

# USER'S VOICE

Vol. 9  
2012

User's Voice

**The Thermo-Friendly Concept—Key to obtaining micron-level accuracies in high productivity machining**

**The Collision Avoidance System is essential for multitasking of highly diverse aircraft components**



Benefits proven in the machine shop — by  
**Okuma's  
"Intelligent  
Technologies"**



Thermo-Friendly  
Concept



Collision Avoidance  
System



Machining  
Navi



After two years the reputation of MULTUS on the plant floor only gets better: "We don't have to make any compensations at all any more, and operation is almost always unattended."

# Upgrading of machining center + lathe line to multitasking machine leads to 24-hour operation with high accuracies of 5 μm and no gauging

Mass production machining of small general purpose engine parts with a MULTUS multitasking machine



With former dedicated MC + lathe line, dealing with irregular Z and Y axis thermal deformation was a struggle

Our company supplies agriculture and forestry equipment (brush cutters, herbicide applicators, rice transplanters), high performance pest control machinery (sprayers, riding power tillers), machinery for green space management (chain saws, blowers, chippers), and industrial machines (generators, welders, floodlights) under three brands—Kioritz, Shindawa, and Echo—to more than 80 countries worldwide. Our Yokosuka plant serves as our base for production technology, and is also responsible for parts machining and assembly of small general-purpose engines.

These small general purpose engines include small, lightweight two-cycle engines with simple structures and four-cycle engines with superior combustion efficiency for riding type equipment. At the Yokosuka plant we produce 2-cycle engines for chain saws and other equipment that is widely used in western countries.

In mass production machining of engine parts we place the greatest emphasis on machining accuracy. In recent years in particular, exhaust gas regulations for small general-purpose

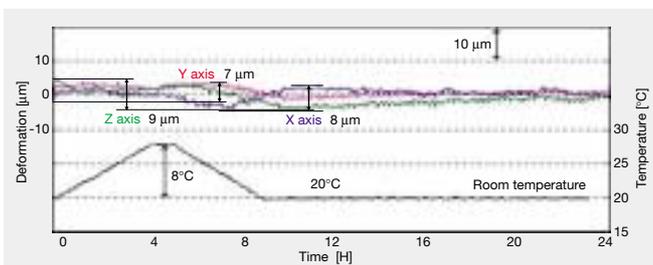


Masahiro Inokuma  
Production Technology  
Assistant Manager

engines are becoming increasingly strict, especially in western countries, and to comply with these regulations we have needed to increase part accuracies in order to raise combustion efficiency and make exhaust emissions cleaner.

We previously machined the key engine components on a dedicated line with four Okuma vertical machining centers and two NC lathes, but warming up was necessary and we struggled with variations in thermal deformation on the Z and Y axes. To compensate tolerances we measured all parts post-process and gave feedback before sending the parts on to the next process. We occasionally tried machining with a horizontal MC in addition to vertical MC, but just couldn't control machine expansion.

When we were looking at upgrading equipment, we reviewed our machining methods up to that time and considered purchasing a multitasking machine. We ordered sample cuts from several manufacturers before selecting a model.



Dimensional stability of ≤10 μm machining dimensional change over time with the MULTUS B200 using Okuma's Thermo-Friendly Concept was the determining factor in selecting a model



High accuracy machining of engine cylinders is critical for cleaner exhaust emissions



Small 2-cycle general purpose engines are the main product of the Yokosuka Plant. Yamabiko is world leader in environmental criteria, meeting the world's strictest exhaust emissions regulations in the United States.



Completed engines are exported to assembly plants in the USA, where they are assembled in final products in a knockdown system.



**The stable high accuracies achieved in process-intensive machining without gauging on the MULTUS B200 have allowed us to meet our challenges**

We had heard about the dimensional stability with the MULTUS B series and put it on our list of candidate machines. We ordered sample machining with continuous cutting for one hour in a solid material, and with the MULTUS dimensions were kept to within one-third of our tolerance range. We felt that with the MULTUS we might even be able to eliminate gauging. Considering the time spent in setup and adjustment and the cost of measuring instruments, getting rid of the gauging process would greatly increase efficiency. However, replacing our previous MC + lathe line with a multitasking machine was a considerable challenge in itself, and while logically we understood the gains in terms of both machining accuracy and process-intensive machining, we were also a little uneasy about whether it would really turn out alright because so many different factors were involved.

However, after we purchased two MULTUS B200 machines in the spring of 2010 and put them in operation on a joint machining line, the dimensional stability of the Thermo-Friendly Concept more than met our expectations. For a while we measured workpiece dimensions in the morning and afternoon, but no compensation was needed and we have had absolutely no problems with downstream processes even with fulltime 24-hour operation. Today it is almost a hands-off operation. Two years after bringing in the machines, we are planning to order special tools for the MULTUS to further shorten the cycle time by 10%.



We use the Collision Avoidance System (CAS) before machining new parts on the line, but since an interference check can be done in advance on the NC screen we haven't had any in-machine collisions.

Masanori Kimura, Assistant Manager 4, Machine Section, Yokosuka Plant, Production Division.

