

# FANUC

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## NEWS



2017-Ⅲ

For six days from September 18(Mon) to September 23(Sat), EMO 2017 was held in Hanover, Germany. It was a very successful event, with 130,000 visitors from all over the world.



The FANUC booth had a giant yellow airship floating near the ceiling, featuring the themes of "one FANUC" and "Service First," and showcasing the latest FA, ROBOT, and ROBOMACHINE products and services. In addition, we exhibited FANUC's approach for IoT, various AI functionalities, and QSSP functionalities that achieve quick and simple robot installation.



At the special exhibit stage, we introduced FANUC's IoT solutions, such as the currently available LINK*i* and ZDT features, as well as the soon-to-be-released FIELD system. We also introduced our AI functionalities, which we have been focusing most of our energy on.

In the FA area, Fine Surface Technology for achieving high quality machining and the demonstration of FIBER LASER processing with highly synchronized axes control gathered much attention. In the ROBOT area, we exhibited various green collaborative robots. The green robot mounted on an AGV was especially popular with visitors. In addition, the large robot lifting aircraft engine parts high in the air was constantly surrounded by



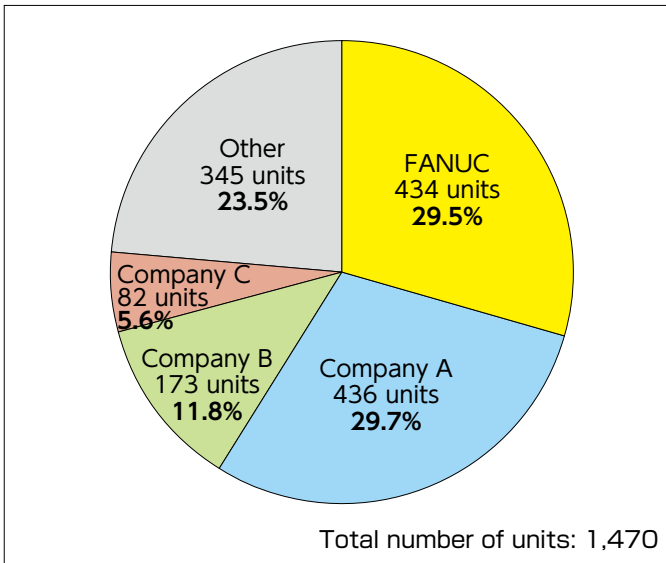
visitors snapping pictures.

In the ROBOMACHINE area, the advanced processing and molding capabilities of ROBODRILL, ROBOSHOT, and ROBOCUT, as well as the demonstrations of AI functionalities, QSSP, and LINK*i*, fascinated visitors. Furthermore, the mold cutting demonstration by the machining-type ROBONANO drew much attention from European automobile manufacturers and watch makers.

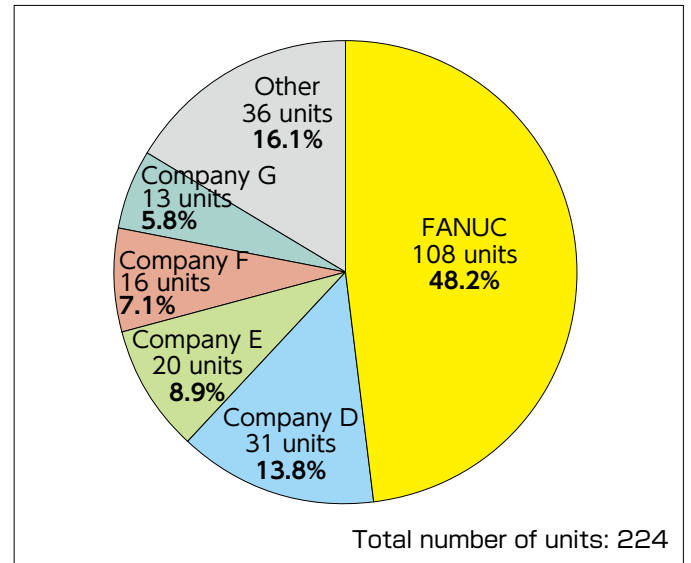
In the SERVICE area, we introduced the various maintenance tools we have available, as well as our business 259 locations in 45 countries, and explained how our lifetime maintenance allows customers all over the world to feel secure using our products.



