MITSUTOYO-KIKO CO., Ltd. Kagoshima plant

Sodick User Report

New Product
Linear Motor Drive
High-speed & High Performance Large-size Die-sinker EDM
AG200L
Linear Motor Drive
Precision Wire-cut EDM
AP350L (oil)
V-LINE®
Vertical Single-acting Type Injection Moulding Machine
VT50

Exhibition
MECHATRONICS TECHNOLOGY JAPAN 2019
MECT2019
2019.10.23-26

Exhibited Machines
- High-Speed Building Metal 3D Printer LPM325
- Linear Motor Drive
  High-speed Ultra-precision Die-sinker EDM AP30L
  Linear Motor Drive
  High-speed Ultra-precision Large-size Wire-cut EDM AL800P
  Linear Motor Drive
  Ultra High-speed Milling Center UH430L
- V-LINE® High-Cycle Ultra-Compact
  Vertical Rotary Injection Moulding Machine HC03VRE

Food Machinery Division
Private Show in Thailand Report
Sodick Europe Ltd.
"Tech Center" Opens
New Dormitory for New Employees, "Swing Daishoji" Complete
International Exchange Program Accepting Interns from Kanazawa University

Support
Kagoshima Spring Village Road Night Run 2019
High-Speed Building Metal 3D Printer

**LPM325**

Supports improvement in efficiency of secondary machining

![Image of LPM325]

* Photo shows the optional MRS specification

Linear Motor Drive
High-speed Ultra-precision Die-sinker EDM

**AP30L**

Ultimate electrical discharge which brings an unexplored world into view

![Image of AP30L]

* Photo shows the full cabin & ATC-16S optional specification

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**Exhibition Information**

**Sodick Booth**
**East Hall 3D15**

**Dates**
2019 10/23 (wed.) - 26 (sat.)

**Venue**
Port Messe Nagoya

**Open Hours**
10:00 - 17:00

* Fri. open to 18:00 in the evening
Closes at 16:00 on last day

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**SAMPLE**
Fluid pump impeller
Laser sintering + Reference surface cutting

**DEMO**
Fluid pump impeller
(Demonstration shape)
Laser sintering + Reference surface cutting

Realizes stable and high-value added machining that can only be offered by the latest technology

Application field representative example
Narrow-pitch micro connector/Small IC package

**SAMPLE / DEMO**
Depth: 6 mm
Pitch shape
High precision machining

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Pitch shape
High precision machining
Linear Motor Drive
High-speed Ultra-precision Large-size Wire-cut EDM
AL800P
Thermal displacement suppression system enables high precision machining of large moulds

Sodick-IoT
S-HARMNY (Option)
IoT platform can be accessed from anywhere

DEMO
"SPW power supply" + "S-HARMNY"
NC screen can be checked remotely

What is S-HARMNY
- IoT platform for machine tools which can be accessed from smart phones, tablets and PCs etc.
- The collected data of the multi monitoring of the machine status and machining rate, consumables and various sensors can be checked in real time.
- The NC screen can be checked from a remote location, as well reserving and executing an NC program.

Linear Motor Drive
Ultra High-speed Milling Center
UH430L
Latest software using AI (Artificial Intelligence)
MotionExpert®-AI EF-Tune

V-LINE® High-Cycle Ultra-Compact
Vertical Rotary Injection Moulding Machine
HC03VRE
Ultra-high cycle of 0.9 seconds per cycle
* Equivalent to dry operation

DEMO
Automatic recovery of the core improves operating efficiency
Core processing equipment S³CORE (Score)

Sodick's "Technology" Creates your Future
NEW RELEASE

Linear Motor Drive
High-speed & High Performance Large-size Die-sinker EDM

NEW AG200L

This is a 3 axis linear motor drive high-speed and high performance large capacity die-sinker EDM, which supports larger size workpieces by expanding the travel of the XYZ axes, while reducing the machine footprint based on an optimized machine design by the latest structural analysis.