**We look to Okuma not just as a machine tool manufacturer but as a company that can help users reinvent their production processes**

What made us feel confident in purchasing MULTUS machines is that we knew Okuma did not see its responsibility as ending as soon as the machine was shipped, but would immediately analyze the causes when any problems arose and provide solutions. We feel that their basic attitude is not just to try to sell machines but to uncover existing value by supporting user's machining operations. We take technologies like the Thermo-Friendly Concept and CAS as evidence of that corporate culture. However, if I could make one request I would like to see improved durability in the ATC for hard users like our company.

Our production of small general-purpose engines has more than doubled in the past 10 years. One reason for this is that we have been quick to meet exhaust emissions regulations in every region while achieving product accuracy. Today we are facing a headwind in the historically high level of the yen, and to continue increasing production domestically we have to constantly pursue a rigorous machining system that achieves both higher accuracies and reduced costs. We are always looking for suggestions for new technologies and machines that contribute to such innovations in production technology.

**Yamabiko Corporation**

Yokosuka Plant/Production Engineering Dept.: 14 Natsushimacho, Yokosuka, Kanagawa TEL 046-865-8333  
 Headquarters: 1-7-2 Suehirocho, Oume, Tokyo  
 Website: <http://www.yamabiko-corp.co.jp/>  
 Established: December 2008

Business activities: Manufacturing and sales of agricultural, industrial and outdoor power equipment (agricultural and forestry equipment, high-performance pest control machinery, machinery of green space management, industrial machinery).

# The Thermo-Friendly Concept—Key to obtaining micron-level accuracies in high productivity machining

Precision machining of difficult-to-machine parts for optical communications with MB-V series machines



## A top player in ultraprecision machining of difficult-to-machine parts for optical devices

Our company's staple business is high accuracy machining of optical semiconductor parts used in relays of cables or base stations for optical networks that carry massive volumes of information. The materials are mainly difficult-to-machine metalized ceramics. For example, Kovar (an alloy in which nickel and cobalt are combined with iron), which is increasingly used. Kovar is characterized by very tenacious hardness and low thermal conductivity. In machining Kovar, dimensional accuracy in micron units and strict surface roughness is demanded. To meet these needs, we placed an order for a special compound Kovar material with a material manufacturer, worked together with a tool manufacturer to develop tools with low breakage, finishing surface roughness, and cutting resistance, and applied coolant with special specifications. After cutting we remove fine burrs from all products by barrel finishing with a polishing agent or compound, and then after washing measure precision to ensure quality. In other words, we are pursuing an area and level of machining that only we can do.

At the same time, to survive in the harsh global competition, we need to achieve mass production of the prototypes we create with champion data, combining both high accuracy and high productivity. What inevitably surfaced was the need for a machining center with superior dimensional stability.



CEO  
Harukuni Takagi

## Dimensional stability that matches its reputation and rigidity that reduces chatter, acknowledged by our specialists

The accuracy control specialists in our prototype, production technology, and mass production departments had heard the reputation of Okuma's Thermo-Friendly Concept from trading companies and information on the Internet. Then, when we were upgrading equipment in the fall of 2010, we purchased one MB-46VAE and two MB-56V vertical machining centers that could handle 5-axis machining with tilting circular table specifications. With the exception of some of our veteran machinists, this was the



Up-and-running MB-46/56V vertical MCs, with unmatched dimensional stability

Specializing in high accuracy and complex shape machining of difficult-to-machine materials including Kovar, nickel alloys, stainless steel, Inconel, titanium



Precision machining of pure tungsten, a very difficult-to-machine material



Ikuo Matsuda, Operating Officer/Plant Director



Masanori Ide, Assistant Section Chief, Prototype Section



Masaki Miyahara, Assistant Section Chief, Manufacturing Section 3



Nobuhiro Iwasaki, Chief Engineer, Manufacturing Section 3

first time we had used an Okuma machining center, but we heard very good things from the production floor about the dimensional stability and rigidity of the machines.

Impressions from the shop floor included the following comments: "We can easily meet demanded tolerances of 5 μm (material: oxygen-free copper). We used to deal with thermal deformation by making a number of compensations, but we don't need to do that anymore" (Production Technology Dept.), and "We used to machine workpieces with difficult-to-clamp shapes using a solid end mill without reducing the cutting speed, but there were times when the workpiece would fly out. This has never happened with an MB-V. We get no chatter with the same cutting conditions, giving us a real sense of the machine's high rigidity" (Manufacturing Section 3). With these positive reports from the production floor, the company purchased two additional MB-46VAEs and one MB-56VB.

While making progress with automated machining we are also looking to enter new fields, such as aerospace, defense, and electronics, in addition to optical communications, automobiles, and medical equipment. A strategic move for this was to order an MB-5000H horizontal MC from Okuma. Again, the determining factor in our machine selection was the Thermo-Friendly Concept. Unlike multitasking machines, which are in the lathe family, the chucking and fixture setup changes with each workpiece on machining centers, and machining of large-variety, low-volume functional parts cannot currently be dealt with by modeling work. The Collision Avoidance System on Okuma's MB-5000H horizontal MC should be a major strength if orders for mass production parts increase.



Precision measurement of surface roughness, shape, and dimensional accuracy in the Quality Control Dept., equipped with state-of-the-art instruments.



