USER'S VOICE

Vol. 3

OKUMA
Double-Column Machining Centers

● An MCR-BII User Testimonial

"Accuracy is survival"
Demanding the world's highest accuracies

● Development Story

The developers speak
A completely new DCMC from close attention to customer feedback and needs

● 6,000 Double-Column Machining Centers Shipped

Three junctures in the development of double-column machining centers

Liquid crystal manufacturing equipment may be considered typical of super precision equipment. The MCR-B Ⅱ, a double-column machining center for 5-sided machining, was the machine selected by this company to make the chassis that supports this high-accuracy requirement. We talked to the production technology section manager of company A, the person responsible for selecting the company's production technology, about the MCR-B Ⅱ.

Company A
Production Engineering Section Manager
(Company and personal names are withheld at customer's request.)

A major reason the user choose Okuma – this highly rigid crossrail design.

LCD exposure systems require accuracies at the nanolevel. The manufacture of these systems requires the world's best machine for 5-sided machining

— The MCR-B Ⅱ —

In the world of exposure systems, rays of light are traced from heights of several hundred meters to widths of 0.1 mm on the ground

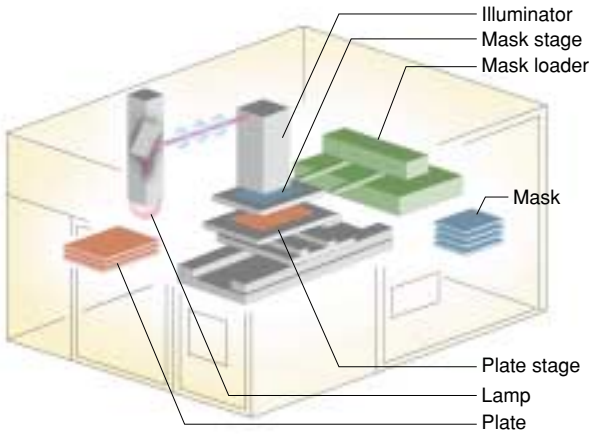
In the manufacturing process for liquid crystal panels, the LCD exposure system is the device that passes ultraviolet rays through the photomask, on which the wiring pattern is drawn, and onto a glass substrate. The picture elements are then burned one at a time on the glass substrate. To burn the circuit sharply on the glass substrate, the parts of the LCD exposure system must be machined to exceedingly strict accuracies.

Liquid crystal panels continue to grow larger, and recently the fifth generation (1.1 m x 1.3 m) and sixth generation (1.5 m x 1.8 m) panels are commonly seen. Preparations are now underway to manufacture the seventh generation (1.9 m x 2.2 m) of these panels. With this product "accuracy is survival," and the machine that makes the chassis serving as the base for various optical devices must maintain strict accuracies.

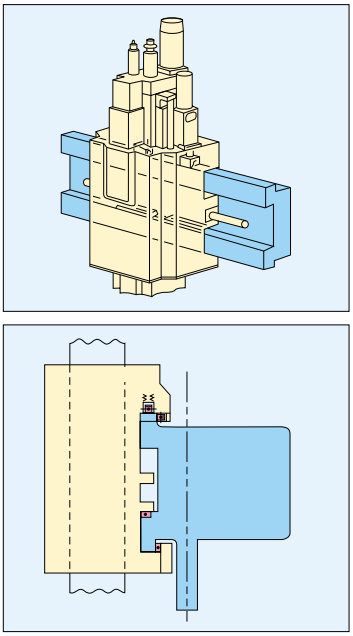
Flatness of 5 μm, perpendicularity of 10 μm —demands for the world's highest accuracies

We were in the market for a new double-column machining center, and leaning toward another manufacturer whose machines we had been using for our chassis. The accuracies we desired were a flatness of 5 μm and perpendicularity of 10 μm on a machined aluminum cube of 1 m. In a subsequent process the chassis would be finished to the sub-micro level. Such demands for rough machining were probably the highest in the world. If the rough machining could not bring the piece to this level, the finishing load would be greater. The optical equipment used in these exposure systems requires extreme accuracy. For this reason, when looking for a machine tool we ask first about the rigidity and then the accuracy. These two points are our main focus.

In fact, when Okuma was mentioned in the process of deciding a new machine, there was a strong feeling among our production engineering staff that it would be better to continue with the manufacturer we were accustomed to,



A large-plate exposure system. An ultra-precise machine with a loader to assemble the illuminator, mask, and plate at a stage.



