Interview with Machine Tools Division Manager

Won the "Monozukuri Award" at the 62nd Best 10 New Product Awards
Linear Motor Drive
High-speed & High Performance Large-size Die-sinker EDM AG200L

Products
Linear Motor Drive Nano Machining Center AZ275nano
Linear Motor Drive Ultra High-speed Milling Center UH430L

Technology
What’s Possible with !! AM (Additive Manufacturing) Technology
Machine Tools Division General Manager  Takashi Matsui

Sodick leverages on its "Total Manufacturing Solution" strengths to win a gold medal!

- As new products and concepts such as electric vehicles and 5G come in to use in rapid succession, automation, the IoT, and globalization have become keywords in the manufacturing industries that support them.

- What will we ourselves focus on? -

We achieved record results in the machine tool industry in 2017 and 2018, however in 2019 influences such as the friction between China and the United States saw a 30% reduction in the size of the market as a whole, reaffirming the fact that China is the key to machine tool sales. However, the issue is not that demand in the Chinese machine tool market has dropped. The drop in domestic demand in China has been slight, and the used market for excised machinery remains brisk. Beginning in the second half of this year, we anticipate seeing movement in equipment associated with items such as electric vehicles and 5G.

- At a exhibition in China recently, I saw a machine that sang the phrase "Made in China." That is an indication that China is beginning to have confidence in their own technology. And I believe that in future, China will grow to become a threat in this industry as well. One of Japan’s strengths lies in its high level of applied technology, and in its precision manufacturing capabilities. Another is a culture in which techniques are passed down within organizations to young people. We want to improve steadily on this at our company too.

- In an era such as this, what are our strengths? -

We have entered an era in which even a large enterprise cannot perform production wholly on its own. At Sodick, we now cooperate with other companies in a variety of domains to offer proposals to our customers.

- Two large events, IMTS2020 (the International Manufacturing Technology Show, held in Chicago in September) and JIMTOF2020 (the Japan International Machine Tool Fair, held in Tokyo in December), await us. How will we present the appeals of our company? -

In 2019, we announced the AP30L, which is suited to the needs of the 5G market. This machine boasts precision processing that cannot be matched by cutting machinery. There is a need for large molds in industries such as automobile and aircraft manufacturing. Although there have been EDMs compatible with large molds in the past, the AP30L, see next page, we released offered world-first technology in a compact form, and won the Monozukuri Award at the 62nd Nikkan kogyo Shimbun Best 10 New Product Awards. We will continue to focus our efforts on new product development.

With China’s “Made in China 2025,” the US’s “Industrial Internet,” and Germany’s “Industry 4.0” all in competitive development, what strategy will Japan take? I believe that if we make products suited to the culture of Japan, a “Japan-style IoT,” through manufacturing with the applied technology I mentioned earlier, we will be able to compete at a global level. And so, when we look again at the abilities of this company, it becomes evident that our strength lies in our "Total Manufacturing Solution." This year, we will introduce products that take a different form to those of the past, which will give a concrete reality to our strengths at IMTS2020 and JIMTOF2020. These efforts will center on the key themes of machinery suitable for the industries where these shows are being held, on consistent manufacturing linked with the IoT, and on improvements in productivity through automation.

- What are the Sodick’s goals for 2020? -

The Olympics—a wonderful event—are to be held in Japan this year. Every athlete seeks to win gold, not silver. The founder of our company acted with the same determination to win gold, or other words, to achieve first place. In 2000 we changed the color of our machinery, and now use a gold color scheme. This reflects our hopes that gold is symbolic of coming first. We will launch new products ahead of the major events that will give a concrete reality to our strengths at IMTS2020 and JIMTOF2020. Let’s join together as a team this year to win the gold with our machinery on the world stage!”

(Editor: Miki Shimamura, Carbimex, Inc.)
Ultra fine machining under 0.5 G
This flagship model demonstrates the highest machining performance in the nano-range
Linear Motor Drive Nano Machining Center AZ275nano

- High-speed milling is achieved with high-speed rotation of small-diameter tools, shallow cutting and high feed cutting
- New ultra-high speed spindle
- Faster acceleration (1.7 times that of conventional models) in the precision range
- High frequency amplifier developed and manufactured by Sodick
- Resolution of scale feedback is enhanced from 3 nm to 0.1 nm
- New NC unit “LN4AZ” developed and manufactured by Sodick
- Vibration-free system suppresses vibration to the limit, enabling ultra-high precision machining.

SAMPLE: φ0.02 mm pin machining
This is machining of a total of 841 pins of φ0.02 mm with L/D 15 times. The active vibration-free system suppresses vibration to the limit, enabling ultra-high precision machining.