To ensure rigorous surface roughness, fine barrel polishing is done with human eyes and hands

### While emphasizing marketing, also making breakthroughs in productivity and developing a high-level manufacturing organization with a Meister system

With the collapse of the IT bubble in 2001, our company's predecessor had continuous 90% decreases in production and suffered fatal damage. From that experience we have come to place the highest priority on marketing, with emphasis on market analysis and sales, and have decided to move in the direction of detailed surveys for technical fields, production methods, and even the timing of equipment investment. When orders fell off thirty percent following the Lehman shock, we took it as a good opportunity to work on making our manufacturing operations more muscular for our next big steps forward, and undertook a fundamental review of our processes with the idea of transforming productivity. In that process, we worked together with toolmakers in challenging the limits of end mills and machines with unequal leads and speeded up roughing as much as ten-fold.

Our aim in training personnel is to be a world-class manufacturing organization, and in cooperation with the Kagoshima National College of Technology we have established an annual industry-specific examination system called the "MC Meister System." This is a system that determines treatment and position within the company according to level of acquisition of advanced theory and specialized skills. It is directly linked to raising the skill and motivation levels of young employees, whose average age is in the late 20s.

Japan had been unrivaled in metalized ceramic products for optic devices, but in recent years competing products that do not use ceramics have appeared. At the same time, there are few companies in other countries that can handle mass production of these functional components, and as optical network infrastructure develops in the United States, Germany, and elsewhere attention is turning to our production abilities. To make one's presence as a company felt in today's difficult economy, we believe the most important thing is to develop and advance elemental technology for all aspects of machining, including blank materials, machine tools, tooling, and coolants.

## Micro-Cut Co., Ltd.

Headquarters/Plant: 12-2 Uenohara Techno-park, Kokubun, Kirishima, Kagoshima TEL 0995-48-5611  
Website: <http://www.microcut.jp>  
Established: 2003

Business activities: High-accuracy machining and machining of complex shapes in various difficult-to-machine materials, especially precision cutting of metals for the communications and optical communications industries



With the first MCR-BIII in the eastern Japan area, we will move into the medical equipment and aerospace fields



Full line of multitasking parts of difficult-to-machine material, machined at micron level accuracies, that are used in semiconductor manufacturing equipment



Thanks to a chip compressor that was developed in-house (sold externally), there is not a single chip storage bucket taking up space in our Yamagata plant

## Significantly reducing lead time with a multitasking machine and taking on new growth fields with a double-column machining center for 5-sided applications

**Precision machining of parts for semiconductor and liquid crystal manufacturing equipment and automatic machines**



Thermo-Friendly Concept



Collision Avoidance System



Machining Navi

**Contract manufacturing, starting from development and design, of manufacturing equipment for semiconductors and liquid crystal and all types of automatic machines**

Keiso contracts everything from design to manufacture of manufacturing equipment related to semiconductors and liquid crystal devices, and various types of automatic machines. Our products are delivered after ensuring quality based on ISO9001. The characteristic of our company, and its strength, is that we do not simply manufacture parts but incorporate our manufacturing know-how by “providing production systems” in manufacturing equipment that achieves the product specs (quality, supply quantity, cost, manufacturing speed, etc.) desired by the customer. At the Yamagata plant we are responsible mainly for parts machining and unit production, while equipment assembly is done in the clean

rooms of our headquarters and Tsukakoshi plant. A chip compactor that we developed in-house is sold externally under the Keiso brand.

In the Yamagata plant our operations cover everything from huge 6 m x 3 m fixtures to tiny  $\phi 50 \mu\text{m}$  drill holes, but the level demanded for semiconductor and liquid crystal manufacturing equipment is particularly high, with machining accuracies in units of single microns needed even for parts. We also handle difficult-to-machine materials, with titanium, ceramic and aluminum composites, super hard stainless steel, and extra super duralumin not uncommon. This kind of parts machining requires machine tools with high rigidity and superior dimensional stability, which is why we have purchased major Okuma models MCR-BII and -BIII, MCR-A (double-column MC for 5-sided applications, MA-550VB, MB-66VB (vertical MC, and MULTUS B400-W/B200-W (intelligent multi-tasking machine).



Process-intensive machining on a single MULTUS B200-W of bar material that was previously done in six processes on multiple machines

### Significantly reducing lead time with a MULTUS and entering new fields with an MCR-BIII machine for 5-sided applications

We purchased a MULTUS B200-W in 2007 with the aim of integrating processes for parts that we had previously machined on several vertical and horizontal machining centers. Machining from bar material (round bar) to square parts that previously took six processes is now finished, including face milling, to the completed part level with a single chucking. We do not need to bother returning to a previous operation for compensation, which has significantly reduced lead times. Especially in the development of manufacturing equipment, sudden modifications or design changes to prototype parts are not uncommon. Since things that used to take several machining centers can be handled overnight in unintended operation with a single MULTUS B200-W, we have also been able to reduce the burden on our workers. In terms of dimensional stability, the Thermo-Friendly Concept with no variation in thermal deformation even during operating intervals has led to much greater ease of use. Currently we have some workers who say they do not feel secure operating the machine without the Collision Avoidance System, and others who struggle with fine condition settings such as tool and workpiece extension to avoid in-machine collisions.

