nichidai. Conceiving technologies, manifesting these into products, maintaining close communication with customers and popularizing products. Nichidai upholds the spirit of "VSOP" in all of

its divisions: development, production and sales.

Mr. Tanaka also stated, "Take pride that Nichidai is the top company in cold-forging die technology in Japan and think for ourselves." He believes that a company will only grow if it has engineers capable of thinking and acting for themselves.

— What type of employee training do you provide to nurture such engineers?

Furuya : "When we were still a fledgling organization at the time of founding, we just took an iron fist type of approach. But now that we have grown into a large company, that simply won't do. These days, in addition to on-the-job training, we provide training with the help of external experts.

I believe it is my duty to guide Nichidai towards further growth while ensuring the good environment and culture of our company that takes a "work with autonomy" approach is carried on despite our larger-size.

— Nichidai also expanded into Thailand in 2013, correct?

Furuya : Yes, and the reason for this is because there are many Japanese automotive manufacturers in Thailand and it is the world's hub of automotive parts exports. We nurture engineers in Thailand as well. But it won't work if we just try to apply the same training that we do in Japan. We do our best to provide training suitable for the Thai culture.

Even support development of original specification EDMs

— You seem to have a long-standing relationship with Mitsubishi Electric EDMs, correct?

Furuya : Yes, I've heard it began toward the end of the 1960s, which is before I joined the company. I believe our founder, Mr. Tanaka, was extremely grateful to Mitsubishi Electric for accepting an installment-based sale using a promissory note as Nichidai was still struggling with financing at the time.

The majority of Nichidai dies and forged products are low-volume, high-mix products, and EDMs are absolutely essential for processing. The number of EDMs we own has increased in accordance with the expansion of our businesses, and one reason we continued to use Mitsubishi Electric machines is the fantastic after-sales service.

Moreover, in order to manufacture special dies, it is not uncommon for EDMs to require original specifications. For example, in 2013, Nichidai and Mitsubishi Electric jointly



A row of various machine tools at the No. 2 Ujitawara Factory



(right) Masato Ito, Corporate Officer and General Manager of the Production Headquarters.
 (left) Satoshi Aoki, Sales Manager and Section Chief of the EDM Section, Industrial Mechatronics Department, Kansai Branch, Mitsubishi Electric Corporation.

developed an original wire-cut EDM robot system to manufacture atypical electrodes. This machine now plays an effective role in high-accuracy die manufacturing. Nichidai also highly regards the stance taken by Mitsubishi Electric regarding technological development.

A company that opens up new technologies has a bright future

— What type of company do you want Nichidai to become?

Furuya : I believe the ultimate point when it comes to satisfying our customers' demands is technology. This is because, at the end of the day, low cost and short lead times are made possible through technology.

To date, we have developed various technology in order to forge a wide variety of parts. But forging technology is unlimited and there is no end in sight. Perhaps the future will bring a processing technique that combines forging and sheet metal. Nichidai is working with Osaka University to develop new forging



The wire-cut EDM robot system jointly developed with Mitsubishi Electric in 2013 to manufacture atypical electrodes. Playing an effective role in high-accuracy die manufacturing.

technologies.

A company that neglects technology has no future, but a company that opens up new technologies has a bright one. Currently, Nichidai takes pride in the fact we are one of the most sophisticated cold-forging die companies in the world. But if we stop now, this won't last.

Our company's name, Nichidai, incorporates our founder's goal of being the "Number one die manufacturer in Japan," and this has been achieved in regards to cold-forging dies. There is no detailed data on cold-forging dies, so this is just my assumption, but Nichidai may even be world number one in this field. Even so, we will not let our guard down due to this position, and continue refining our technologies even further.

— Finally, please comment on the Nichidai baseball team. Many companies have been forced to disband their baseball teams due to poor business performance, but the Nichidai team has been active since the team was formed in 1997.

