USER'S VOICE

vol. 7

OKUMA
Vertical CNC Lathes Series

Vertical CNC Lathes User Testimonials

Reducing lead time and using plant space effectively

Transforming the image of vertical lathes

Support system for single source for machine & control provides sense of assurance

Development Story

Unique vertical lathes matched precisely to customer needs

USER'S VOICE

Nikko Seiki makes brake and drive train parts for large and medium-sized trucks and agricultural machinery, and boasts advanced manufacturing technology that has frequently won them awards from their clients as an outstanding quality supplier. Fourteen Okuma vertical lathes are operating in their plant, and they have devised ways to draw out the maximum performance of these machines.

Machine rigidity is essential for flywheels

Shop floor knowledge combined with a highly in pursuing higher accuracy and productivity

Nikko Seiki Co., Ltd.

Kazuo Hashimoto
President

Head office/factory:
333 Sugaya, Ageo-shi, Saitama

Business activities:
Machining and assembly of parts for trucks, buses, and large automobiles; machining of prototype parts for commercial vehicles; machining and assembly of general machines, specialty equipment, fixtures and tools

Accurate machining of heavy, hard workpieces

Nikko Seiki's main products are brake and drive train parts for large and medium-size trucks and agricultural machinery, each of which has strong characteristics. A characteristic of the flywheels used for smooth crankshaft rotation is their weight itself, which means that they can't be made lighter like other parts. Hard materials are used in agricultural machinery, and this puts a large load on machines and cutting tools. Truck brake drums are important parts since they are so closely tied to vehicle safety, and with their height the weight balance tends to move outward. These workpieces are machined at high rotation speeds, and require high accuracy. The hub on which the wheel is attached is another important safety part, and ensuring product rigidity requires the use hard materials with strict surface roughness.

Twenty years ago we machined these parts on horizontal lathes or machining centers, but from considerations of accuracy, productivity, and effective use of floor space, we looked into bringing in vertical lathes. In machine selection we imagined machining brake drums, and we compared the machines of several companies from the perspectives of ease of workpiece attachment and removal, tool life, dimensional variation (accuracy), cycle time, and space reduction. After careful assessment, we chose the Okuma (at that time Okuma & Howa) 2SP-V5.

Brake drum machining line with 6 vertical lathes and robots

Hub and drum assemblies are important safety parts that demand high accuracy machining

Shop floor knowledge was used for smooth disposal of chips and coolant

rigid Okuma vertical lathe

Okuma's vertical machines hold cutting tools differently, have few breakdowns, and are easy to use

What surprised us when we actually used the machine was the lack of chatter even when cutting hard materials, and a completely different tool life. This was not noticeable with carbide tools, but the life of diamond tools was about twice as long. This is probably due to the high rigidity from the column, spindle, and turret structure and the good slideway finishing.

Okuma's LH-40 horizontal lathe has been one of our favored machines for 30 years, and its OSP controller provides an easy-to-use absolute position feedback system and easy program creation and compensation input. Except for robots, we use OSP for the controller on all our machines.

Using manufacturing floor knowledge to draw out the full potential of vertical lathes

Chip disposal is generally considered to be a structural weakness of vertical lathes, but when we ordered our machines, we had Okuma come up with ideas to counter chip collection and provide smooth discharge, and deliver the machines with optional specifications, based on the assumption that the machines would be used in lines. We also had Okuma provide other specifications that reflected our needs, such as a shower type coolant system and a chucking structure for easy attachment and removal of workpieces. We use a V60 to machine hubs with a chuck that is a size larger than the manufacturer's recommendation, but we have had absolutely no problems with machining accuracy or draining of coolant. The full potential of a machine can be drawn out by combining the user's and manufacturer's knowledge and innovating where necessary. This leads to productivity gains for the user and product advances for the manufacturer. There are many good examples of this in our plant.

Strengthening competitiveness to win in the era of global procurement

The trucks produced by our clients excel in the areas of power, mileage, and environmental performance, and thanks in part to the weak yen are selling well overseas. At the same time, global procurement policies are becoming clearer, and parts manufacturers need ever higher QCD (quality, cost, delivery). To stay ahead of this trend, in 2006 we launched an automated line to machine brake drums using vertical lathes and robots (photo). We have also ordered a 2SP-V60 to machine flywheels. Today we are greatly expanding our business while at the same time facing circumstances that could threaten our survival. We have begun considering overseas production, and look forward to sure service and proposals based on mutual trust with Okuma.