The state-of-the-art MCR-BIII machining center for 5-sided applications that we installed at the end of 2011 was purchased based on the decision of our top management to take up the challenge of entering the medical equipment and aerospace fields as our next areas of growth. In aerospace, for example, 35% of the parts for the Boeing 787 next-generation passenger airplane are made in Japan, and the national government is also putting effort into growing this industry as a base industry second to automobiles. However, entering this field requires not only technical skill and large costs but also strict quality management. We will focus first on manufacturing jigs and tools, and then after obtaining certification in international standards aim for full-scale entry. We have become proficient in high-accuracy machining with 5-sided machining applications using diverse attachments with the MCR-BIII, but the MCR-BIII is equipped with the latest intelligent technologies—the Thermo-Friendly Concept, Collision Avoidance System, and Machining Navi. By taking full advantage of these technologies we look forward to entering a new dimension in machining.

Mitsuhiro Okada  
Section Chief  
Manufacturing Section 1  
Manufacturing Dept.



Kaoru Yamaguchi  
Director and Machining  
Dept. Manager



We absorb machining know-how from Okuma engineers under a policy that “the art of manufacturing is the art of developing people”

### We nurture people to take pride in our products, feel affinity for our machines, and guarantee quality, under a policy that “the art of manufacturing is the art of developing people”

In harsh global competition, developing our people is a key point in pursuing manufacturing that can be done better in Japan than elsewhere. Our employees are educated and trained with the goal of mastering processes from program creation to setup, machining, and measuring, reaching a level where they can guarantee quality. In that process we emphasize pride in “not simply making parts but producing equipment with the same high level of perfection that is built into automobiles,” joy in the art of manufacturing, and affinity for our machines.

As one part of these efforts we ask Okuma engineers to hold visiting lesson-like classes so that we can absorb the machining know-how that is unique to machine tool manufacturers. In these settings we discover hints for new machining methods from technical discussions between the different parties, and increase our motivation to achieve higher technical levels. From these experiences and also from looking at the evolution of successive OSPs, we sense the pride of Okuma in their products and their attitude of uncovering hidden user needs, which they then reflect in improved performance and ease of use. For us these learning processes become the substance for a solid manufacturing foundation.

## Keiso Kougyo Co., Ltd.

1-2-2 Matsugaoka Zaou, Yamagata City, Yamagata TEL 023-688-8351  
Website: <http://www.keiso-kk.co.jp>  
Established: December 1972  
Business activities: Design and manufacture of manufacturing equipment, jigs, and tools for the semiconductor and electronics industries; all aspects of surface mounting machines and semiconductor manufacturing equipment; liquid crystal and plasma display manufacturing equipment; contract production of various types of automatic machines and machining of precision parts

## Just-in-time delivery of finished products to customers' assembly lines, with an integrated production management system

The major characteristic of our company is start-to-finish production of all processes (die design/fabrication, aluminum melting, die casting, cutting, washing, surface treatment/coating, assembly, inspection) of aluminum die cast parts, and just-in-time delivery to our customers' lines. What has made that possible is an integrated production management system that we have pursued since our predecessor's (founder's) generation. We bought our first CAD/CAM system with a general purpose computer in 1983, and since then have worked to shorten delivery times with use of IT and expansion of our information network.

In 2008, with assistance from the New Energy and Industrial Technology Development Organization (NEDO), we started an automatic supply system that links an aluminum melting and holding furnace, supply robot, and die cast machine, and reduced our CO<sub>2</sub> emissions by 150 t/year. During that time, we also took measures to comply with the Restriction of Hazardous Substances (RoSH) directive in Europe, and worked to remove chrome from our surface treatment line.

Considering the size of our company this may seem to be an extravagant capital expenditure, but Kyoto does not have such a high concentration of machining companies as Higashiosaka, and our situation forced us to pursue start-to-finish production on our own. At the same time, to continue as a primary supplier of major corporations we need to take the lead in adopting new technologies and constantly improve quality and productivity. Our company has about 2,000 different products (control instruments, robots, semiconductor mounting machines, sensors, optical fiber parts, etc.), and what is demanded above all is high quality and short delivery times. This is also what attracted our attention to the Thermo-Friendly Concept for precision cutting processes.



CEO  
Kouichi Tanaka

## We sought stable machining on the micron order, and the dimensional stability of the MA-400HA was "just as advertised"

After casting products in a die casting machine, we used to perform drilling, threading, and surface cutting operations in the casting using a horizontal machining center, but accuracies were not that high. Then, in 2007, we undertook a review of our machining equipment. Although only small amounts of material are cut in cutting operations, machining on the micron order at strategic points is essential, and flatness and pitch accuracy of holes and taps, including good position accuracy (concentricity) when parts are reversed on the B axis, is demanded in parts with various thicknesses. However, with the machines at that time there was inconsistent accuracies from the effects of thermal deformation, and

# A machine we can trust for precision machining in start-to-finish production of high-quality die cast parts

## Precision machining of cast parts on MA-400HA horizontal machining center



Precision machining a die cast part on MA-400HA



Parts require flatness, concentricity, and pitch accuracy in micron units

Precision die manufacturing



Molten metal automatic supply robot



Forming with die cast machine



Micron-level inspection with 3-dimensional measuring machine



Aluminum ingots



Molten aluminum at 700°C



Tower aluminum melting and holding furnace



Precision machining of parts on a horizontal MC



Finished products

we had to make compensations every hour or even more often in seasons when there was a large temperature difference between morning and evening.