The share of the number of our machines exhibited at the EMO venue is as follows. We would like to thank all our customers that kindly exhibited our products at the event.



CNC share



Robot share (excluding FANUC booth)

The share of CNCs and ROBOTS exhibited at EMO. [internal investigation]

We held our customer dinner event on the night of September 18 (Mon), where many customers came not just from Europe and Japan, but also from the United States and Asia. After our Chairman and CEO, Dr. Y. Inaba's speech and President Yamaguchi's toast, customers enjoyed the occasion with wine and plates of food in their hands.



## AC Party

The 60th AC Party was held on August 21(Mon). The AC Party started as a get-together organized by the Automatic Control Section, where Honorary Chairman Dr. S. Inaba started the development of NC units. The group has grown larger every year, now including 1,127 members. This year's AC Party, which marks the 60th year since it started, was attended by 1,074 people, including 99 new members.

Following Dr. Y. Inaba's opening speech and President Yamaguchi's toast, the AC participants, filling the entire FANUC Forum, bonded with drinks and plates of food in their hands, with a renewed determination to strive toward further development, with "one FANUC" as their keyword.



# FANUC Global Service Conference

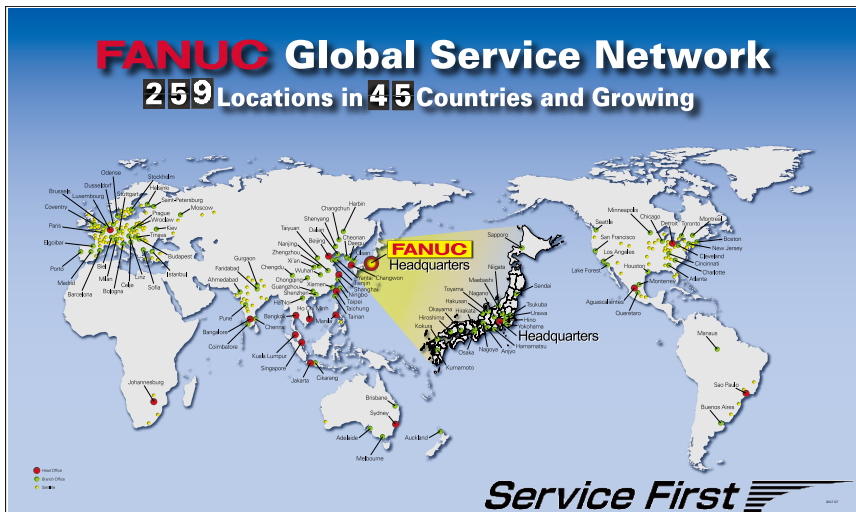
We held the Fourth FANUC Global Service Conference (FS Conference) for three days from July 18 (Tue) to July 20 (Thu) at the FANUC Forum, which is located on the premises of FANUC Headquarters. More than 310 people, including 113 attendees from overseas, gathered together to have enthusiastic discussions on how to provide better services.



Following the opening address by Dr. Y. Inaba, the business division session and the working group session were held. During the business division session on the first day, participants were divided into three business divisions and had lively discussions surrounding the main themes of "shortening maintenance operation times" and "preventive maintenance," which are efforts aimed at improving equipment operating rates for customers. During the working group session on the second day, energetic discussions were held with overseas participants serving as moderators, covering topics such as machine parts, training, technological information, and IT services. On the final day, the plenary session was held with all participants in attendance, including Dr. Y. Inaba, President Yamaguchi, and related executives, where the awards for the annual top service people were handed out, and results from the discussions of each session were reported.