Fumio Muto
Engineering Section Chief

USER'S VOICE

Toei Metal Industry continues to advance as a key supplier of major construction machinery manufacturers, and one of the world's top manufacturers of track pins and bushings for the underbodies of construction machinery. In their six machining plants in Osaka, Shiga, and North Kanto, they operate a total of 20 Okuma vertical lathes (V55-100, VTM), and excel in high-mix, low volume production of large workpieces.

Large construction machine poster displayed in reception office.

Lead time reduction and effective use of with two-spindle vertical lathes

Toei Metal Industry Co., Ltd.

Mikio Kita
Head of Engineering Section, Production Engineering Dept., Shiga Office

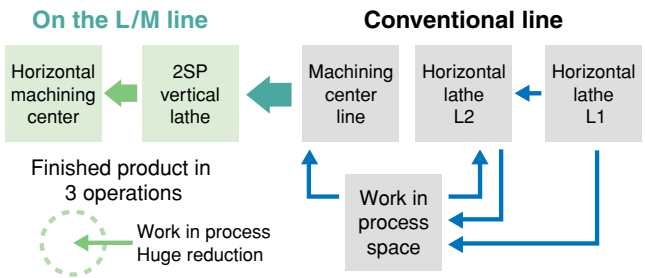
Yokaichi Plant:
1740 Omori-cho, Higashi Omi-shi, Shiga Prefecture
(Head office: 1-5-12 Minami Megaki, Ibaraki-shi, Osaka)
http://www.toei-metal.com

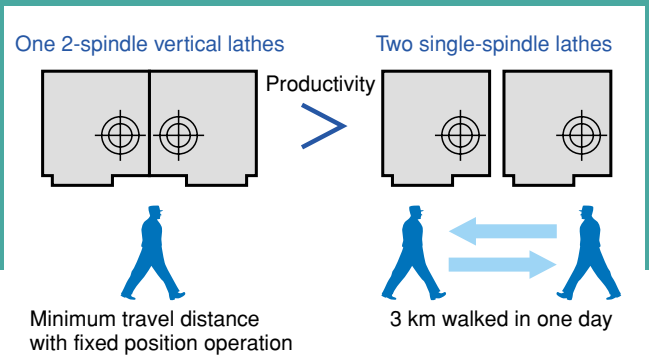
Business activities:
Machining and heat treatment of parts for construction machinery, industrial machinery, agricultural machinery, automobiles, civil engineering machinery

New L/M line established with the aim of shortening lead time and reducing work in process

We are a group company with facilities including six machining plants and heat treatment facilities in Osaka, Shiga, and North Kanto. In our machining plants machine products for a wide range of fields, with a focus on parts for large construction machines. In the Yokaichi Plant we manufacture mainly parts for crawlers (caterpillar tracks) on bulldozers used in mining and other activities overseas, vehicle underbody products such as hubs (the parts to which wheels are attached) for dump trucks, as well as arm hinges. Over the past several years, the soaring prices of metals on the global market has led to the reopening of shuttered mines and strong demand for construction and earthmoving equipment, and our plant has been operating at full capacity. We handle a wide range of workpiece sizes, from ø400 to ø1500 mm, with materials of cast steel, cast iron, and forgings.

We bought Okuma vertical lathes in order to set up flow lines consisting of 2SP-V60 two-spindle vertical lathes plus MC-600H horizontal machining centers, with the aim of shortening lead time and reducing work in process for machinery cases, which we had been producing in batches divided into lathe processes and machining center processes. Another factor in our decision to introduce vertical lathes was the advantage in terms of safety and quality (parts would not fall over), since nearly all of our operations involve heavy workpieces.





Space-saving design

factory space achieved

A major attraction of Okuma vertical lathes was the travel distance reduction achieved by using these space-saving machines

Previously, machining these parts involved numerous trips back and forth for turning and drilling operations, but by setting up lines with lathes and machining centers we achieved our target of completing the process in three operations, shortening lead time, and reducing the amount of work in process. The biggest thing was reducing the area to keep work in process. Our workpieces are large, and the space occupied by pallets was considerable. By reducing these areas our workpiece flow has improved and we have identified various possibilities to raise productivity.