At that time we were taken to the Okuma Machine Fair, where a major topic was machines with the Thermo-Friendly Concept that changed the concept of thermal deformation. We thought if machines really achieved that level of performance we wouldn't need to have an operator watching each machine all the time, and could increase the efficiency of our workshop. In November 2008 we went ahead and purchased an MA-400HA horizontal machining center. We found the performance to be true to the claims, giving us accuracies suitable for high quality die cast parts at a single shot. Moreover, even though we installed it in a location near the factory entrance where drafts come in from outside, the dimensional stability was unchanged. In other words, the Thermo-Friendly Concept allowed us to install the MA-400HA in an environment that could be called extreme for a machine.



Eiichi Tanaka, Advisor



High quality die cast parts showing technical strength

### Building an IT network with subcontractors to improve competitiveness with a start-to-finish production system

As in other industries, die cast products are exposed to tough global competition, and cost and quality is compared with that in developing nations. However, if a comparison is made of not just the cost for a single process but of the cost, quality, and delivery time from CAD data to finished product, our company comes out ahead. This is our real strength, and the outcome of our pursuit of start-to-finish production with integrated management. Achieving high quality requires high-level die design and manufacture, but we also have know-how from tacit knowledge built up over many years. To build up these strengths even further we are linked to our subcontractors through the Internet, and have developed a manufacturing industry partnership to share manufacturing information (orders, shipments, progress, quality, receipt and inspection). We were awarded the 2009 Grand Prize for IT Operations in Small and Medium-Sized Businesses, a Minister's Prize from the Ministry of Economy, Trade and Industry.

In the future we will continue to combine our tacit knowledge with information technology while refining our start-to-finish production system and working to be a die cast maker with standout QCD ability.



Trophies attesting to high-level use of IT

## Tanaka Seiko Co., Ltd.

Headquarters/Plant: 129-1 Megawa, Makishima-cho, Uji, Kyoto TEL 0774-25-1166

Website: <http://www.tanakaseiko.co.jp>

Established: 1946

Business activities: Die cast parts (control instruments, OA equipment, FA equipment, automobile equipment), precision die-casting dies, information service (production management system software, complete information system development)

# The high thermal stability of the MB-46VA is essential for mass-production machining with the high accuracy demanded of automobile parts

Mass-production machining of constant velocity joints on an internally designed FA line



## Mixed-flow line with MB-46VA machining center raised productivity 1.2~1.3 times

We have purchased Okuma products for about 30 years, ever since our first NC lathe, an LC20. Today, about 80% of our machine tools are made by Okuma. Our company originally specialized in shaft work for home electronics, but gradually mass-production machining of function-intensive parts for automobiles has come to make up 80~90% of our work.

Orders for parts that demand strict dimensional accuracy will increase to the extent that customers acknowledge our approach to pursuing machining technology. In 2005 we were asked about producing balance shafts (monthly production 50,000~60,000 units) that required outside diameter machining with a tolerance of 18  $\mu\text{m}$ . With these workpieces there was concern about wavering and chatter, and so for this work we selected the Okuma LB300, which we recognize as our best for machining accuracy. We then added a fairly large revolving center and steadyrest and incorporated an external measuring system we had developed, and started up an automatic line. The results were excellent, and currently we have shortened the cycle time down to 50 seconds.

Based on these results, we next purchased an MB-46VA vertical machining center. Our aim was to increase efficiency of parts for

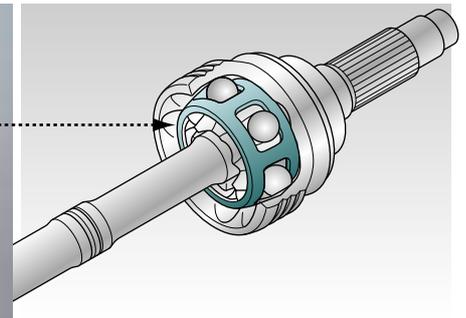


Tatsuhiko Shibata  
Dept. Manager  
Engineering Dept.

constant velocity joints, which transmit engine and propeller shaft rotation sideways, and cage machining. Previously, we used a broaching machine with a long blade to cut through the window portion of the cage, but productivity can be greatly improved with end milling on a machining center after quenching the workpiece. However, that machining center needs to have sufficient rigidity to withstand the hardness of the workpiece, and dimensional stability. We were told that a new design concept, the Thermo-Friendly Concept, was used on the MB-46VA and that it could control



LB300 production line; 50~60,000 shafts/month



"Constant velocity joint cage," a key safety and typical UNICRAFT "integrated-function" part



FA mixed flow line incorporating mobile robots and an internally-designed inline measuring system



"Integrated-function" parts for automobiles are distillations of Unicraft Nagura technology



Akihiro Iida, Section Head  
Production Technology  
Engineering

machining dimensional change over time to within 8 μm. After confirming the performance in test machining, we went ahead and purchased one.