FANUC continues to remain faithful to the fundamental principles of "Walking the Narrow Path" and "Strict Preciseness and Transparency" that were established at the time of the company's founding, while also adhering to the new fundamental initiatives of "Service First" and "one FANUC" to build strong relationships based on trust with our customers around the world.



## Service First

Conforming to the spirit of "Service First," FANUC provides lifetime maintenance to its products for as long as they are used by customers, through more than 250 service locations in 45 countries throughout the world.



The three businesses of FA, ROBOT and ROBOMACHINE are unified with SERVICE as "one FANUC," to provide innovation and reassurance to manufacturing sites around the world.



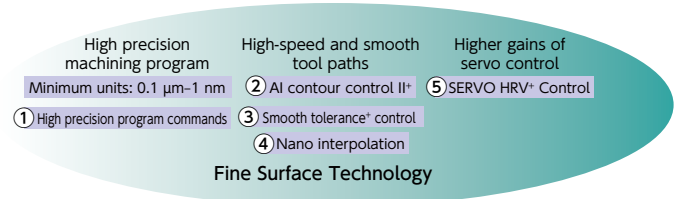
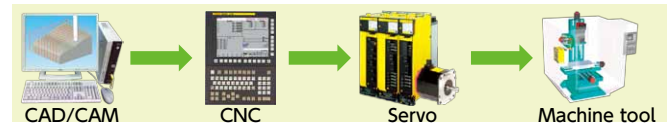
# Introduction of New Products and New Features (FA)

## Fine Surface Technology

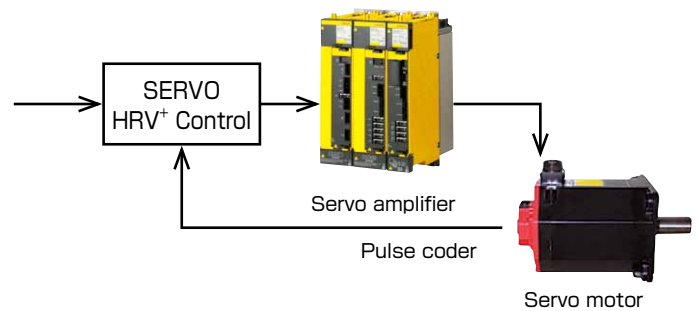
"Fine Surface Technology" is a state-of-the-art CNC and SERVO control technology to achieve high quality machining of high precision molds and parts of mobile phones.

The CNC system precisely analyzes high-precision machining program commands created by CAD/CAM to generate smooth tool paths, and the high precision servo system accurately drive feed axes of a machine tool to achieve high quality machining.

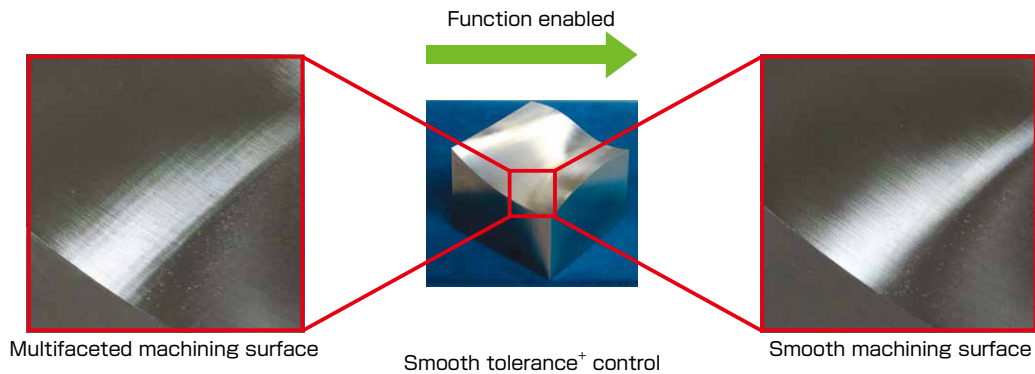
- ① For high quality machining, smooth program commands are required. High precision program commands enable the use of precise machining programs accurate to the nearest 0.1 nm.
- ② AI contour control II+ even allows for high speed machining by program commands for minute blocks, while optimally controlling the machine tool according to the machined geometry.
- ③ Smooth tolerance+ control performs smoothing within the specified tolerance to generate smooth tool paths.
- ④ Nano interpolation that precisely calculates the position commands to the nearest nanometer improves the machining accuracy. In addition, it enables the machine to move smoothly, achieving high quality machining surfaces.
- ⑤ The servo motor with an optimized rotor design, servo amplifier with a high resolution current detection, Pulse coder with fast response and high resolution, and high gain control with SERVO HRV+ Control achieve highly precise feed of axes.