Counterbalanced spindlehead helps maintain long-term, stable accuracies.

5-sided machining expert MCR-BII (high-speed, high-accuracy specs) with stainless-steel tank and full-enclosure shielding in support of ecological concerns.

and we were about 80% decided to go that way.

Convinced by cross rail support construction, temperature correction of spindle, machining surface with no steps, and the ardor of the person in charge of manufacturing.

Even so, we were persuaded by the enthusiasm of Okuma's representative to at least go see how the 5-sided machining MCR-BII was manufactured, and 5 or 6 of us visited Okuma's Oguchi Plant. The most interesting thing we saw was the cross rail accuracy. Something that long and heavy should sag of its own weight; how did they support it for smooth movement? Our question was answered when we saw the cross sectional configuration of the slideway, guide system for the spindlehead, and application of the lever principle to the clamp mechanism.
I myself am a class A machine assembly technician, and have participated in the Technical Olympics.* I am also experienced in tuning the machines we use, and have made various modifications to machine tools. When I saw the construction of the MCR-BII cross rail, I could see just what Okuma was trying to do, and how they did it. Spindle temperature correction was controlled to 0.1 micron, and a check of the machined surface revealed no unevenness. I felt this was a machine that could handle our demands. Afterward was putting in the details. When we showed our desired accuracies again to the person in charge, he immediately took up the challenge. At this time, I had nearly decided to myself that we would go with Okuma.

So satisfied with the machining accuracy of the MCR-BII that we recommend it to our subcontractors.

I heard after we had received the machine that Okuma had taken greatest care in finishing the cross rail so that it would be sure to give us the accuracies we need. And the excellence of the machining is seen everywhere—the rigidity and reproducibility in mounting the attachment head are good, and we are very satisfied with the machining accuracy. So much so that we recommend it to subcontractors visiting our plant.

Today the competition among manufacturers of LCD exposure systems is fierce. One of our company's core technologies is development and manufacturing technology for high precision lenses that are also used in telescopes. This becomes the base for many of our products. After using Okuma's MCR-BII for 5-sided machining, I can feel the same passion for detail in their machines as we have in our lens production engineering.

* World Skills Competition; Over four days of competition, young people drawn from 40 member countries test themselves against tough international standards.

Interviewer - Atsunori Sakamoto

Sanko Machinery Co., Ltd.
Takasaki, Gunma Prefecture
Business activities: Manufacture of parts for liquid crystal board manufacturing equipment, semiconductor manufacturing equipment, aerospace and rocket parts, electron microscopes, and other products.

Tsuneyoshi Ishii, President

Masami Shimura, Managing Director

High accuracy, short delivery time, and low cost are keys in machining large parts. Machines for 5-sided applications form our basis for building in high quality

Introduction of a new machine attracts new work

Ever since our company was founded we have operated under the motto, "If it produces chips, we can machine it." Including the quenching process, we have machined everything from construction equipment to agricultural machinery. However, after we introduced first Okuma's MCV double-column machining center and next the MCM for 5-sided machining, the type of work we bring in has changed. We are in a situation where "the machine dictates the work."

More than 20 years ago, we received orders for electronic microscope parts from a precision instrument manufacturer. Up to that time we had operated at the level of fitting together male and female sides, based on the skill and intuition of our operators. These new orders opened the way for us to begin high accuracy machining based on thorough reading of the drawing data and using an MCV-A. The opportunity for us to further raise our level in terms of high accuracy for large parts and complex shapes was the machining of parts for the H-II rocket. We have machined nozzles and other parts for fuel systems, and more recently we have also machined bigger parts such as the body for booster rockets.

As we accumulated experience we attracted new business, so that today we have 18 of Okuma's double-column machining centers, including 8 for 5-sided machining. The inside of our plant looks just like an Okuma showroom.

Based around machining centers for 5-sided applications, we have built a strong presence in the "high quality" fields of liquid crystal and semiconductors

In recent years, demands continue to increase for high-accuracy, short lead time, and low cost, even with large parts. To meet these demands we need to build in quality centered on the superior basic performance of machines for 5-sided applications in combination with the efficient use of milling machines and large lathes. In the past several years in particular, we have seen rapid growth in machining of parts for semi-conductor manufacturing equipment and exposure and test equipment related to liquid crystal boards. Our MCR-BII for 5-sided machining and other machines are always at full capacity.