Main Specifications

<table>
<thead>
<tr>
<th>Each axis stroke (X x Y x Z)</th>
<th>(mm)</th>
<th>2000 x 1200 x 800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table dimensions (width x length)</td>
<td>(mm)</td>
<td>2500 x 1550</td>
</tr>
<tr>
<td>Machining tank inner dimensions (W x D x H)</td>
<td>(mm)</td>
<td>3000 x 1800 x 1000</td>
</tr>
<tr>
<td>Liquid level adjustable range (from upper surface of table)</td>
<td>(mm)</td>
<td>520 - 950</td>
</tr>
<tr>
<td>Max. weight of workpiece</td>
<td>(kg)</td>
<td>10000</td>
</tr>
<tr>
<td>Max. suspended mass</td>
<td>(kg)</td>
<td>100</td>
</tr>
<tr>
<td>Distance from floor to table upper surface</td>
<td>(mm)</td>
<td>1440</td>
</tr>
<tr>
<td>Machine dimensions (W x D x H) (including Power Supply Unit, Dielectric Tank)</td>
<td>(mm)</td>
<td>4770 x 5220 x 4605</td>
</tr>
<tr>
<td>Machine installation dimensions (W x D) (including space for maintenance access)</td>
<td>(mm)</td>
<td>5770 x 6220</td>
</tr>
<tr>
<td>Machine weight (including Power supply)</td>
<td>(kg)</td>
<td>19000</td>
</tr>
<tr>
<td>Work tank capacity</td>
<td>(liter)</td>
<td>6250</td>
</tr>
</tbody>
</table>

Reduced weight shifting & improved axis responsiveness

Adoption of a slide structure where the Y-axis is stacked vertically, reduced the weight shifting while expanding the stroke of the machining axis, and improved the responsiveness of the axis.

Stable electrical discharge system Arc-less Plus

The performance of die sinking has improved greatly, such as increased speed, maximized suppression of electrode wear, and realized various machining surface qualities from satin to mirror surfaces.

Improved operating efficiency

Various assist functions and help functions by the "LN2A2 power supply" unit only for the AG200L equipped with a simple highly visible operation screen, supports improvement in operating efficiency.

Supports large-size workpieces + space saving

The X-axis was expanded to 2,000 mm from 1,200 mm, and the Y-axis was expanded to 1,200 mm from 650 mm. Sodick successfully realized the downsizing of the machine by reducing the machine size (area) 1.5 times compared to the conventional maximum size machine, while supporting large-size workpieces with about double the maximum workpiece size (area), and a machining tank space volume of about 3.2 times.

Unique Y-axis slide method
Linear Motor Drive
Precision Wire-cut EDM

NEW AP350L(oil)

This machine enables flexible manufacturing of precision moulds, such as motor cores including small size and medium size. This is a high precision wire-cut EDM with an oil specification which responds to various high precision demands of automobile and electrical related moulds.

4 axis linear motor drive + Highly rigid structure

This machine adopted highly rigid and low waving linear guides equipped with high speed & dynamic response linear motor drives developed and manufactured in-house for the X, Y, U and V axes. The adoption of a highly-rigid machine structure (low center of gravity gantry column), and minimized machine displacement by weight shifting realizes high-accuracy positioning and excellent machining accuracy.

Main Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. workpiece size (W x D x H)</td>
<td>540 x 500 x 100</td>
</tr>
<tr>
<td>Max. weight of workpiece</td>
<td>100</td>
</tr>
<tr>
<td>Each axis stroke (X x Y x Z)</td>
<td>350 x 350 x 120</td>
</tr>
<tr>
<td>Auxiliary axis (U x V)</td>
<td>35 x 35</td>
</tr>
<tr>
<td>Max. taper angle (Thickness: 100 mm)</td>
<td>±7°</td>
</tr>
<tr>
<td>Wire diameter</td>
<td>φ0.05 - φ0.25</td>
</tr>
<tr>
<td>Machine dimensions (W x D x H)</td>
<td>1985 x 2095 x 2160</td>
</tr>
<tr>
<td>Machine weight</td>
<td>4650</td>
</tr>
<tr>
<td>Total electric capacity</td>
<td>13 kVA</td>
</tr>
</tbody>
</table>

Demonstrates superiority of oil machining
Standardly equipped with super finish & high-speed machining circuit

The super finish circuit “Super PIKA Oil” provides excellent surface roughness, which reduces the polishing processes of moulds and precision components. The “High-speed Eco-Cut O-Plus” reduces machining hours and greatly reduces the cutting times at Rz 1μm or less.

Automation of High Precision Machining

The high-speed automatic wire threading unit “FI-AWT” which demonstrates a high wire threading rate regardless of it being non-submerged or submerged, and the NC unit remote control software “S-Viewer,” supports prolonged continuous automatic operation and improvement in the machine operating rate.