The driving force for this was the space-saving design of the 2SP-V60. The difference was clear when we lined up the 2SP-V60 against machines in its class from other manufacturers. In the end, we also purchased a 2SP-V55 and 2SP-V80 to handle workpiece sizes in new orders. Then, based on these cases, we conducted a major reorganization of 26 machines in our plant in 2006. We integrated operations into three production lines, and reduced the number of work in process pallets from 200 to 40.

Operability for easy handling even by new employees, and improved working ease with further modifications

The operation panel and switches on V series machines are simple and the layout is operator-centered, so that even novice operators find them easy to use. In fact, we initially station our new employees on the 2SP-V60 and 2SP-V80 line, and then as they gradually become accustomed to other machines train them to be multiskilled workers.

There are still places, however, where the machines could be made easier to use with further modifications. For example, the coolant nozzle is sometimes hit when we are moving workpieces suspended from above, and we would like to see the machine modified so that the nozzle did not protrude outside the machine. Another example, although this may be partly a physical limitation of vertical lathes, is the difficulty of up and down turnover of workpieces of the 280 kg class even with the use of a turnover device. Another thing is the difficulty of assuming the postures to measure workpieces with a micrometer. Such measurements are more difficult than with a horizontal machine, leading to measurement error variation until workers become accustomed to the vertical machine. Even though workpieces are large, fit tolerances are strict. If improvements could be made here, the possibilities for vertical lathes would grow.

Lead time shortened and work in process storage areas greatly reduced with a line consisting of a 2-spindle vertical lathe and a machining center

Amaki Machine Works Co., Ltd.

Kazuyoshi Amaki
Executive Director

Ibi Plant:
1546-27 Ichiba, Ibigawa-cho, Ibi-gun, Gifu Prefecture
(Head office: 1-43 Ryoke-cho, Ogaki-shi, Gifu Prefecture
http://www.amaki-mw.co.jp/

Business activities:
Machining of automobile, aircraft, air conditioner, motor, and industrial machine parts; design and production of various fixtures, machine tools, labor-saving machines and devices; machine repair, retrofitting, and replacement

The V60 is perfect for machining high-speed train (shinkansen) parts and truck brake drums

Wheel bearing cover for N700 series shinkansen

Selection of the best machine for the job leads to increased orders

We have felt comfortable with vertical lathes since the era of general purpose machines, and are familiar with their basic characteristics, such as the ease of obtaining surface accuracy even with low chucking pressure, and the ability to use simple chucking fixtures, since the workpiece adheres well to the datum surface with its own weight. We deal with a huge variety in terms of type of industry, accuracy, and lot size for machined parts, from the turning of jet engine combustion chambers of ø1600 mm to the automatic machining of bearings with the combination of vertical lathes and robots. In these circumstances, we think one of the most important things we can do to obtain stable orders is to select the best machine for the project, matching workpiece configuration, required accuracy, production lot, cost, and delivery. That is why we choose Okuma V series machines.

V40 and V60 selected for rigidity and machine reliability

We purchased a 2SP-V40 in 2006 to cut hard-machining nickel materials. In addition to the basic ease of use of vertical lathes, we are confident in the rigidity of this model because it does not pick up vibrations or produce chipping. At about that time we received an offer to machine the covers for the wheel bearings on the N700 series shinkansen, and in 2007 we purchased a new single spindle type V60R. The workpiece material was aluminum, the shape was irregular, and the size was ø600 mm.

We then happened to receive a sudden large order for brake drums (castings) for large trucks, and had to shift the V60R over to machining them. At that time, when our schedule was very tight, we received support from Okuma. Today our production of brake drums has settled for the time being, and we are using the V60R for machining of shinkansen parts.

Fuller range of machine sizes

It is apparent from looking at our company's web site that the majority of our main equipment is made by Okuma. In addition to the relationship of trust built over many years, it is also reassuring that they are just a short distance away. Speaking from the basis of that relationship, it would be nice if Okuma would develop a machine with a double-column construction that has a maximum turning diameter of the ø2000 class. I think this would require different engineering and know-how from that for a machining center, even though both may be double column, but I suggest it would be worthwhile to study the marketability of such a machine and the core technologies.

V60R operating at full capacity

USER'S VOICE

The V55R transformed our image of vertical lathes

Itao Tekkosho Co., Ltd.