For example, we machine aluminum material of 7-8 tons for liquid crystal manufacturing equipment, which is then finished to the micron level by our clients with a scraper, and assembled. We could not meet this demand without the proper machinery and precision machining technology. We have also worked to improve our production technology by developing our own dedicated fixtures and machines under a quality control system that has received ISO9001 certification.

Marumae Co., Ltd.
Toshikazu Maeda, President
Takaono, Kagoshima Prefecture
Business activities: Machining of parts for semiconductor and liquid crystal manufacturing equipment, optical instruments, and robots for clean rooms, and design and production of motorcycle racing parts.

"Idealistic logic" led us to machine chambers on our MCR-BII

Precision machining of high thermal expansion aluminum

One of our main businesses is machining the chambers for liquid crystal manufacturing equipment. A vacuum is created inside a large aluminum container (chamber) and plasma is sprayed with several thousand volts to produce a pattern on the glass substrate for liquid crystal. Although the surface is covered with alumite for insulation, minute flaws, spots of grease, or microdust on the surface at this time can be a cause of defects in the plasma spray. Therefore, exceptionally clean finishing is required.

As you know, aluminum has twice the thermal expansion of steel, and a 1°C difference in temperature can cause expansion of 24 microns per meter. With a 2.5-m square material, a thin piece of 120 mm is cut out at 2-m square from material of 600 mm in size. We therefore have to be extremely careful about many things—warping, bending, clamps, scratches from chips, etc.

Micron accuracies can be obtained with a high-accuracy double-column machine and thorough temperature control

Desired accuracies are 2 mm in depth (Z axis), 5 mm on the X and Y axes, and 5 mm in flatness. Moreover, given the effects of long cutting times and temperature, milling is repeated with the machining locations changed. At this time we want machined steps to be less than 1 mm, small enough that it cannot be felt by hand. To reliably ensure this accuracy, we in fact aim for accuracy at twice that level. We looked into various machines, but only the precision specifications of the MCR-BII could perform reliably under these conditions.

Assuming these machining accuracies, we then implemented strict temperature controls in the plant. This included sandwich panels on the walls and double pane windows covered with a UV (ultraviolet) protective film. We started with ventilation and heat exchange, but the most important things are being constantly aware of temperature during setups and always recording interior and exterior temperatures during machining.

Creating new technologies through a search of world-class benchmarks

I have enjoyed making things since childhood, and got started in machining when I bought a milling machine to modify motorcycle parts. From the simple pleasure of realizing "I can do this!", seven years ago I bought an NC machine (vertical machining center MX-55V) and founded Marumae's precursor, T'sM's R&D. I also learned CAD/CAM on my own. This background may have given me a different perspective, but my philosophy is to search for the reasons behind things. In doing so you can discover what needs to be done, and do things you were unable to do before. In the future I plan to pursue high value-added machining in areas where it is impossible without the commensurate technology.

Without a double-column machining center that gives a high level of finish, we couldn't survive fierce competition for automobile pressed parts

Ogihara Corp.
Eiichi Ogihara, Chairman
Ota, Gunma Prefecture
Business activities: Design, manufacture, and sales of dies for automobiles; design, manufacture, and sales of machine fixtures; manufacture and sales of pressed parts; and welding, assembly, and sale of pressed parts.

Dies are made from scratch. The machines that cut the dies, as well as the specifications of the downstream press machines, are determined by the design concept of the dies. Over the years we have worked with various machine tool manufacturers in that spirit, and pushed vigorously for high accuracy, high speed dies. We have had a relationship with Okuma for over 30 years, starting when we ordered a double-column machine, and their reliability in terms of basic performance has remained unchanged. Their attention to detail in places that are not seen, for example, in producing accuracy by scraping the attachment surface for the bracket that support a ball screw, leads to a machining quality such that there is no machining unevenness even after a tool change.

In recent years automobile press dies, cam configurations, slope machining, and other processes have become more complex, while at the same time accuracies and delivery times are growing stricter. In addition, overseas die plants tend to rely more on machines than worker skill, so we need to have machines that produce the same high level of finish. This is the reason we have actively introduced MCR-BIIs not only in Japan but in our overseas plants as well.

High-accuracy machining lessens the burden on downstream processes, which is significant for many automobile press parts that require complex, curved surface machining. For these reasons, we look to Okuma not only for the high rigidity of the basic structure, but to build machines that will do just what we need.