FANUC's CNC and SERVO control technology that achieves high quality machining



High precision SERVO system  $\alpha i$ -B,  $\beta i$ -B series



## Modernized Series Oi-F 10.4" LCD Unit

FANUC has developed the Series Oi-F 10.4" LCD/MDI unit with an all new design. The unit features compact external dimensions, equipped with a 10.4" LCD.

Due to its compact external dimensions, it can be used as a replacement for the current 8.4" LCD/MDI unit.

- Flat, thin display for improved design of the operator's panel
- Operation screen with modern, flat design
- Due to same operability, suitable even for customers accustomed to conventional operations.
- A compact operation panel is realized by reducing the external dimensions even with a large LCD.
- Icon display that allows the user to see the hierarchy of the displayed soft keys at a glance



10.4" LCD/MDI unit (vertical)



10.4" LCD/MDI unit (horizontal)

# Introduction of New Products and New Features (ROBOT)

## ■ FANUC Robot R-2000*i*C/210WE

FANUC has developed and begun selling the washing robot R-2000*i*C/210WE, as part of the R-2000*i*C series, which can be used for washing applications. The product features much higher environmental resistance compared to the previous R-2000*i*B/210WE, for enhanced reliability.

- Robot for washing environment, with a payload of 210 kg.
- High chemical resistance and rust proof performance that have been achieved by applying a special coating over the cast surface and by using stainless steel sheet metal.
- Improved reliability through the adoption of a reducer specially designed for washing robots, which makes the structure as simple as possible.
- High dust and drip-proof properties that have been realized by improving the airtightness of the motor cover and purging the air, which enables the robot to withstand use under harsh environments in which high-pressure jet water is dispersed.
- Monitors the internal purge pressure with the built-in sensor to detect abnormal fluctuations in purge pressure.
- Uses a special oil lubricant that improves exchangeability, maintainability, and thermal resistance.
- Can easily replace the previous machine, with the same installation bolt positions and operation range as the R-2000*i*B/210WE.



Washing robot  
R-2000*i*C/210WE

## ■ Robot Absolute Accuracy Compensation Function: *i*RCalibration Signature

FANUC has developed the "*i*RCalibration Signature" function, which compensates errors in the mechanical unit of the robot and improves the absolute position accuracy (deviation from specified positions or curves). This function will be introduced sequentially starting with large models.

- Significantly improves the absolute position accuracy by performing automatic calibration for each robot using high-precision three-dimensional measuring equipment.
- Effective in fields in which high absolute accuracy is required, including laser machining and the aerospace industry.
- Contributes to a reduction in man-hours for setup or replacement of automotive body manufacturing lines, as it can minimize the corrections needed for programs created by the offline teaching system when teaching with actual machines.
- Currently supports the R-2000*i*C series and M-900*i*B series. The models of supporting this function will be sequentially expanded.