Masayuki Itao
President

Head office/factory:
1-65 Kogyo Danchi, Komatsu-shi,
Ishikawa Prefecture

Business activities:
Design, manufacture, and sales of industrial and construction machinery parts Design, manufacture, and sales of industrial vehicles

Two 2SP-V60s being run by a single operator

Before purchasing an Okuma product, we conducted a thorough in-house evaluation of vertical lathes

Our main products are idler wheels, which are essential parts for the underbodies of hydraulic shovels and bulldozers. These important parts, made from cast steel, are used to adjust the tension of caterpillar tracks, and sizes vary widely from ø200 mm (5 kg) to ø800 mm (260 kg). We supply the majority of these parts used by a large construction machinery manufacturer, and have used vertical lathes from several manufacturers in cutting them. However, our early in-house assessments were harsh. Our working space is small, and although the workpieces sit solidly in the machines, our criticisms were of the week clamping or cutting force, and poor cutter life and chip disposal. Still, it was hard for us to give up on vertical lathes altogether, since it seemed possible, by taking advantage of their characteristics, to machine in two processes workpieces that required four processes on horizontal lathes. That was our situation when we met Okuma (at that time Okuma & Howa) 12 years ago.

Okuma made a good impression by working with us into the night, and by their insistence on rigidity

When we visited Okuma's Konan Plant for a trial cutting with the V55R, we were not successful in cutting our part because of chatter. Then, even though we were first time visitors, the people who worked with us were the people in charge of the machine—even the manufacturing department manager came out and started discussing what measures we could take. This continued until late into the night. In this process we came to understand Okuma's philosophy that rigidity is the lifeblood of a machine tool, and that they applied the structural design of a machining center to their lathes in order to achieve that rigidity, and considered sliding rather than rolling to be important in the slideway. As an engineer himself, our manufacturing department manager was impressed with their enthusiasm and commitment. In the end our cutting problem was solved with the use of a special tool called an anti-vibration bar, and our cycle time was reduced 30% when we started using the V55R in our plant. This completely transformed our image of vertical lathes.

As our command of the machine grows, we feel the real advantages of a vertical lathe

Today we are using fourteen 1-spindle or 2-spindle lathes, from the V1R to the V100R. Even more than the abundance of sizes, it is the advantages from the solid machine mass and stable cutting of even small diameter shaft centers and good cutter life that lead to repeat orders. From our association with Okuma and the dependability of V series machines, we have expanded to machining centers and are adding several new machines each year.

We segregate our processes so that workpieces of less than ø300 mm are machined on unmanned lines with horizontal lathes, and those of more than ø500 mm are machined on vertical lathes. We hear that there are still many users who haven't realized the power of vertical lathes, and with that in mind it seems that vertical lathes may still have some untapped potential.

Toshihiro Tanaka
Engineering Section 2 Chief, Engineering Dept

USER'S VOICE

Kawasaki Ironworks Co., Ltd.

Shunji Shimada
President

Head office/factory:
2-34-5 Musashinodai, Fussa-shi, Tokyo
http://www.kawatetu.co.jp/

Business activities:
Manufacture of joint flanges and other accessories for concrete piles, manufacture of parts for seismic isolation fittings, machining and manufacture of civil engineering and construction members, design and fabrication of various types of industrial machine, various machining processes

VTM and V80 give improved accuracy and ability to handle large pieces compared with special-purpose machines built in-house

Aiming for accuracy and the ability to handle all sizes of non-welded joints

Our company has grown as a specialty maker of joint fittings (steel flanges) that connect the concrete piles used in foundations for construction and civil engineering projects. In the past the common practice was to connect a number of piles with welded joints, with the welding done on site. However, because of advantages such as reduced work time, no need for welding, work safety, and less impact from the weather, non-welded joints that are connected with the bolts have become the mainstream.

Back when welded joints were used, we machined workpieces of ø250-600 mm using 2-spindle vertical lathes that we developed in-house. Non-welded joints, however, require a higher level of accuracy in the machining of the connectors and drilling or tapping in various configurations. The ability to machine large diameter workpieces is also essential. We first brought in a VTM-100 vertical turning center to handle workpieces of ø1000 mm. That was followed by a 2SP-V60 and then a 2SP-V80 with milling function.