Won over by the user-friendly Five Center that provides a high level of finish. In the future, looking for a DCMC that adopts effective heat deformation measures

Fuji Technica Inc.
Izu-Nagaoka Plant
Kazumichi Iwamoto, Machine Section Manager
Sunto-gun, Shizuoka Prefecture
Business activities: Automotive stamping tools and dies; various press toolings; master models; test fixtures and jigs; various special purpose machines and fixtures; technical services.

Our CEO says that the key in making dies is to have high speed, high accuracy machines, and to use them well. He also strongly advises the development of double-column machining centers. In line with this, Okuma has put tracing equipment outside the columns and developed an integral motor spindle that turns at 6,000 rpm to handle a wide range of work from rough machining to finishing, and made it a standard specification. The MCR-A5C, a compact, fully functional machine for 5-sided applications, was born of these efforts. The basic construction of the cross rail, table guideway, spindlehead, and other structures, and the follow-up accuracy of the B, C axis universal head and Super-NURBS, all show in the finish. The Windows-type controller is also easy to use, and the thoughtful layout inside the control cabinet makes for easy maintenance.

In this plant we have brought in a 2,400-ton press to focus mainly on automobile side panels and other large molds, and we hope to see the development of a DCMC that uses the same Thermo-Friendly Concept adopted in the smaller MB-V and MA-H series. Achieving machining accuracies of within 20 microns over time without air conditioning would make it much easier for the downstream operations. A machine that can meet the demands of die and mold makers is sure to be a hit, and we would very much like to see a double-column machine that meets the needs for high quality without polishing.

Rigidity that can produce high accuracy under harsh conditions is essential. We also look forward to solving the problems inherent in die/ mold machining

Marusun Suruga Group
Suruga Die Tec Inc.
Fumitaka Iwasaki, Assistant Plant Manager
Fuji, Shizuoka Prefecture
Business activities: Middle and small size press dies, hot coining dies, specialty machines, fixtures, progressive dies, transfer dies, and stamping dies.

In addition to the chronic shortage of skilled operators, the past 3 or 4 years has seen severer demands in terms of cost and delivery times for automobile pressed parts. A top priority is introducing machines with the rigidity to produce stable accuracy even under the harsh usage conditions needed to meet these demands. That's the reason we purchased an MCR-BII and MCR-A. Super-NURBS (high speed contouring) in particular has earned a good reputation on the shop floor.

However, while the software for 3-dimensional configurations has seen remarkable progress, there are still no macro-functions (automatic programming) for the 1-dimensional processes characteristic of dies such as cutting of the block mounting surface and attachment bolt holes. It would be helpful to be able to make settings easily on the OSP for operations like drilling. Okuma's Machine & Control manufacturing has developed measures for heat in the operation panel for times like this year when we saw continuous very hot days, improved durability for tough operating conditions, and I look forward to their further improvements.

In recent years there has been increased use of high tension steel for lighter weight in automobile sheet steel, and the survival of die and mold makers lies in their ability to adapt to this difficult material. I expect that Okuma will have these trends in mind when developing their next double-column machines.

To achieve the ultimate in plastic machining, we look forward to a faster, more accurate DCMCs

Miyazu Seisakusho Co., Ltd.
Oizumi-machi, Gunma Prefecture
Business activities: Automobile press dies; welding jigs, from design to on-site maintenance (main plant).

Yoshiaki Hashida, Managing Director

Hideo Hagimoto,
Manufacturing Department Manager

We purchased the first MCV with ATC in 1977, beginning a long relationship with Okuma's double-column machining centers. The occasion for our purchase was the dramatic improvement in accuracies related to the upper/lower molds. They fit together just right at a single shot, and I remember that the downstream processes became easier. At that time some people thought that ATC was unnecessary for machining molds, but I think that ATC was the springboard of our automation. An Okuma engineer stayed at our company, and while absorbing die/mold know-how, dealt in detail with transverse table grooves, the need for grinderless operations, and attempts to increase speed while reducing pick feed in curved surface machining. This was all later reflected in the machine's performance. In the current design concept of the MCR-BII we can see such accumulated experience everywhere.