The results were great. We produce about 30,000 cages per month, but they have various sizes and similar shapes, and we tried to make our automation more muscular by developing a mixed-flow line that could handle diverse-type, small lot production. The result is a mixed-flow line that handles more than 10 different types of cages, with productivity increased 1.2~1.3-fold.

This mixed-flow line firmly established the reputation of the Thermo-Friendly Concept in our company, and a group company started a new LB3000 EX loader line.



▲"Electric upsetting," which enables plastic forming of bar material in any location, contributes greatly to making products more lightweight and eliminating processes (photo shows fork shafts for manual transmission. Finished products are at top.)

Various trophies and award plaques relate our high reputation as an outstanding supplier



### Ease of use of OSP recognized by multi-skilled technicians; motivation from Okuma service personnel

We have adopted a policy of "No. 1 in Customer Value" to back the guarantee of high quality from our precision machining technology, and have worked to cultivate super cross-trained workers.

Employees like Akihiro Iida, Head of the Production Technology Section, who are qualified expert technicians in machining, perform a wide range of jobs from FA line startup to gauging macro design, while even general plant workers handle two lines per person. Our Maintenance Section naturally handles daily maintenance, but changing ball screws is also done in-house. In the course of accumulating these skills, we have received considerable support from successive Okuma servicemen. Whenever we consult them the response is quick, and their range of answers and energy are good motivation to our employees.

These workers have a high opinion of the Okuma OSP control because of the design concept from the user's standpoint and its ease of use. The best examples are the ease of program editing and macro incorporation and readily understandable parameter changes; nothing about it causes operator stress.

Over the past several years the automobile parts industry has been hit by major economic changes and natural disasters—the Lehman shock, Great East Japan Earthquake, flooding in Thailand—facing a number of difficult situations. Each time we have worked together with our customers to raise our competitiveness with productivity improvements, value engineering based on the development of new methods, and other efforts. Our situation will not allow for optimism for the foreseeable future, but we intend to survive the global competition by expanding in areas such as mixed flows on FA lines centered on high accuracy machines, external sales of our internally-developed robot and measuring systems, and "electric heating upsetting (electric upsetting)."

## Unicraft Nagura Corporation

Location: 350-1 Iride, Kosai City, Shizuoka 431-0411 Japan  
TEL 053-578-0511

Website: <http://www.unicraft-nagura.co.jp>

Established: April 1957

Business activities: Development and manufacture of precision automotive parts, precision electrical appliance parts and measuring devices, robot systems



## The Collision Avoidance System is essential for multitasking of highly diverse aircraft components

### High-accuracy machining of hydraulic parts with MULTUS and LB3000 EX



Thermo-Friendly Concept



Collision Avoidance System

**Manufacturing and quality control technology for hydraulic parts, refined over half a century, used in company's move into aircraft industry**

We have been involved in the production of hydraulic parts for about 50 years out of our company's 76-year history. The precision machining technology we have refined in the course of that time and our high-level inspection and assembly technology form the foundation of our company. Our core business has been products for construction and industrial machinery, but we are now working to develop aircraft parts as a new pillar of our operations. An airplane fuselage consists of several million parts, among which hydraulic actuators (actuating mechanisms for controls) are used in about 30 places on each plane, including the actuating mechanism to put the main landing gear up and down and the flight control systems that maintain the attitude of the fuselage. We established a project team in 2009 to enter this field, and while starting to develop

Hideki Takabayashi  
Executive Director



mechanisms for landing gear we worked toward acquiring JISQ9100 certification for quality management systems in the aerospace industry.

Airplane parts obviously require a high level of quality accuracy, and the establishment and implementation of strict quality control in manufacturing processes to guarantee safety are absolute conditions, the bar for which is higher than we had expected. For example, we received a trial order from an aircraft parts maker for shuttle valves (units equipped with check valve function), but we could not seem to achieve the demanded performance even if we machined and assembled to drawing tolerances. As a result of repeated trial and error, we finally succeeded by machining parts to higher accuracies than the designated tolerances and modifying our assembly methods. This led to repeat orders. During this time we also acquired JISQ9100 certification, and now manufacture parts based on a quality management system that conforms to those standards.



Some of the parts exhibited at the 2011 Paris Air Show



CAS gives operators a solid sense of reassurance



Hydraulic actuators are used in about 30 places per plane

**In addition to greatly reducing lead time, the Collision Avoidance System is also a big strength**

In the spring of 2010 we purchased a MULTUS B200-W as part of an effort to upgrade our equipment for making aircraft parts, which are produced in diverse types with small volumes. Moreover, even specifications for a single part will differ with the aircraft manufacturer and we must comply with parts improvements while also continuing to supply the original parts as spares for as long as the aircraft are in operation. To meet these needs it was essential that we purchase a high accuracy multitasking machine. Compared with our previous method using lathes and machining centers, the waiting and setup times for each process have been greatly reduced and we have been able to shorten lead time about 60%.