Furuya : Thanks to our baseball



The company baseball club, formed in 1998, has grown into a powerful team that produces professional baseball players.

team, our company is now known throughout Japan. But we aren't able to support them like larger corporations, who are regulars at intercity and JABA games. The baseball players themselves work full-time from early morning and practice in the evenings every day. Despite this, we have made it to the Intercity Series twice and JABA four times.

When our team makes it through preliminaries to secure a spot in national competitions, our employees are really excited and it creates an excellent feeling of unity in the company. Passionate motivation and a sense of unity are absolutely essential to a company's growth. That is how our baseball team really contributes to Nichidai.

Corporate Data

Nichidai Corporation

Net sales
 ¥14 billion 264 million
 (consolidated, term ending March 2016)

No. of employees
 645 (consolidated, as of March 31, 2016)

Main Businesses
 Development, production and sales of precision forged dies for automotive parts, mass production of precision forged parts, assembly of turbocharger parts for diesel engines, development and production of sintered wire mesh filters.

History
 1959 Founded as Tanaka Gokin Seisakusho (Tanaka Alloy Works)
 1967 New factory completed in Neyagawa, Osaka Prefecture and re-established as Nichidai Corporation
 1971 Head office and factory relocated to Tanabe, Kyoto Prefecture
 1988 Ujitawara Factory completed
 2000 Listed on JASDAQ
 2008 Thai subsidiary established

Development Story

M800/M80 Series Computerized Numerical Controllers



In March 2015, Mitsubishi Electric released the first series of computerized numerical controllers (CNCs) to have undergone a full model change in ten years, the M800/M80 Series. The major feature of these machines is enhanced productivity and reliability due to developing our own special-purpose CNC CPU for the first time. We also enhanced operability by adopting a touch panel design that enabled operation similar to a smartphone.



Mitsubishi Electric's new CNCs, the M800/M80 Series. On the bottom right is the standard model M80 Series, on the far left is the high-grade model M800S Series, ideal for high-speed, high-accuracy machining and multi-axis, multi-system control, and in the middle is the M800W Series, which features Windows as the operating system for the display unit.

First full model change in ten years targeted achieving "instant grinding with ease"

This spring, for the first time in ten years, Mitsubishi Electric released the M800/M80 Series of CNCs with upgrades in every aspect from the NC controller to the drive unit and motor.

Major features of the latest models, achieved through in-house development of a special-purpose CPU capable of the high-speed optimal processing demanded of CNC units, are high-speed, highly efficient and high-accuracy machining. We have revised the design of the display and keyboard unit and equipped a touch panel function enabling operation similar to a smartphone.

Planning and development of the M800/M80 Series began around eight years ago, shortly after

development of the previous models (M700/70 Series) ended. The development concepts were "CNCs capable of quick and easy use," intuitive operation and swift machining, immediate assessment of status even if the machine stopped due to malfunction, and prompt restoration and recovery. "Productivity and reliability are absolutely essential features of CNCs. The ability of a unit to achieve these features in the various scenarios it is used is best expressed as, "quick and easy use," explains Takahisa Tanaka, Senior Manager of the NC System Development Group in the NC System Department of the Nagoya Works, and development leader for the M800/M80 Series project.

The greatest feature is the special-purpose CPU developed for CNCs in-house by Mitsubishi Electric. Normally, CNC devices use general-purpose CPUs, and that had been the practice at Mitsubishi Electric to date. However, Mr. Tanaka decided, "The performance of CNCs demanded by the market could not be guaranteed over the long-term using a general-purpose CPU". It was decided that a special-purpose CPU would be developed by drawing on Mitsubishi Electric's overall strengths. According to Mr. Tanaka, the development team included an engineer who had previously worked on development of hardware for supercomputers. By adopting a CPU customized to suit CNC functions, it was possible to reduce the number of



Takahisa Tanaka
Senior Manager, NC System Development Group
NC System Department
Nagoya Works, Mitsubishi Electric Corporation



Naoki Nakamura
Manager, NC Engineering Group
NC System Department
Nagoya Works, Mitsubishi Electric Corporation



Yutatsu Kanemoto
Manager, NC Hardware Engineering Section
NC System Department
Nagoya Works, Mitsubishi Electric Corporation



Takeshi Tsuda
Manager, NC System Group
Drive Control Systems Engineering Department
Advanced Technology R&D Center



Main development members (Second from right, Tooru Otsu, Senior Manager, NC Hardware Engineering Section, NC System Department).