In the field of plastic working, however, achieving the shape desired at the time of press forming still requires 10-20% correction, even if the mold is machined to specifications with micron-level accuracy. Additionally, as the development time for cars becomes shorter, demands increase for high speed and high accuracy similar to that with a small MC even in die/mold machining. Almost every day, we think that collaboration between users such as us and machine tool makers, in order to bring about technical innovations that can't be imitated elsewhere, will be the key for continued growth.

The MCR-BII swept the die/mold market with an automatic attachment changer for each spindle unit, a universal head for easy machining of inclined surfaces, and other features. Engineers give their own stories on the development of this best-selling machine, which is the driving force behind our 70% domestic market share in double-column machining centers.

Shunsuke Wakaoka Machining Research Center
Senior Engineer (PhD Engineering)

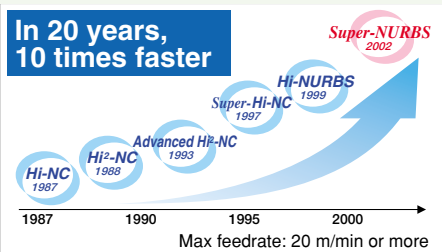
Undergraduate and graduate degrees from Hiroshima University Faculty of Engineering. Joined Okuma in 1974. Worked on design of double-column machining centers and automation (auto gauging, tool life management, cutting load indication, etc.) of horizontal machining centers. After working at Prototype Testing Center, was assigned to Osaka office as chief engineer. Has been in current position since 1994, focusing on the development and implementation of advanced applications. Earned PhD in 2002 for "Study of Rigidity and Machining Performance of Machine Tools."

I want to open the way to a new field that dynamically integrates various applications

A history of pursuing high speed, high accuracy die/mold machining

The ten years after I joined Okuma (in 1974) were just the time when the company was starting in the area of die/mold machines. It was a period when we were attempting to make products with a total system incorporating peripheral technologies. I witnessed the evolution from copying to NC machining, and then on to three-dimensional auto-programming systems that did not require a transfer model. It was always a battle for faster and more accurate machining. I was initially involved in automation technology as a machining center designer, and worked to develop such things as auto gauging, auto tool length offset, tool breakage and cutting load detection systems, and tool life management. Most of these functions are now incorporated for the automation of die-mold machines.

Around this time Okuma was also working to bring machines and NC to a higher level, and also, in collaboration with tool makers, was developing hybrid tools that used both ceramic blades with superior wear resistance at high speeds and carbide blades for their rigidity. We presented these developments to customers, who sometimes expressed surprise at the advances we were making. This was because we were not pursuing just machine performance, but the ability to perform more and more operations.



Trained in the production technology departments of automakers

Many of Okuma's double-column machining centers have also been delivered to automakers. As an engineer in the Osaka office I was our representative for Mazda in Hiroshima, and after seeing the beautiful free-form curves they made I was impressed with their high level of skill in using machines. They were very clever at seeing what a machine could really do, and bought an MCR-BII as the forerunner of the competitor machines. Of course they made very strict demands, and we had to really press ourselves to get the maximum performance out of the machines to meet those demands. The person in charge of design at that time was Mr. Furuhashi. With him at the head office and me standing in front of the machine on-site, we would exchange drawings, faxes, and mobile phone calls (at that time still quite expensive) until late at night. Amid all this, I was very happy when one of the managers of their die/mold department told me that the MCR-BII attachments had changed their design concept for die configuration.

Information gathered after a technology is made public provided hints for new technologies

Okuma was making great advances in high speed NC and servo control technology, and applications technology was evolving rapidly with the melding of peripheral and elemental technologies such as a shape smoothing (1995), high quality surface machining at 30,000 rpm with a large diameter tool of ø30 mm (1998), and shrinkage fit tooling that can be used at high speeds. Okuma's proposed machining methods for plunging, machine gun cutting, super L/D and other processes have been well received by customers. In the area of NC, Super-NURBS (developed in 2002) combined with control technology such as PFCII has earned an excellent reputation, with some customers going so far as to say they were "essential for high speed, high quality die/mold machining." This is why we have a share of more than 80% for double-column machines in the press die field.

You can see this evolutionary process together with a variety of sample workpieces at the Techno Gallery at our head office. The Machining Research Center here displays a wealth of data that may offer hints or machining know-how for masters in the field. This is provided based on the thinking that revealing technology openly will lead to the accumulation of new information and produce even newer technologies. You are welcome to drop in any time you visit our company.