<table>
<thead>
<tr>
<th>Machine</th>
<th>AZ275nano</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>STAVAX (HRC52) 25 x 25 x 10mm</td>
</tr>
<tr>
<td>Notes</td>
<td>φ0.02mm, 0.5 mm height pin</td>
</tr>
<tr>
<td>Cutting time</td>
<td>Rough machining: 12 hr 7 min 45 sec (63 sec/pin)</td>
</tr>
<tr>
<td>Cutting condition</td>
<td>Main spindle rotation speed: 15,493 rpm, Feedrate (F): 407 to 462 mm/min</td>
</tr>
<tr>
<td>Cutting tool</td>
<td>2 pcs, CBN φ0.8xR0.2xL0.5 (MSB230)</td>
</tr>
</tbody>
</table>

EF-Tune application example
Comparison of tools
This example shows when the feed rate (F value) is calculated using EF-Tune. The bottom of the tools after reflector shape machining (rough) were compared.

<table>
<thead>
<tr>
<th>Machine</th>
<th>LH430L/LN4X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>STAVAX (HRC52) 25 x 25 x 10mm</td>
</tr>
<tr>
<td>Tool</td>
<td>Rough machining BALL R1.0 (MSB230)</td>
</tr>
<tr>
<td>Finishing</td>
<td>BALL R0.3 (MSB230)</td>
</tr>
</tbody>
</table>

EF-Tune application example
Al-based software assists machining!
EF-Tune (Optimum cutting speed calculation software)
- Calculates the optimal conditions ideal for machining based on analysis using artificial intelligence (AI) technology.
- Improved performance of high-speed/high-precision contouring control SEPT
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Al-based software assists machining!
EF-Tune (Optimum cutting speed calculation software)
- Calculates the optimal conditions ideal for machining based on analysis using artificial intelligence (AI) technology.
- New screen design with clear visibility and direct operation.
- Improved performance of high-speed/high-precision contouring control SEPT

All-axis (3-axis: XYZ) linear motor drive
- Equipped with Sodick's proprietary PWM amplifier, which increases speed of linear motor control cycle on each axis (3 times faster than previous model)
- MotionExpert®-AI allows more accurate estimations of machining time and surface quality.

AI-based software assists machining!
EF-Tune (Optimum cutting speed calculation software)
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EF-Tune application example
Comparison of tools
This example shows when the feed rate (F value) is calculated using EF-Tune. The bottom of the tools after reflector shape machining (rough) were compared.

The optimal F value reduces tool wear!

When EF-Tune is used: Surface roughness Ra 0.210 µm

No wear even after more than 30 minutes of machining. Appropriate feed rate reduces tool wear!

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What's Possible with !!

AM Technology

(1) Make Metal Molds!

Compatible molds: Plastic, Rubber, Die casting

Procedure:
- 3D modeled cooling channels
- Design
- 3D modeled cavity and core design
- OPM machining
- Secondary machining
- Injection molding
- Completed products

Number of molds: 52
Number of mold components: 3
Lead time: 54 days

Point of SRT method:
- Purpose: Quasi-mass production and prototyping on both possible
- Aim: High-cycle, High-quality molding
- Mold type: Good precision and highly rigid
- Production method: Selectable
- Molding material: SUS420J2

Examples using SRT:
- SUS420J2 suitable for plastic molds
- Small objects for which warpage is suppressed can be manufactured
- Deformations due to stress release are small (easy secondary processing)
- Can thin the base plate
- Hard to break even when molding big workpieces
- No mold modification required for the stress concentration zone
- Can directly target dimensions by cutting machining (no model correction required)
- Hardness of molded object is about HRc30
- Using the same base materials, common heat treatment conditions can be used.

(2) Make Components!

Using generative design to mold components and reverse engineering processes and model creation topology analysis for calculating optimal shapes while maintaining high levels of rigidity.

- AI, CoCr, Ti, SUS305, Inconel, Maraging Steel

(3) Precision in Large Items!

(4) Metal 3D Printer Lineup

Model | LPM325 MRS* | OPM250L MRS* | OPA350L MRS*
--- | --- | --- | ---
Max. size of object (L x W x H) (mm) | 250 x 220 x 220 | 250 x 220 x 220 | 330 x 350 x 350
Machining method | Shaper | Milling | Milling
Feature | High-quality molds and components | High-speed molding and high-quality finishing | High-quality molds and components
SRT method | | | *Meets option
Rapid progress with production of vehicle-mounted electronic components

The insert molding technology that has become their specialty

Orders and production of electronic components for FUJIKOHGYO Co., Ltd. (Hakusan City, Ishikawa) are going well. Although they make individual press components and general formed plastic items, they specialize in using precision-pressed items made in-house together with thermoplastic resin to create insert-molded items. Of these, their customers are particularly pleased with the QCD (Quality, Cost, and Delivery) of the vehicle-mounted electronic components, which include high-performance switches, sensors, and connector terminals.

FUJIKOHGYO’s insert molding technology has progressed to the point where it can be called their specialty, and the injection molding machines that support it must not be overlooked. Particularly as they entered the 2000s and moved to install Sodick’s injection molding machines featuring the V-LINE® system, their processing techniques developed dramatically, helping to achieve the successful results.