Attracted by cost performance and ease of use

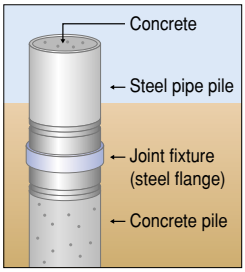
We chose Okuma vertical lathes because of their adaptability to workpiece size, 2-spindle productivity and ease of use, and high cost performance including the controller. Many of the workpieces we deal with are of thin material and do not require much travel on the Z axis. Considering also the machine footprint, the VTM and V80 were just right for us. We use the VTM for workpieces that require 10 or more tools, and the V80 for anything less.

With the absolute position feedback system and the manual indexing function for OSP, plus the standard settings for drawing function and tool path, we felt the design was really oriented to the machine shop floor.

Production of joints with sizes ranging from ø250 to ø1200 mm

Rising interest in earthquake-resistant technology

The string of strong earthquakes that hit the Chuetsu Region of Niigata and incidents of faulty earthquake-resistant construction of apartment buildings have led to increased interest in earthquake-resistant engineering and foundation work. An increasing number of companies are introducing construction methods that use steel pipe piles as foundation piles near the ground surface for factory construction. Demand for a wide range of joints for steel pipes is growing, and we plan to build a new factory and bring in new V100R vertical lathes. At the same time, the global price of steel is rising dramatically, and cost competitiveness has become a major issue in this industry, where materials account for a large proportion of cost. These things give us all the more reason to look closely at cost performance when making facilities investments.



Pile and joint (drawing)

USER'S VOICE

Okuma's vertical lathes gave rise to our "Haguruma Kobo"

Kohara Gear Industry (KHK) Co., Ltd.

Toshiharu Kohara
President

Headquarters:
13-17 Naka-cho, Kawaguchi-shi, Saitama Prefecture
http://www.khkgears.co.jp/

Business activities:
Manufacture and sales of KHK stock gears and all types of order-made gears

V25R quickly completing turning operations in the "Haguruma Kobo"

Starting up a new project while facing the crisis of possibly having to leave our founding site

When I took over as the fourth generation of my family to run this company, business results were falling as a result of the recession from the bursting of the IT bubble. As things were going we would have had to fold up operations at our Kawaguchi Plant (Saitama Prefecture)—our original plant—and to integrate our facilities at the Noda Plant (Chiba Prefecture), where 90% of our stock gears are produced. We also faced other blows, such as the retirement announcement of the technician at an associated plant who we had trusted for many years with our turning operations. However, with strong feelings toward the community and employees, we searched for some way to keep the Kawaguchi Plant alive.

What we came up with was a Custom Gear project to meet the needs of our customers. Gears are generally manufactured as many standard parts with prepared holes, and modifications (steps, key slot, tapping) are made to match these standard gears to the uses of customers or trading companies. Our idea was to contract this work and supply the gears has finished products.

Facilities investment conveyed our seriousness to customers

Although the concept was in place, we did not have any lathes that could handle this additional machining at the Kawaguchi Plant. We started visiting machine tool trade shows, manufacturers, and people in the business to study machines and machining know-how. We were initially considering horizontal lathes, but were advised that if we wanted to keep machining costs down we should concentrate on pursuing efficiency with single setups on a vertical lathe. This was how we came to know about Okuma's vertical lathes. We found that the machines were just what we were looking for in terms of ease of installation and loading/unloading of workpieces and tools, and rigid, space-saving designs.

We decided to purchase V25R and V60R vertical lathes from Okuma, and at the same time some 800 sets of optional specification chucks matched to all our stock gears so that we could work with single setups. The initial investment was considerable, but customers understood our seriousness about this custom machining when we showed them this equipment, which led to them giving us orders.

Birth of the "Haguruma Kobo" and major plant reconstruction

Later we increased the types of processes and shortened delivery times for this custom gear system, and worked to enhance our process management and teaching of skills. Our "Haguruma Kobo" handles this machining in a one-piece flow system and business has steadily grown. This is a gear version of places that give immediate delivery of, for example, golf clubs or pizzas matched to the customer's order. In fact, when the Kobo was in its growing period, we decided to undertake a major overhaul of the aged Kawaguchi Plant and to bring in a new MILLAC 852V machining center, but even during this construction we did not stop our custom gear system and continued to fill orders. This experience formed the foundation for creating a plant that puts customers first and has integrated manufacturing and sales. Today I feel real meaning and joy in our efforts to keep the Kawaguchi plant open.