Automatic calibration at FANUC

ISO9283 test	
<i>i</i> RCalibration Signature disabled	3.57 mm
<i>i</i> RCalibration Signature enabled	0.21 mm

Example of absolute accuracy measurement results for the R-2000*i*C/210F

FANUC will continue to improve the accuracy of our ROBOTS and contribute to the expansion of the fields to which automation can be applied.

# Introduction of New Products and New Features (ROBOMACHINE)

## ■ FANUC ROBOSHOT $\alpha$ -S450iA

FANUC has developed the FANUC ROBOSHOT  $\alpha$ -S450iA, which has realized the largest clamping force for a ROBOSHOT ever at 450 t.

### ① Support for large molds

- The new model has achieved the largest mold thickness and tie-bar spacing in its class, and supports large molds, which are becoming more common in the field of molding for automobiles, containers, and medical components.

Max. clamping force	[kN]	4500 (450tonf)
Mold thickness (max/min)	[mm]	1000/350
Tie-bar spacing (horizontal × vertical)	[mm]	920×920

### ② Compact design

- The new model features a compact design with its overall height kept to a minimum by means such as the use of a low-floor base, which has realized excellent workability for maintenance work including changing molds.

### ③ Screens with superior operability

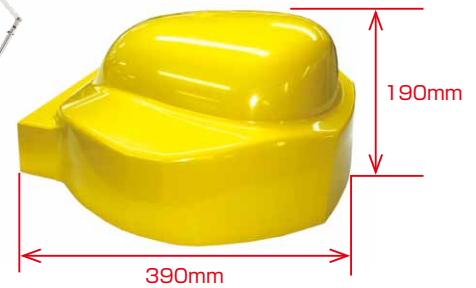
- Intuitive and easy-to-use screen operations have been realized by the new *i*HMI user interface.



ROBOSHOT  $\alpha$ -S450iA



Genkotsu-Robot M-1iA



Example of a large molded product (Cover of Genkotsu-Robot)

## ■ FANUC ROBOCUT $\alpha$ -C800iB Z500 Specification

FANUC has added the Z500 specification with the Z-axis stroke extended to 510 mm to the ROBOCUT  $\alpha$ -C800iB series wire electrical discharge machines, which feature high reliability and performance.

### ① Extended Z-axis stroke

- The extended Z-axis stroke has made it possible to support for large parts and molds, including those for automobile or consumer electronics.

XY stroke [mm]	UV stroke [mm]	Z stroke [mm]	
		Standard	310
800 X 600	200 X 200	Option	510

### ② Improved discharge control

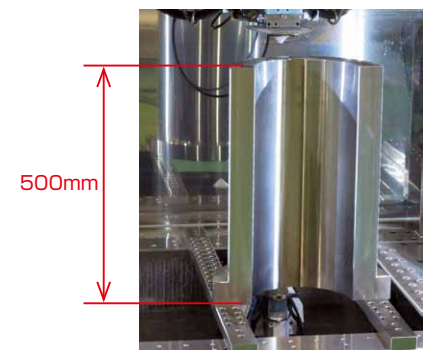
- The straightness accuracy of thick plate machining has been improved by the new discharge control.

### ③ Thermal displacement correction function

- Displacement of the upper and lower guides due to changes in room temperature has been reduced by advanced thermal displacement correction using multiple temperature sensors, realizing stable machining even for large workpieces with a long machining time.



ROBOCUT  $\alpha$ -C800iB Z500 Specification



Example of high accuracy machining of a thick plate



# Introduction to FANUC Factory ROBOCUT Factory

In the ROBOCUT factory, ROBOCUT wire electrical discharge machines with high reliability and performance are manufactured.

FANUC has a long history of manufacturing wire electrical discharge machines. It started over 40 years ago in 1975, and a total production of 30,000 units was reached in January 2017. Currently, the small  $\alpha$ -C400iB model, medium-sized  $\alpha$ -C600iB model, and large  $\alpha$ -C800iB model are manufactured in the factory.