Developing a special-purpose CNC CPU drawing on the overall strengths of Mitsubishi Electric

electronic components and improve reliability.

Software was also entirely renewed. Naaki Nakamura, Manager of the NC Engineering Group, placed in charge of software development for this project reflects, "Together with the help of the Advanced Technology R&D Center, we challenged ourselves to go all out renewing the software. We exerted great effort to find a direction for which all members of the development team agreed."

Takeshi Tsuda, dedicated engineer of the Advanced Technology R&D Center's NC System Group, Drive Control Systems Engineering Department, commented, "We devised a way to support smooth machine motion in all situations using an algorithm that was as simple as possible. However, we had to maintain compatibility so that past CNC data could be used. To tell the truth, it would have been easier to develop completely new software from scratch. We really struggled to maintain compatibility with conventional models."



The display unit incorporates touch panel operation whereby the user merely swipes his/her finger across the screen, just like a smartphone, in order to zoom in/out and move the cursor, thus speeding up the process dramatically.

In terms of display and keyboard unit design, the development team aimed to achieve a device capable of quick, user-friendly operation. In other words, the design was conceived as a result of efforts to enhance productivity. For example, the cursor needs to be moved frequently when creating an NC program on the operation screen. Accordingly, a touch panel format was adopted whereby the operator merely swipes his/her finger across the screen, just like a smartphone or tablet, in order to move the cursor. This sped up the process dramatically.

Using a touch panel was raised as an issue for consideration in the initial planning and development phase eight years ago, and adoption was decided just three years ago. This is because the development team judged people had become more familiar with touch panel operation due to the popularization of smartphones and tablets. However, in regards to capacitance touch panels, Yuutatsu Kanemoto, Manager of the NC Hardware Engineering Section in charge of hardware development, said "It was extremely hard work resolving all the hardware-related issues."

Moreover, with just one year remaining before the project was scheduled for completion, Mr. Kanemoto was faced with a predicament. Development was proceeding in the direction of keeping the display unit the same size as conventional models so it would not feel unusual to operators. However, the design of the machine tools themselves was rapidly changing to

enable machining with increased visibility whereby the operator could get closer to the machine. In order to respond to this design trend, Mr. Tanaka, as the development leader, decided to create a more superior design for the new display unit.

This made it necessary to reconsider hardware configuration from scratch. Mr. Kanemoto and his hardware development team exerted their best efforts to set about hardware changes, and succeeded in developing a display unit with a machine-mounted face thickness 20mm less than the previous year's model, a thin 9.5mm. In line with this hardware change, it was necessary to once again make changes to software.

As a result of overcoming these many difficulties, the M800/M80 Series was completed according to plan. These machines offer significantly improved performance; for example a 10% reduction in cutting time with the mold machining program used for internal evaluation. Moreover, the display and keyboard unit designs were well-received, and resulted in both products receiving the Ministry of Economy, Trade and Industry's Good Design Award in 2015.

Mr. Tanaka summed up the latest development project as follows, "It was my motto to first say 'Yes,' regardless of how difficult the challenge we faced. From that point, it's okay to say 'But' and then explain the difficulties involved as long as the initial stance is a positive one. I think development succeeded because all members participating in the project took such a stance."

Product

Computerized Numerical Controllers

For customers to use Mitsubishi CNC with confidence, Mitsubishi Electric offers the service from the three points of view : Technical support, Training, and Service parts/repair.
With Mitsubishi CNC global service network, Mitsubishi Electric is ready to support the customers who have production bases around the world.