Developed and manufactured in-house
Adopted ceramics

This lightweight and highly rigid machine structure consists of in-house developed ceramics with insulating properties used on the main parts of the machine. Work can be continued with the same setup to fine finish machining without tools for insulating.
V-LINE® Vertical Single-acting Type Injection Moulding Machine

NEW VT50

This is a vertical type single-action injection moulding machine that demonstrates an accurate filling performance and stable plasticization performance by the V-LINE®, which realized high cycling by adopting a hybrid toggle clamping mechanism.

Injection & plasticization unit

The injection and plasticization unit succeeded the V-LINE® which realized stable and high accuracy moulding. A high-speed and high-pressure specification and dynamic response specification equipped with the super-dynamic response LDDV injection valve can also be selected.

High-cycle specification

The adoption of the hybrid toggle mechanism additionally equipped with Sodick’s unique hydraulic pressure balancer for the electric toggle type clamping system, reduced the cycle by 20%* compared to a conventional machine, which contributes to further productivity improvement.

* Comparison value in an actual moulding cycle of same moulded product

Expanded platen size

The tie bar interval in the horizontal direction was expanded to expand the internal area of the tie bar to 116% compared to conventional, which can now support the upsizing of moulds accompanying the complicated shapes of products, and moulds with sliding cores.

Main Specifications

<table>
<thead>
<tr>
<th>Clamping Unit</th>
<th>Plasticization &amp; Injection Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. clamping force [kN]</td>
<td>490</td>
</tr>
<tr>
<td>Tie bar distance [mm]</td>
<td>420 × 360</td>
</tr>
<tr>
<td>Open daylight [mm]</td>
<td>600</td>
</tr>
<tr>
<td>Mould open/close stroke [mm]</td>
<td>250</td>
</tr>
<tr>
<td>Min./Max. mould thickness [mm]</td>
<td>250 / 350</td>
</tr>
<tr>
<td>Max. injection pressure [MPa]</td>
<td>262</td>
</tr>
<tr>
<td>Max. injection speed [mm/sec.]</td>
<td>400</td>
</tr>
</tbody>
</table>
On the day of the show, visitors tasted vacuum-packed rice of Japan, and vacuum-packed rice made by Thai rice produced by Sodick’s sterile packaged steamed rice equipment, and we obtained favorable comments from the visitors where they mentioned it was "very delicious."

Date : 2019/9/6
Venue : Novotel Bangkok Bangna Hotel,
333 Soi Sringarindra 65, Nong Bon, Prawet, Bangkok 10250

Contents of Seminar

- **Thai Rice Industry towards a New Life Style**  
  Speaker: Dr. Kevalin Wangpichayasuk, Kasikorn Research Center

- **Innovative Heat Treatment in the Production of Packaged Rice**  
  Speaker: Dr. Phisamai Srichayet, Kasetsart University

- **Introduction of Sodick and Packaged Rice Market in Japan**

- **Introduction of Sodick’s Sterile Packaged Steamed Rice Production Equipment**

- **Rice & processed rice products: How to improve the added value and nutritional factors**  
  Speaker: Dr. Naphatrapi Luangsakul, King Mongkut’s Institute
Sodick User Report

An Intrinsic Product Appeal That Wins Over Customers Around the Globe

MITSUTOYO-KIKO CO., Ltd.'s product lineup is centered around its bolt and nut-related dies. Its products are used in 15 countries around the world, including Japan, the U.S., Europe and Asia. These products can be found propping up automobiles, household appliances, furniture, construction and a broad range of other manufacturing fields. The “Double Hex”, developed in 1981, now boasts a 70% share of the domestic market. For this feature, we visited the Kagoshima Plant, which is responsible for the entire production process.

From a trading company to a die manufacturer

This plant consists of 10 buildings lined along an expansive 20,000 m² site located in Minamikyushu, Kagoshima. Since its completion in 1991, the plant has gradually expanded in size and application, from the cutting of materials to their processing, heat treatment and other such processes in 1998, to establishing full product manufacturing capabilities including quality inspections and shipment. MITSUTOYO-KIKO began as a trading company for screw machining equipment. The shift from selling dies to involving themselves in the manufacturing process was prompted by calls from customers that there were not any dies of a satisfactory quality available.

The company’s first steps as a manufacturer was to establish a manufacturing plant close to its head office in Kasugai City, Aichi, which immediately preceded the development of the “Double Hex”. This product was born out of concerns that hexagonal shaped bolts and nuts would often break apart during the final phases of machining. The Double Hex is composed of six components that are split up in advance to provide the additional durability needed.

The company successfully found an avenue for manufacturing that offered a product appeal that overcame the lower priced competitor's products overseas.