This factory has a capacity to manufacture 100 ROBOCUT units each month. Assembly of machine bases, final assembly, and tests are performed in constant temperature rooms to maintain the high quality of ROBOCUT.

In the manufacturing process, machines, measuring equipment, and host computers are connected via an in-house network to effectively transfer manufacturing data, manage the progress of processes, and provide work instructions. In addition, machine accuracy is measured automatically, and a large amount of measurement data from the automatic measurement system is stored in the host computer to be centrally managed as the manufacturing data of each machine.



ROBOCUT final assembly test area



Automatic machine accuracy measurement system (laser length measurement)

In the automatic assembly system using all-around intelligent robots installed in the unit assembly area, two robots perform detailed assembly work for ROBOCUT, which used to be performed by human workers, by fully utilizing FANUC's vision sensor *i*RVision and force sensor. The system realizes multi-product production, assembling products including the dielectric fluid draining unit and work-pan seal unit.

In addition, for the assembly of the Automatic Wire Feed (AWF) system for ROBOCUT, the collaborative robot CR-35iA has been introduced to handle heavy components. This is part of our efforts to create a safe environment which can accommodate all kinds of workers.



Automatic assembly system that performs multi-product production (Dielectric fluid draining unit, work-pan seal unit, etc.)



Collaborative work between a human and a robot (AWF unit assembly)



## Cornerstone-laying Ceremony for the New Tsukuba Robot Factory

On July 12 (Wed), FANUC held the cornerstone-laying ceremony for the new Tsukuba Robot Factory in Chikusei, Ibaraki Prefecture. Present at the ceremony were former Ibaraki governor Mr. Masaru Hashimoto, Chikusei mayor Mr. Shigeru Suto, and other honored guests. After Dr. Y. Inaba's greeting and former governor Mr. Hashimoto's congratulatory address, a ground-breaking ceremony was held to wish for safety during the construction work.



From left: President Yamaguchi, Dr. Y. Inaba, Former Governor Hashimoto, and Mayor Suto

## Mibu Laser Factory Completion Ceremony

On November 1 (Wed), the completion ceremony for the Mibu Laser Factory was held at the Mibu-hanyuda Industrial Park in Mibu, Tochigi Prefecture. Present at the ceremony were Tochigi governor Mr. Tomikazu Fukuda, Mibu mayor Mr. Kazuya Kosuge, as well as other honored guests who participated in the lively event.

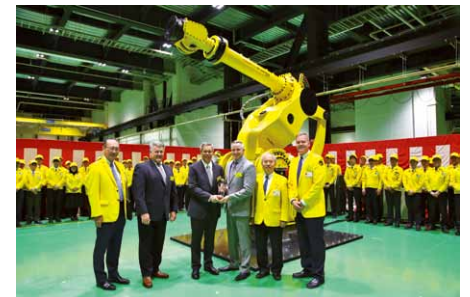


From left: President Yamaguchi, Chairman Shibata of Furukawa Electric Co., Ltd., Mayor Kosuge, Governor Fukuda, and Dr. Y. Inaba

## Celebration to Commemorate a Cumulative Total of 500,000 Robots Shipped

In November 2017, FANUC reached a cumulative total of 500,000 robots shipped.

In commemoration, we invited executives from General Motors Company, the customer who purchased the 500,000th robot, and held a ceremony on November 6 (Mon), in front of the FANUC Robot M-2000IA/900L waiting to be shipped at the corner of the No. 2 Robot Assembly Factory at FANUC Headquarters, with 100 members of the Robot Business Division in attendance. Dr. Y. Inaba presented Mr. Drouillard, GM Executive Director, with a commemorative plaque.