Mitsubishi CNC Lifecycle Management

For the customers to use their familiar machines for many years, Mitsubishi Electric continues to offer services:

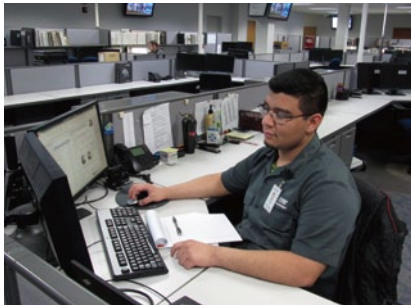
Whenever Wherever Forever

We provide the best service to support customers' production environment indefinitely

Technical Support **Minimizing Downtime with Professional Support**

Need to know how to cancel CNC alarm immediately!

Our call centers in various regions around the world can support customers quickly.



We have call centers in each overseas base to respond quickly to customers having trouble with the CNC. Our skilled engineers support customers to accurately resolve problems over the phone. We ship out service parts or send field engineers as needed to ensure a timely recovery of your machine.

Need support to recover the machine quickly!

Our field engineer visits customers' site to repair the CNC system.



Our specialists who acquired high skills on CNC system repair visit the site immediately based on the customer's request. We make full use of measuring instruments, etc. to precisely understand the machine state, and then adjust the faulty items or replace the parts. As a result, the machines are recovered quickly

After machine restoration we are also making efforts to prevent machine failures, suggesting preventive solutions by measuring the battery voltage of CNC and drive units and the insulation resistance of motors.



Our call centers and field engineers around the world are working hard day to day to enable our customers to safely use their machines. Please feel free to contact the nearest service center with any tiny issue.



Product

Processing machines

We offer worldwide support for Mitsubishi Electric's state-of-the-art Industrial Automation Machinery



Our rich lineup of EDMs cater to diverse processing needs ranging from parts processing to ultra high precision processing. Utilizing our advanced laser technologies, our laser processors deliver high productivity, stability, and low running costs. Service and support of these Industrial Automation Machines is available worldwide through Mitsubishi Electric's extensive global network. Our local staff will provide a prompt response to your various needs from inquiries about processing applications to requests for training and repair.



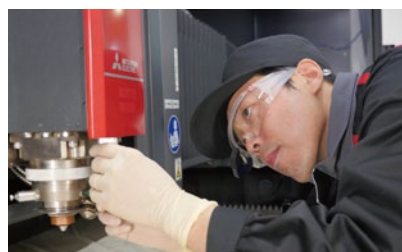
Applications

We can propose optimum processing applications to cater to your needs before and/or after installation. If you have any questions about processing applications, please feel free to contact us.



Showrooms

EDMs, laser processing machines, and various other Mitsubishi Electric mechatronics products are displayed in our showrooms. Our dedicated engineers are always ready to help you.



Service and Repairs

We offer repair services, dispatch of engineers to the field, replacement parts sales, and technical support in close cooperation with our local distributors. In case of a malfunction, we will promptly assist you to fix the problem.

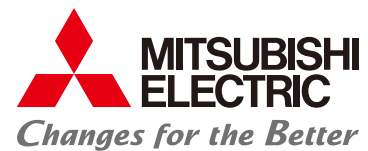


Training

We offer wide variety of regular training courses to give engineers the ability to use our products quickly after purchase. We offer basic operations to applied programming using actual products.



for a greener tomorrow



Best Balance of High-precision, Operability and Productivity

Global standard M80 Series CNCs combine high performance and operation ease

Next-generation M80 Series CNCs enable the introduction of innovative added-value to machining shop.

The independently developed dedicated CPU and advanced control functions ensure diversified control demand for high-precision machining and excellent productivity.

- Brings out the full potential of machine tools
- Implement ever more complex machining in an easy and efficient manner
- Customize the standard screens as per the preference of operators



M80 Series MITSUBISHI CNC M80 Series