The decision to concentrate plants in Kagoshima

“I don’t feel we should have our product bases overseas. Not now, not ever.” So states Yoshitaka Funahashi, president of MITSUTOYO-KIKO.

The Kagoshima Plant has persisted to a Made in Japan approach ever since it was first completed. This was to prioritize a level of quality that customers could be satisfied with.

Kagoshima carried a certain appeal in that there were fewer competing manufacturing industries in the area compared to Aichi, allowing the company to scoop up promising young employees, while also offering convenient access from the head office in Kasugai City, making it possible to visit and return from the plant within the course of a day.

Kawanabe, the town in which the Kagoshima Plant is situated, is known for its Buddhist altars, and handiwork is deeply rooted within the local populace.

“While it goes without saying that high precision machinery is essential for producing our products, the quality infused in each product could only be possible with the skills and craftsmanship of our workers.

This is why securing young workers to pass this down to was absolutely essential.” (President Funahashi)

Currently people in Kagoshima who work outside the prefecture at a rate of 50%, and the ability to secure young employees is expected to continue in the future.

500 machine tools combined with automation

The plant has around 500 machine tools involved in manufacturing processes. The latest equipment from each manufacturer lines the plant floor, which are operated by some 180 workers.

“For electrical discharge machine, one person could feasibly take control of six to seven machines, or four to five surface grinding machines and cylindrical grinding machines.

This is why machines by the same manufacturer are organized together. For example, surface grinder machines from different manufacturers may spin in opposite directions.

With machines from the same manufacturer, the basic operating procedure will not change even when machines are upgraded.

Workers in the field act on muscle memory, and are capable of operating multiple machines at once provided they are from the same manufacturer.

This also leads to operation efficiency improvements.” (President Funahashi)
New production equipment is selected based on their flexibility in dealing with special specifications, the ability to maintain a high level of precision through maintenance, and the response capabilities of maintenance service personnel.

Extensive efforts have also been made in pursuing potential areas for automation in the manufacturing process. Certain rigs allow for unmanned operation at night, the use of an ATC (Automatic Tool Changer), and the exchanging of workpieces and tools according to a scheduler. When walking through such an orderly plant, you cannot help but notice the ease at which automatic carrier robots go to and fro while deftly avoiding the human workers and other obstacles. These carriers transport products being processed to the next manufacturing process, greatly reducing the amount of time required for human workers to transport goods. This truly represents the cutting edge in manufacturing environments.

All workers employed at the Kagoshima Plant have been employed locally. Since the founding of the Kagoshima Plant, human resource development has involved superiors and senior employees teaching all aspects of the job to new hires as part of OJT (On the Job Training). An apprenticeship period of three months is currently set for new employees, during which time they learn the necessary skills and techniques required for work. Additionally, skill maps are set up for both new employees and veterans alike, outlining what each employee is and is not capable of, and setting targets for each period. This is done in the pursuit of multi-skill development. "One of the benefits of multi-skill development is the ability to get a broader picture of operational methods and processes. Personnel transferring across from other groups often realize a more efficient way of doing things." (President Funahashi)

There is yet another side to MITSUTOYO-KIKO.

## Objectives of multi-skill development

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- Additionally, skill maps are set up for both new employees and veterans alike, outlining what each employee is and is not capable of, and setting targets for each period.
- This is done in the pursuit of multi-skill development. "One of the benefits of multi-skill development is the ability to get a broader picture of operational methods and processes. Personnel transferring across from other groups often realize a more efficient way of doing things." (President Funahashi)

### Further enhancements planned for the future

Until now, MITSUTOYO-KIKO has continued to expand to meet customer needs. Looking ahead, the company is looking to pursue further enhancements that will propel the company to the next level. The company will look to improve delivery times and quality to further boost customer satisfaction. "An Intrinsic Product Appeal That Wins Over Customers is our management strategy. We hope to become the overwhelming first choice for customers who view MITSUTOYO-KIKO’s products as absolutely essential. We pursue further human resource development and capital investment to achieve this aim." (President Funahashi)
Sodick Europe Ltd. Tech center
Opening Ceremony Report

An opening ceremony was held on location on Wednesday July 10, 2019 to celebrate the opening of a new tech center at our sales subsidiary Sodick Europe Ltd. (Warwick, West Midlands, U.K.), which is our central sales location in Europe.

Sodick was quick to pursue opportunities to expand the business overseas, now carrying out sales and support activities while enhancing it marketing framework to become closely in tune with changing market needs in five areas consisting of Japan, North America, Europe, China and Asia. As a result of these efforts, overseas sales now account for around 70% of the total sales of the company.