From left: President Yamaguchi, Mr. Trusty, GM Managing Director, Mr. Gibbons, GM Executive Director, Mr. Drouillard, GM Executive Director, Dr. Y. Inaba, and FANUC America President Cicco

## 13th Japan Student's Indoor Flying Robot Contest



The 13th Japan Student's Indoor Flying Robot Contest was held on September 2 (Sat) and September 3 (Sun) at the Ota Omori Sports Center. This contest is planned and held to support students' education in aircraft design, manufacturing, and test flights. A total of 63 teams from universities, technical colleges, high schools, and vocational schools across Japan participated in the contest and competed in exciting games. Participants manufactured aircraft according to strict rules, and conducted simulated missions to transport emergency supplies to disaster-stricken areas, in a competition of their flying performance and operating skills. FANUC started providing special sponsorship last year, and awarded the FANUC Award to the National Institute of Technology, Akita College, which won the championship in this category.

13th  
Japan  
Student's  
Indoor Flying  
Robot Contest

Main sponsor: The Japan Society for Aeronautical and Space Sciences  
Co-sponsors: Tokyo Ota Ward Office, Japan Aerospace Exploration Agency (JAXA), and Ohta Business Sozo Kyougikai  
Chairperson: Shinji Suzuki, Professor at the Graduate School of Aeronautics and Astronautics, the University of Tokyo  
Committee Chairperson: Takeshi Tsuchiya, Professor at the Graduate School of Aeronautics and Astronautics, the University of Tokyo

## MOTION & CONTROL™ **NSK**

NSK Ltd. contributes to the industrial world as one of the world's leading companies in the fields of industrial machinery bearings and automotive bearings, which are indispensable to modern society.

NSK Steering Systems Co., Ltd., which is a wholly owned subsidiary of NSK Ltd., has greatly contributed to the development of the automobile industry in Japan, since its establishment in 1961.

We visited the Soja Plant of NSK Steering Systems Co., Ltd. located in Maebashi City, Gunma Prefecture, to interview Mr. Iritani, President, and Mr. Kamamoto, General Manager.



(Left) Keisuke Fujii, (middle) Mr. Iritani, President, (right) Mr. Kamamoto, General Manager

### Could you tell us about the features of the company?

**Mr. Iritani, President:** NSK Ltd., the parent company of NSK Steering Systems Co., Ltd, mainly engages in three lines of business, which are industrial machinery bearings, automotive bearings, and steering systems and actuators. Among these, we handle the domestic production of the steering system business. Fifty-five years ago, when the bearing and automotive industries were experiencing their growth and development period, the production of steering systems using ball screws started in the Soja Plant in Gunma Prefecture. This was the start of our steering business. Since then, with the changing trends in automotive technologies, we have been engaging in the comprehensive production of steering systems, from ball screw columns to manual columns, as well as witnessing increased production of electric power steering systems and rack and pinion steering systems, due to benefits from low-fuel consumption in recent years. Our company is designated as a "model domestic plant" for the global steering system business. While domestically constructing optimal production lines, we expanded these lines to nine overseas plants in the United States, China, Poland, India and Thailand. In addition, we are also responsible for the education and training of local engineers. Currently, we are hosting trainees from countries such as Poland and India, and we are striving each day to transfer and establish the technologies of Japan.

### What made you decide to use FANUC products in your plant?

**Mr. Iritani, President:** From around 1990, we started introducing FANUC robots to handle heavy or repetitive work. In 2010, we started to use robots for the supply of parts related to pre-machining processes. Since then, a wider variety of robots have become available, and their prices are also reasonable now, which made it easier for us to introduce your robots into many processes. We are gradually introducing robots into other processes, including the assembly process where robot usage had been difficult until now. This has mostly been made possible by bin picking using cameras or other vision sensors that are getting better and better each year, and force sensors.



External view of Soja Plant.



## How do you evaluate FANUC?

**Mr. Iritani, President:** I think that, compared to the rapidly growing demand for automobiles overseas, the domestic demand for automobiles cannot be expected to grow as rapidly. Therefore, the number of units of robots used in our domestic plants will probably not increase dramatically.