Hiroshi Okamoto
Assistant Manager,
Manufacturing Dept.

USER'S VOICE

Maruei Industrial Company

Teruo Maruyama
President

Sagamihara Plant:
3514 Tana, Sagamihara-shi, Kanagawa Prefecture
(Headquarters: Unoki, Ota-ku, Tokyo)
http://www.maruei-k.co.jp/

Business activities:
Manufacture and sale of parts for construction machinery; design, manufacture, and sale of fixtures and tools
Manufacture and sale of various types of DC nut runner

We selected Okuma for ease-of-use and single source for machine & control service

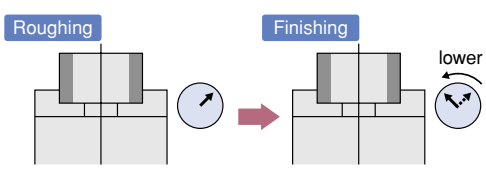
2SP-V80 turning underbody parts of ø800 mm.

The power in these machines is seen in efficient production of medium and large workpieces

We machine a wide variety of parts, including underbody and hydraulic parts for construction machines such as hydraulic shovels, wheel loaders, and bulldozers. On our vertical lathes we turn mostly medium and large cast-iron or forging workpieces that become wheels, housings, and flanges and other supports.

The thing we really appreciate about vertical machines is the ease of checking they allow. They give stable accuracy without concern about horizontal vibration even with heavy workpieces of more than 200 kg. Even with non-round workpieces that have poor weight balance, we can adjust the balance with a simple fixture. We machine many thin workpieces, and because we can do roughing with high-pressure chucking and automatically switch to low pressure for finishing, there is no bother using a pusher as with horizontal lathes. Chucking warp is also prevented.

Continuous machining with automatic switchover between two pressure stages



We can feel rigidity and stability in long-lasting cutters

We currently have five 2-spindle vertical lathes, including 2SP-V35/60/80, that we run for about 18 hours a day. Even so we maintain our required accuracy of tolerances of 1-2/100ths of a millimeter; we can feel these machines' high rigidity. Okuma's sales line about "machine weight, stable moving balance, and technology to integrate the spindle and bed absorb machine vibration" is borne out in the long life of cutters.

It would be easy if all processes up to drilling were completed once a workpiece is loaded on the machine, but since a single process such as ID, OD, or groove machining can take up to 90 minutes on a large workpiece, we decided not to use the multitasking option but to pursue efficiency by separating processes so that drilling is done on a machining center or drilling machine.

Support system for single source for machine & control provides sense of assurance

In selecting a machine model and its specifications, we consult with the machine manufacturer and show them the workpieces that will be machined. But what is most important to us is the service we receive after we have purchased a machine. One reason we can trust Okuma is that they are a "single source for machine & control" manufacturer. With continued use machines, like humans, will "catch a cold" or get "injured." At such times it is a great sense of assurance to have a single place nearby, like a general hospital, that can diagnose and treat the problem, whether it is in the head (controller) or limbs (machine).

The demand for construction machinery is expected to increase worldwide in the future, and we are focusing efforts on enhancing our production system so that we can reliably meet customer needs.

USER'S VOICE

Okuma vertical turning is a key ally in our pursuit of roundness

Gien Kogyo Co., Ltd.

Sadataka Shimizu
Headquarters Plant Manager

Headquarters:
3-22-8 Asanishi, Ogaki-shi, Gifu Prefecture
Within Ogaki Tekko Danchi

Business activities:
Manufacturer of transmission parts for industrial robots, automobile parts, machine-tool parts, hydraulic equipment parts, and electric appliance parts

Industrial robot reduction gear case that demands high roundness

Meeting the strict accuracies demanded by clients

A major part of our business is machining reduction gear cases for industrial robots. We used to cut even workpieces of the ø500 mm classes on horizontal lathes, but in 1991 we were faced with the need to raise our level of roundness to 1/100th. At that time it was no easy matter to achieve this in turning. There is a limit to the accuracy that can be gained by dropping the check pressure for finishing on a horizontal lathe.

So we started looking at vertical lathes, and found several manufacturers. What emerged in our search was that the 2SP-V5 of the former Okuma & Howa was the only machine equipped with an automatic chuck pressure switching function. With the purchase a 2SP-V5 we acquired the best vertical lathe for our needs, but that still did not mean it was easy to achieve our target roundness. Much hard effort was required on our part.