Of these overseas sites, Sodick Europe Ltd. in the U.K. is particularly important, acting as a base of operations for the whole of Europe, and its sales activities encompass a broad area covering the U.K. and the rest of Europe, Russia and the former Soviet Union, the Balkan States, Turkey, the Middle East, Egypt and South Africa.

The introduction of this tech center is expected to speed up the company’s business expansion in Europe, boost our market share in the automobile industry, aerospace and healthcare fields, and contribute to improving the image of the “Sodick” brand locally.

The opening ceremony was attended by a vast array of dignitaries, including the Ambassador of Japan in the U.K.
Sodick Europe Ltd. Aims for introducing a new tech center

Enhance classroom (conference room) related facilities at the tech center, carry out periodic service and machine processing instruction for vendors, and study sessions and training courses for sales representatives to further improve the level of service provided by vendors.

In addition to die-sinker EDMs, machining centers, metal 3D printers and other machine tools, the showroom also displays type injection moulding machine and nearly all other Sodick products that are certified for sale in Europe having cleared the CE mark safety requirements set.

The show room is temperature controlled for precision machining, enabling the company to quickly respond to customer requests for test machining demonstrations and machinery observations.

The tech center includes a metal 3D printer room, providing speedy, practical solutions to a broad range of needs of the active manufacturing market.

The tech center is equipped with a large scale warehouse featuring a broad lineup of expendable supplies and repair parts, while greatly expanding the stock volume.

Machines exhibited at the showroom

- Linear Motor Drive Precision Metal 3D Printer
  - OPM250L
- Linear Motor Drive High-Speed & Ultra-Precision Wire-cut EDM
  - ALC400P
- Linear Motor Drive High-Speed & High Performance Wire-cut EDM
  - ALC600G
- Linear Motor Drive High-Speed & High Performance Large-size Wire-cut EDM
  - ALC800GH
- Linear Motor Drive High-Speed Wire-cut EDM
  - VL600Q
- Linear Motor Drive High-Speed & High Performance Die-sinker EDM
  - AG40L
- Linear Motor Drive High-Speed & High Performance Die-sinker EDM
  - AG60L + EROWA Automation System
- Linear Motor Drive High-Speed & High Performance Large-size Die-sinker EDM
  - AG80L
- Linear Motor Drive Ultra High-speed Milling Center
  - UH650L
- High-speed Small Hole Drilling EDM
  - K1C
- V-LINE® High Response Injection Moulding Machine for High-Value Added Products
  - GL30-LP
- eV-LINE Electric Injection Moulding Machine
  - MS100

Sodick Europe Ltd.
Agincourt Road, Warwick, CV34 6XZ, United Kingdom
Tel: +44-1926-698-888
A second employee dormitory has opened in the city center to ease new employees in starting their new life as company employees as they come from all over the country to start work at the Kaga Plant (Miyamachi, Kaga City, Ishikawa), a major production center.

The name of the new dormitory, “Swing Daishoji”, is derived from Sodick’s new logo, the “S-WING”, and the Daishoji Domain (subfief), a subsidiary domain of the fief of Kaga in feudal Japan upon which the dormitory lies.

This dormitory is run as a welfare facility assisting employees in acclimatizing to their new life by promoting lively communication and opportunities to further exchanges between employees.

The food production machine shop at the Kaga Plant welcomed three undergraduate students and two postgraduate students from Russia as interns as part of their short-term overseas study program at Kanazawa University.

This internship began following Sodick’s election as a special member of the Organization of Frontier Science and Innovation, Kanazawa University the previous year. After a company information session and touring the food production machine shop, the students got some hands-on assembly experience with a noodle-making machine, manufacturing in the can production section, and performed sensory tests and noodle analysis tests, etc. in the development section. These exchange opportunities with students from various nationalities provide a great sense of stimulus for the Japanese employees in the plant.

A marathon event that runs from evening to night, providing a wondrous sense of nature!

Sodick supported and participated in this, the fourth time the event has been held.

Starting from Yamanakaza, Yamanaka Hot Spring, Ishikawa at 4PM, this hard course spans 32 km of Kaga’s natural wonder, with a maximum difference in elevation of 350 m. The run lasts from dusk to night, encapsulating an extraordinary experience for all.

The finish line celebrates the arrival of each runner with a fantastic light up display, with all participants taking part in exciting post-run events, while also sampling the local cuisine and enjoying a bath at the Kaga Hot Spring Village.