Now, as the need for complicated shapes and materials requiring complex processing grows, they are devoting themselves to the study of these techniques with the intention of continuing to offer their customers safety and peace of mind.

Although such work is still component processing, the requirements for low-current and vehicle-mounted products differ significantly. Vehicles do not require tolerances as exacting as those of low-current products, but because human lives depend on these components, faults are unforgivable, and it is not possible to stop production in mid-flow. It almost goes without saying that the company’s lack of experience in resin molding left the company uneasy about this move.

After careful consideration, the decision was made to follow along with its customers. The company established an integrated production system in-house that included pressing, resin molding, and assembly. It’s different when you are talking about a company with sales of more than 10 billion yen, but I think it’s very unusual to find a company such as us, with sales hovering around 2 billion yen, that has three different processes.” (President Koshimura)

Experiencing the merits of V-LINE® system

FUJIKOHGYO’s molding techniques began to improve significantly with the beginning of the 21st century. Specifically, this was brought about when the company received orders for stop lamp switch cases, and in 2002 installed its first Sodick’s injection molding machine (a horizontal model). While it is a precondition that all vehicle-mounted components are inspected, and it is absolutely unacceptable to ship a faulty item, trials with their existing injection molding machines did not produce stable components.

But, “When we ran tests at Sodick’s factory, there was no variation in shape or weight, and we were able to produce stable re-
In recent years the ratio of Sodick-made vertical injection molding machines for inserts has increased.

Fujikohgyo’s technology and Sodick’s injection molding machines are a good match, which is evident in the insert molding. It is used for processing a variety of components now, but by far the most numerous are those for making vehicle-mounted components, which account for 80 percent of sales.

The first is the processing of connectors for vehicle-to-vehicle distance sensors. These connectors are made from resin, which is both heat- and electricity-resistant. Although trials were made using in-line system injection molding machines, they were unable to resolve the marks on the product exterior caused by the resin gas. Generally speaking, it is easy for marking to occur at fast filling speeds, but when we lowered the speed we found that the resin would not go all of the way around; we couldn’t get it to work, no matter how many times we tried.” (Hashimoto)

Hashimoto says that when they tried with the Sodick’s rotary model TR100VR, both measuring and filling were stable, and the marking problem was resolved, leading to improved productivity.

The second example is processing of components for connectors used in vehicle weight sensors, which are made of PBT (polybutylene terephthalate) resin. Although initial trials were undertaken using in-line system injection molding machines, the curve dimensions would not stabilize, even when flow analysis was performed. The issue lay in stabilizing the weight of individual product items. When attempts were made with the Sodick’s rotary model TR100VR, both measuring and filling were stable and the curving problems resolved.

Examples of components for vehicle-to-vehicle distance sensors (left) and those for vehicle weight sensors (right)

No wear on screws or cylinders

Insert molding is also used to produce components other than those used in vehicles. One example is processing of gas sensor module components made using polyester resin.

An example of gas sensor module components made using polyester resin.

In recent years the ratio of Sodick-made vertical injection molding machines for inserts has increased.

Many improvements have been achieved in molding.

Company profile

Fujikohgyo Co., Ltd.

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FAX 076-275-0933

Representative
President Kiyoshi Koshimura

Established
1939

Capital
40 million yen

Number of Employees
110

Sales
2 billion yen

URL http://www.fujikohgyo.co.jp
Thailand Plant Received Award for Environmental Energy Initiatives
- Thailand Energy Awards 2019 -

A Sodick plant in Thailand has received an award in the Energy Management Team for Designated Factory category of "Thailand Energy Awards 2019," a system of awards operated by Thailand's Ministry of Energy that recognizes efforts made with regard to environmental management and energy conservation.

With a core formed by the Maintenance Department, the Energy Saving Committee worked to reduce electricity consumption throughout the entire plant, using monitors to construct a management system, and was commended for its results three years running.

At the award ceremony held in Bangkok on October 18, 2019, Takeshi Asano, vice-president of Sodick Thailand Co., Ltd., came up on stage to receive the trophy from Deputy Prime Minister Somkid of Thailand.

Food Machinery Division Award

Won the Silver Prize at the Fuji Sankei Business i Business Advertising Awards

A Sodick advertisement highlighting the food machinery has won the Silver Prize in the Transformative Advertising Category of the 58th Business Advertising Awards given by Fuji Sankei Business i.

With women taking a more prominent role in society, an increase in the number of elderly people living by themselves, and the growing awareness of the need for disaster prevention, the demand for rice packs that are easy to use and have a long shelf life is booming.

To create this advertisement, we obtained data on trends in production volume for the past six years from the National Pakku Gohan Association. We created unique representations, using photographs of sterilized cooked rice (rice packs) to make graphs. Additionally, we place a large image of demand growth as an eye-catching element in the title section on the front page of a newspaper.