2SP-V60 greatly increased productivity

Huge improvement in productivity with the use of vertical lathes

Once we started operating the 2SP-V5 in earnest, we found that we could reduce to two operations—throw out and finishing—what used to take four operations to complete on a horizontal lathe. This was a huge improvement in productivity. The 2SP-V5 has two spindles, and it was also much easier to use than two single spindle lathes side-by-side. The operator's movement was reduced and we saved floor space. What was most attractive from the management pointed view is that the cost was lower than investing in two machines.

As we began to receive orders for workpieces of increasingly large size, we continued to strengthen our lineup of vertical machines with the V55, V60, and V80. We currently have a total of seven vertical lathes at our Headquarters Plant and No. 2 Plant, which we run at a pace of 20 hours per day. In addition to industrial robot parts, we are expanding our machining to parts for ship cranes and wind power generators.

We look forward to structural modifications for easier repair

V Series machines all have strong sliding guides that can withstand heavy cutting, and they get good marks for dimensional accuracy. Chip disposal is also not a problem. However, we turn many odd-shaped pieces so that we sometimes have to force the operation somewhat, and in rare cases the workpiece comes off or the chuck breaks. At those times it would be helpful in order to get the machine back running as quickly as possible if the problem could be handled by replacing a simple unit, or if the machine were devised so that even we users could make repairs.

Shigeo Matsumoto
Headquarters Plant

開発物語

Story of vertical lathe development

Two-spindle V Series and VTM Series bring landmark productivity and high accuracy to machining plants that handle medium and large workpieces. Behind these machines is the story of engineers who are passionate about developing new markets.

Training Project,
Product Development Dept.
Kenjiro Mori
General Manager

Graduated from the Department of Mechanical Engineering, Faculty of Engineering, Gifu University. Joined Howa Sangyo (currently Okuma) in 1971, and was involved in the design of the first NC lathes. Later worked on the development of horizontal lathes (1 spindle, 2SP); ATCs, loaders, and other peripherals; vertical lathes; and vertical multitasking machines.

New market for medium and large workpiece machining seen in market surveys; unique vertical lathes matched precisely to

No vertical lathe that could reliably machine medium-sized workpieces

In the 1980s, when we were searching for a new type of lathe that was not made by other manufacturers, we first developed a 2-spindle face lathe with the aim of raising productivity in mass production, and conducted a survey to feel out market needs. What we found was dissatisfaction with existing vertical lathes. At that time they were mainly large machines with workpiece machining diameters, called turning, of ø2000-3000 mm, and they had to be used even to cut workpieces of ø800 mm. Spindle speed could not be raised and there was much loss when this did not suit machining conditions. Customers were looking for the appearance of a vertical lathe that was smaller, easier to maintain around the spindle, had outstanding chip disposal, and was suited to mass production. We decided to make the development of such a lathe our goal.

Birth of the first 2SP vertical lathe, the V5, the best lathe for mass production of ø500 mm machining diameters

In setting the machine size, we decided to develop a machine for workpieces of around ø500 mm, since ø300 mm workpieces could be mass-produced on horizontal lathes. Our main target was customers who manufactured underbody parts such as truck brake drums or flywheels for construction machinery. Considering mass production productivity, we decided to make 2 spindles the basic specification.

For the machine to be suitable for mass production, it of course needed rigidity, which is the basis for machine accuracy, but it also needed to be reliable in providing stable accuracy and not breaking down, and finally easy to maintain. Vertical lathes at that time had complex structures around the spindle, so that even changing a V belt required lifting the large machine base. Changing spindle variance was also very difficult. By integrating the spindle and peripheral mechanisms into a single unit, repairs that were needed in the event of a collision in the machine and breakage could be done simply, by replacing the unit.

Assessment of conventional vertical lathes

Machines are too large
Machining accuracy varies
Maintenance is difficult
Not suited to mass production

▼

Appropriate machine size
Control of thermal deformation
Unit for parts around spindle
2-spindle
Automatic switchover of chuck pressure
Traditional rigidity technology

▼

New vertical lathe handles mass production

2SP-V5

In mass production, stable accuracy is crucial. To minimize variation in accuracy caused by thermal deformation, we used all our knowledge to minimize the effect of heat, such as by integrating the base and spindle and increasing the permissible heat capacity, until we reached a column structure. Our idea was not to use some device to cool the heat that is generated, but to work in the design stage to avoid thermal deformation that would affect machining dimensions. Part of this is common to today's Thermo-Friendly Concept.