However, I believe that, when we consider introducing robots in overseas plants, the biggest advantage would be if the robots can be used in an environment similar to that in Japan.

Since FANUC has a strong support system overseas, including for services, we feel reassured in using FANUC products.



## Do you have any requests for FANUC?

**Mr. Iritani, President:** We would like you to deepen your ROBOT technologies, including an increase in speed and space conservation through further weight reduction, expansion of the robot application range through the promotion of AI and deep learning technologies, and a reduction of introduction work through simplification of the teaching process. In addition, we will continue to strive to maintain a good partnership with you, as you are also our customer that uses NSK products. So, we would like to ask for your continued support.

(Interviewer: Keisuke Fujii, Public Relations Department Manager, FANUC CORPORATION)



Many bin-picking robots are used in the plant.

### NSK Steering Systems Co., Ltd.

(<http://www.nsk.com/jp/company/plants/nssh/index.html#tab3>)

President: Kazunori Iritani    Capital: 7,500 million yen    Number of employees: 947 (as of March 31, 2017)  
Soja Plant, Soja Manufacturing Department    Address: 1-8-1 Soja-machi, Maebashi City, Gunma, Japan    Phone: (81) 027-253-1331  
Soja Plant, Akagi Manufacturing Department    Address: 1240-1, Idoimachi, Maebashi City, Gunma, Japan    Phone: (81) 027-268-1000

## Four Seasons of FANUC

Fall is in full swing, and the forest around FANUC is beginning to yield its fruits.

The plants that were in full bloom in early summer are now bearing fruit, adorning the forest as it prepares for winter.



Zumi crabapple

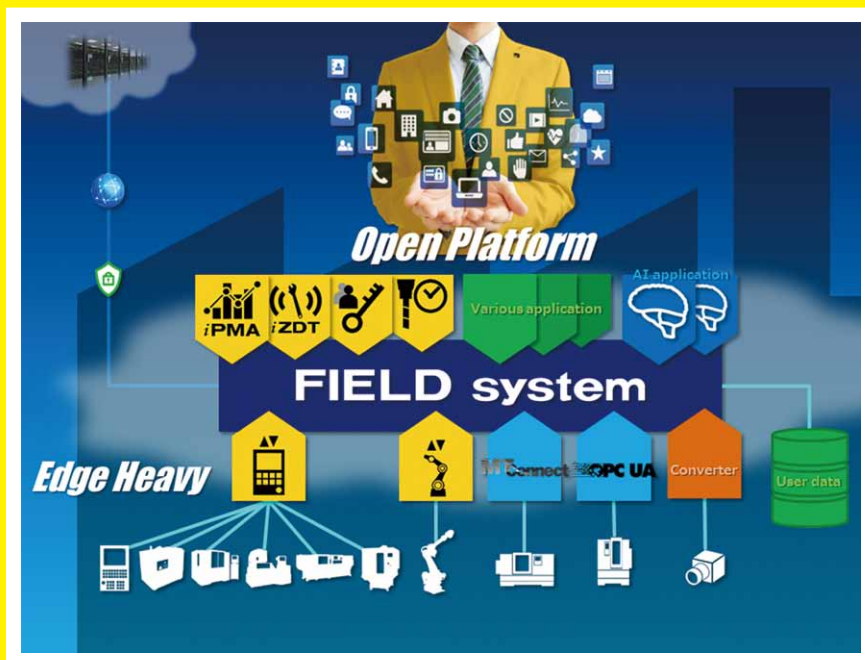


Chigo-yuri



# FIELD system

FANUC Intelligent Edge Link & Drive system



FIELD system is a platform open to everyone, and was developed for edge-heavy computing by bringing together the latest IoT and cutting-edge AI technologies.

By using this system,  
FANUC aims to work with partners around the world to  
innovate manufacturing.

FANUC News 2017-III

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