SPACE TURN Development Story
As told by the developer

Seiji Furuhashi Assistant General Manager
Design Department

Graduated from Machine Dept. of Hamamatsu Technical High School in 1971. During first 4 years at Okuma worked on rotary knitting machines and other machines as a textile machine designer. Since 1975 has been involved continuously in the development of double-column machining centers. After working on the MDB, MCV, and others, has been involved since 1992 in the revolutionary MCR-BII machine for 5-sided applications. Also worked on the development of the compact MCR-A5C (Five Center) machine for 5-sided applications.

Our target was the automobile press die market. Customers have told us, “The universal head of the MCR changed our ideas about die machining.”

For a new double-column machine, listen closely to the voices of many customers

In the late 1980s Okuma’s double-column machines made their presence felt with the best-selling MCV-A and MCM series, as well as the MCR machine for 5-sided applications that use automatic attachment changers. However, we were approached by customers in the growing automobile press mold market with demands for considerable improvements. We studied these requests thoroughly to identify the kind of machine that was needed, considering everything from the rigidity and configuration required for die/mold machining to the performance and types of attachments, and even peripheral devices.

The concept we developed was that the machine must (1) reliably ensure speed and accuracy even when machining for long periods, and (2) have the wide-range capacity to go from rough cutting to finishing on a single machine.

Attachments and heads are key

The first problem was that the performance of the attachment changer was limited by the performance of the spindle “joint.” We then thought we could realize optimum tool performance with automatic changing of each spindle unit. Some people voiced concern, saying the idea was good but questioning whether we could make an effective automatic exchange mechanism for the spline that was connected to the spindle to transmit the turning force.

What we thought was a key point in development was whether the universal head could machine inclined surfaces with only a change of attachments. This mechanism was developed specifically for efficient cutting on a slant bed lathe for a certain user, but we thought that if we made it smaller it might also contribute to increased productivity in die/mold machining. This became the breakthrough for the spread of the MCR-II in the press die market. The appearance of the universal head led to the ability to machine the cam slide section, which up to that time had been machined separately, at the same time as the rest of the die. This reduced man-hours greatly, and was said to have “changed the way of thinking about die/mold machining.”

New model for easy upgrade from vertical machine to one for 5-sided applications

The MCR-A5C (Five Center) has earned a solid reputation as a compact, economical machine for 5-sided machining, and this model also got its start from input from customers. Since 80% of the work that goes through a machine for 5-sided machining is cut in two directions, vertical and horizontal, and there is a strong need to save space, we attempted to pare down the functions and make the machine more compact. In particular, the basis for smooth upgrade from a vertical machine to a machine for 5-sided machining was to design it to have the same size as the MCV-A series. This would be an impetus for such upgrades.

We are currently receiving aid from the Ministry of Economy, Trade and Industry for research and development for a next-generation double-column machining center. Here as well we would like to employ new mechanisms identified from customer needs. We hope you will look forward to these new machines.

User's Voice

TESTIMONIAI

Our machining strategy is based on a skilled workforce and use of double-column machines with more cost-effectiveness

Amagi Machine Works Co., Ltd.
Shigeki Amagi, Managing Director

Ogaki, Gifu Prefecture
Business activities: Machining of automobile, aircraft, air conditioner, motor, and industrial machinery parts; production of various fixtures (machine, welding, assembly).

Throughout our company's 60-year history, we have met the machining needs of the time with precise technical capabilities. Today our five plants do work for a wide variety of fields—automobile, air conditioning, industrial machines, medical equipment, and aircraft—and we delivery jobs from one piece to mass production with diverse materials including cast iron, iron, carbon steel, and aluminum. The basis for our operations is a highly skilled workforce and machinery that is very cost-effective.

We encourage our workers to obtain certified qualifications, and currently nearly half of our approximately 300 employees hold national certification as machine operators. The machines we look for are ones that have a high level of diversity and can reliably produce the required accuracies. Among double-column machining centers alone we have nine MCVs, four MCR-BIIs, and one MCR-A—a full representation of Okuma's products.

We have a premaintenance team that measures the inclination of all large machines once every two years, and our own staff make adjustments to tables and columns. This surprises visitors to our company, but having thorough knowledge of the machines we use raises our skill and lets us extract the maximum capacities of the machines. This is the strength of machining at Amagi, and a source of our pride.

http://www.amaki-mw.co.jp

Novel ideas and maximum use of the features of Okuma's double-column machines can increase productivity even with difficult work

Tanaka Machinery Inc.
Hideaki Tanaka, President

Soja, Okayama Prefecture
Business activities: Production of press molds and peripheral devices, train coach parts, parts for iron and steel making, and design and production of rubber forming molds.