Even more than its dimensional stability, CAS is a major strength of the MULTUS. With models prepared on 3D CAD and input to the MULTUS, even the smallest interference can be reliably identified and avoided, and we can then leave the machine on its own with assurance. The effect is remarkable in machining rod ends (round surface plain bearings), and there are times when nearly 40 tools are used so this system is always on. Before the MULTUS we purchased an LB3000 EX to machine parts for industrial machines, but it also has the Thermo-Friendly Concept, thanks to which we can machine to about 10 μm without any special attention. With both machines workpieces are changed at night by articulated robots in untended operation with in-process gauging and automatic compensation to deal with tool wear and other changes.



Takashi Hanano, Leader  
Manufacturing Section 1, Manufacturing Dept.



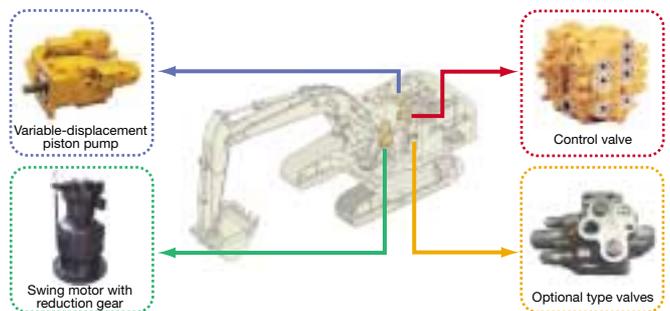
LB3000 EX with outstanding dimensional stability, used for general machine parts

**To create next generation industry in Ishikawa Prefecture, three companies partnered to accept start-to-finish production orders for hydraulic actuators**

Our initial goal was to build a system to accept orders for start-to-finish production of hydraulic actuators in Ishikawa Prefecture, in partnership with processing and treatment companies that performed special processes (heat treatment, plating). The three partner companies needed to obtain Nadcap certification, an international certification system for special processes. The other two companies needed to upgrade their furnaces and make new plating lines for aircraft at a rapid pace, while we needed to install a nondestructive inspection system that could check fine scratches and have our employees receive technical training at suppliers. This project was adopted as the first project subsidized by the Ishikawa Next-Generation Industry Creation Fund.

Considering the rarity of companies that can accept orders for start-to-finish production of hydraulic actuators, the shortened lead times and cost reductions realized with this system expand possibilities for new multifunctional part orders and entry into foreign markets. Current aircraft production is expected to double in 20 years (36,000 units), and the impact of that is inestimable.

The bar for entry into the aircraft parts industry is very high in terms of technology, quality control, and human resources development, and involves much hard work. However, the know-how we have cultivated in that process has raised the level of our entire plant. The results are seen in customer satisfaction, and we have received new inquiries from existing customers in the construction and industrial machinery fields. As our technical skills spiral up, we take on challenges such as machining ultra-high tensile steel and other difficult-to-machine materials and high-level multitasking operations. We expect to have increasing opportunities to make maximum use of Okuma's Intelligent Technologies.



Ultra-precision machining technology refined through manufacturing hydraulic devices, boasting 50 years of experience

**Takabayashi Mfg., Co., Ltd.**

Headquarters/ Plant: 25 Ni Kanaichi-machi, Kanazawa-city, Kanagawa  
 TEL 076-258-1340  
 Website: <http://www.takabayashi-mfg.co.jp>  
 Established: 1936  
 Business activities: Parts manufacturing for aircraft, hydraulic devices, machine tools, and industrial machines (precision parts and units centered on hydraulic parts)

# MULTUS gives highly accurate machining repeatability, purchased for company to grow in the global market

## Efficient machining of unique clamp system components on MULTUS



Thermo-Friendly  
Concept



Collision Avoidance  
System

### Commercialization of automatic die/mold change systems and workpiece clamping systems with unique non-leak technology

The company name “Kosmek” is taken from the initials of the five engineers that founded the company, who were involved in the development and manufacture of precision instruments. What became the core technology for the company’s growth was the development of non-leak valves that dramatically raised the usage of hydraulic clamps. Up to that time general use hydraulic cylinders had continued to send oil, being held down and pushing, with the pump turned by a motor, but when the motor stopped the force dissipated. Then, between the pump and actuator, we attached a non-leak valve (patented) with an original mechanism so that hydraulic oil does not leak, and attempted to make die changes automatic and boltless and clamp workpieces in our factory. As a result, work time, accuracy, operability, safety, and cost were greatly improved.

Products we have commercialized with this technology are a “single fixture die/mold change system (for injection molding, die casting, and press forming machines),” “workpiece clamping system,” and “high-accuracy positioner” that can be used by anyone quickly, simply, and with high accuracy. These products have been adopted in a wide range of industries that operate machine tools, including automobile production lines and the electronics, food, and IT industries.