A space-saving design is also essential for dealing with mass production. We compared the operator's travel distance when operating one machine with 2 spindles and two single-spindle machines side by side, and took great pains to achieve a machine size that would reduce operator burden.

This was our first attempt at developing a vertical lathe, and obviously it was not easy to come up with a design that would assure part machining and assembly accuracy. However, it was a great help to already possess the technology to create rigidity by making use of our experience with vertical machining centers, and traditional technology for heavy machining. In 1987, Okuma launched its first vertical lathe, the 2SP-V5.

5-Axis Multitasking Technology Section,
Engineering Dept.

Yasuyuki Noda

Graduated from the Department of Mechanical Engineering, Chubu Institute of Technology (currently Chubu University). Joined Okuma in 1990, and was involved from start to finish in the development design of vertical lathes and vertical multitasking machines. After the V35, he was a key member in the development and cultivation of V Series and VTM Series machines, and also worked on FMS design.

VTM-120YB

customer needs

A push to greatly enhance the series with the second generation and grow the market

The launch of the V5 was a refreshing surprise for the market. This machine was purchased by many companies, and we received many requests to develop a series around it. The introduction of the single spindle R was our response to calls for a single spindle machine for a single process rather than a 2-spindle machine for 2 processes, or “to raise productivity in 3 processes by lining up 2-spindle and 1-spindle machines.” For customers who wanted a “machine on which small workpieces could by easily machined by all employees, male or female, and that took advantage of the characteristics of vertical lathes,” or “a machine that was handy for machining odd-shaped workpieces such as automobile knuckle joints,” we later developed the more compact V3, V2, and V1.

This new market in vertical lathes was beginning to take root, and to make it grow further we reviewed the motors and ball screws in 1995 with a focus on increasing the speed of the products and raising manufacturing efficiency by sharing parts. We developed new, 2nd generation models in a short period, starting with the V35 and then the V55 and V80. By this point we had a strong sense that it was our mission to cultivate a market for vertical lathes that could handle machining diameters up to ø1000 mm, and we developed the V40, V60, new V80, and V100 in succession. These models had a clear sales strategy and were welcomed by customers, who praised them as the top machines for machining accuracy, saving space, and product variation. During this time, the industries of the customers who purchased vertical lathes also expanded, and came to include makers of materials and parts used in pumps, shipbuilding, wind power generators, civil engineering, and construction.

Pump housing machining

Hub machining

Knuckle machining

Aluminum wheel machining

Development of the VTM vertical turning center and expansion to a series

While the V Series was winning a solid reputation, we were also hearing from many people who wanted to conduct further multitasking (process integration) by single chucking in order to raise production efficiency and make more effective use of factory space for large part machining. In response to these calls, we put the know-how we had accumulated in the V Series to use in developing a vertical machining center that would raise multitasking capacity and expand turning and milling operations with the use of ATC. In 1997, we launched the VTM-65 and VTM-100. Then in 2000 we developed and launched the VTM-120YB, a true multitasking machine equipped with Y axis functions. This was followed by the VTM-80YB and VTM200YB to build a series, and currently we can handle large workpieces with maximum turning diameters of ø2000 mm.

Today the industrial world is working hard to meet the strong demand from BRICs and other countries, and many of our customers are operating at full capacity. A fair number of them are struggling with the problem of how to raise productivity in existing plants with limited floor space. Vertical lathes and multitasking machines, which save space and can handle mass production, should help customers to overcome these problems. We hope to actively work with industries or types of workpieces that have not yet enjoyed these advantages.

OKUMA

Want to raise productivity for medium and large piece machining, but don't have extra space?

The answer is vertical turning

For vertical machines, come to Okuma

- Space-saving installation
- Ease of workpiece loading/unloading
- Good for odd shapes, thin material
- High rigidity, high productivity

Outstanding, wide variation for machining diameters of ø250 mm to ø1,000 mm

Thorough space reduction


SV250


V40R


V60R


V80R


V100R

Integrated operations for high productivity


2SP-V40


2SP-V60


2SP-V80

Vertical CNC Lathes
V Series
Single/Twin spindle

okuma.co.jp/english

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