The purchase of an MCV-A double-column machining center in 1982 was what allowed us to escape being a secondary outsource planer and become a primary outsource that customers come to with difficult tasks. The crucial moment for us came when we received work for the undercarriage of the Eurostar, the train that crosses the English Channel. Conditions were strict: in addition to the undercarriage being large, the places to be machined were scattered, there was a key slot in an inclined surface, and the delivery time was short. At that time machines for 5-sided applications were becoming common, but we still didn't have one. Therefore, using original machining processes and fixtures, we combined an MCV-A and horizontal machining center to produce a setup similar to today's continuous 5-axis machining, and our production performance was three times that of companies using 5-sided machining. This surprised our customer as well.

As the workpieces became larger, we bought the MCR-BII that we had wanted. Then, taking a hint from the spindle attachment system on the machine, we ordered a special angle head that could cross beyond the frame of the undercarriages to enable machining of the interior side. Again we raised productivity three-fold. During this time we machined a variety of large parts, including supports for uranium fuel transport, molds for shinkansen (bullet train) carriages, printing press frames, and hubs for windmill power generators. We are now focusing on machining of liquid crystal manufacturing equipment with the MCR-A5C (Five Center). We have struggled as the demanded accuracies increased dramatically, but today we continue to operate at full capacity. The MCR-A5C is adaptable and packed with functions. It is extremely valuable to us, truly a machine for the times.

6,000 double-column machining centers shipped

Okuma Corporation
Junro Kashiwa,
President & CEO

Okuma's double-column machining centers were born in 1964. That was the year of the Tokyo Olympics and the opening of the Tokaido Shinkansen bullet train line. Japan still had not achieved affluence, but it was an age when the number of households with a black and white TV had reached 90%, and national sports heroes such as Oh, Nagashima, and Taiho were active. I remember it as a time when people had energy and dreams.

Afterward Japan entered a period of true rapid growth, and I feel that our double-column machining centers advanced together with the expansion of the economy and technological development.

This is because we established our position at three junctures in Japan's economic growth and advances in technology.

Juncture 1

Japan's high growth rushed forward headlong, but with no small measure of troubles and difficulties. The oil shock of 1973 in particular was a huge blow. The manufacturing industry is Japan was forced to reduce costs dramatically, leading to a shift away from a labor intensive production approach. The MCM for 5-sided machining offered both high accuracy and high efficiency, and was a big hit with over half being delivered to machine tool makers that produced "mother machines."

The demand for high-efficiency machining has continued unabated, and today the focus for our machining centers is on machines for 5-sided applications.

Juncture 2

During the period of high growth we experienced a wave of motorization, but initially there was a large gap between Japan and the countries of the West. However, through an indefatigable pursuit of technology, we finally caught up with the West in all areas including performance and design. In the area of press die/mold machining as well, we have loaded the MCR-BII, our flagship double-column machining center, with a combination of Okuma's own die machining system (DMS) and high speed NC function (from Hi-NC to Super-NURBS) to achieve even higher accuracy and speed. Thanks to the support of Japan's leading automakers and large press die manufacturers, we have gained an 85% share of the press die market in Japan.

Juncture 3

The period of high growth came to a close, bringing increasingly intense competition to the manufacturing industry. This competition has helped small and medium-size businesses to transform themselves, becoming stronger and more adaptable. The thing people at these mid-size companies have placed greatest emphasis on is distinguishing themselves with high speed and high accuracy. Because of this we have received a very favorable response to the MCR-A5C machine for 5-sided applications (Five Center), which can replace the best-selling MCV-A series machines.

Okuma's double-column machining centers thus grew together with the Japanese economy, and, thanks to our many users, in July 2004 we reached shipments of 6,000 units.

We will continue to evolve to develop machines that are useful to the many people working in the field of liquid crystal devices. We ask for your continued patronage.

OKUMA

Double-Column Machining Center Series

6,000 Machines Shipped

1964
JP Vertical
Boring Machine

40 years of experience

For advanced manufacturing

2004
5-Sided Machining Applications

MCR-BII 35E

OKUMA Corporation
Export Department

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