### Machining repeatability raised by more than a single digit with MULTUS, encountered in the course of creating “variable production” to accommodate changes in model and volume

Our clamp products are sets of 20–30 components per model, many of which are customized for each customer. As a result, the total number of models has expanded to more than 20,000 and the number of parts to more than 60,000. Moreover, orders range from a single unit up to as much as 100 units, and are designed and manufactured from one to four weeks at the longest. This is diverse type, very small lot production, typical in the world of changing models and changing volumes. It demands both the technology to give shape to a single special product from nothing and the power



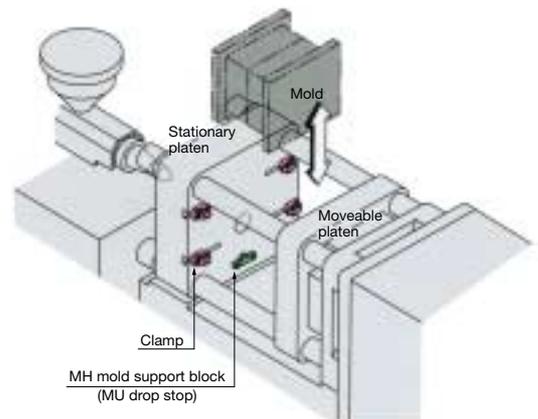
Makoto Uemura  
Director  
Manufacturing Dept. Manager

to rapidly deliver medium volumes of 200 units. The ability to meet these needs is another strength of our company.

Two to three years ago, seeking to optimize our changing model, changing volume production, we began working on “variable production” for which we rebuilt our lines separately for medium volume parts, small volume parts, and special parts. In that process we purchased a multitasking machine that provided highly accurate machining repeatability, a topic at the time. We did not insist on the manufacturers of our existing machinery, and after starting from a blank page and going through all models it was the MULTUS, equipped with the Thermo-Friendly Concept, that stood out. However, we had no experience using OSP, and so we ordered one of our machining experts, Kouichi Baba of the Production Technology Office, to operate a MULTUS himself and verify its machining accuracy and the ease of use of OSP. We sent him to the Okuma Headquarters Plant with about 50 designated workpieces. When he intentionally stopped the machine at midday and in the evening to check repeatability of machining accuracy from a cold start, he was surprised at figures that were a full digit better than the error we had expected.



Workpiece clamping system products for which increased production efficiency was expected with the MULTUS



“High accuracy mold change system with single fixture” that overturns the concept of die changes (can be used with hydraulic, air, and magnetic clamps)



MULTUS with gantry loader (for medium lot parts) will soon be added to MULTUS B200-W and B300-W that machine special parts for workpiece clamps

### Data from Collision Avoidance System loved by our experts is accumulated and used in accelerating efficiency improvements

What Mr. Baba most admired was the performance of the Collision Avoidance System in the Okuma OSP control. In first part machining we used to open the machine cover and carefully machine the workpiece while checking for interference, but with the MULTUS we can start right in on production machining if the program data are OK. We have many processes like drilling a small hole between jaws, and so this gives us a great sense of reassurance.

The initial work of establishing material, cutters, and fixtures for each workpiece is burdensome, but if a database is prepared with the accumulation of these machining programs, repeat handling can be speeded up at an accelerated pace. In the medium term, this function will be a major weapon for us in dealing with changing model, changing volume production. In addition, when creating a machining program with OSP, the shape appears on the screen as you input numbers based on drawings. You will notice immediately if you input a number mistakenly, and this also gives a large sense of reassurance. We therefore purchased one MULTUS B200-W and one B300-W, but their reputation in the machine shop continued to grow and we have now ordered a model with a gantry crane. We



Hiroshi Akamatsu, General Manager, Production Technology Office, Manufacturing Dept.



Kouichi Baba, Production Technology Office, Manufacturing Dept.

use the former for special parts and the latter for machining medium lot parts.

After the Lehman shock we thought about moving a manufacturing base overseas, but in the end we decided to go in the direction of pursuing global standards with an insistence on technical development and manufacturing in Japan. For that purpose, we are aiming for world leading Q (quality), C (cost), and D (delivery) while relentlessly improving operations through PARF\* activities, training technicians, and refining our technical prowess symbolized by more than 400 patents and utility models and quality assurance technology based on more than one million endurance tests.

\*Acronym for Practical Program Of Revolution Factories. A practical program to achieve high productivity and high profitability based on constitutional innovations in manufacturing.



PARF-implemented orderly machine shop environment

## Kosmek Engineering Ltd.

Headquarters/Plant: 2-1-5 Murotani Nishi-ku, Kobe  
TEL 078-991-5118  
Website: <http://www.kosmek.co.jp>  
Established: 1986

Business activities: Design, manufacture, and sales of precision instruments and hydraulic and pneumatic equipment (for automobile, machine tool, semiconductor, and electronics industries)

# Benefits proven in the machine shop — by Okuma's "Intelligent Technologies"

Thermo-Friendly Concept



## Intelligent technology

Collision Avoidance System

Machining Navi

### Machine



Manageable Deformation—Accurately Controlled  
**Thermo-Friendly Concept**

**"Working with temperature changes"\***

Okuma machines that feature TFC are designed to respond to heat in certain (manageable) directions. Coupled with highly accurate thermal deformation compensation, the benefit is highly stable accuracy over long, continuous runs.

\* Thinking outside the box



### Operation



Collision prevention  
**Collision Avoidance System**

**World's first "Collision-Free Machine"**

CAS prevents collisions in automatic or manual mode, providing risk-free protection for the machine—and great confidence for the operator.



### Machining



Cutting condition search  
**Machining Navi**

**Easy optimization of cutting conditions**

With graphical representation of machine performance, the operator can easily select optimal cutting conditions.

