

MESSAGE FROM THE CTO

Expanding the fields Yaskawa can contribute to in solving social issues to realize Vision 2025.

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Opening of YASKAWA Technology Center (tentative name) for further improvement of development speed and the ability to respond to diversity

History and technological turning points of Yaskawa Electric

In the period of our startup, in which coal mine equipment shifted from steam engine to electricity, our business started with providing motors for mining and carrying coal. After 1950s, energy shifted from coal to oil and the industry structure drastically changed to a heavy industry while the target of our motor technology was changed from coal mine to iron and steel. The turning point of carving out a path to next era was development of motors and control devices to realize high reliability of running 24 hours a day, 365 days a year required by control of steel plants. Next turning point was the coming of the era of mass production and consumption of automobile and home electrical appliance, etc. along with Japanese

economic growth from late 1970s. It required mass production of the same quality by machine tools and production equipment using highly reliable motor drives instead of manpower. Within this background, the concept "Mechatronics (mechanism + electronics)" came out of the idea "fusion of clients' machines and our motors and control devices provides more advanced functions" and the word we created is now commonly used in the industry.

Then, Yaskawa declared the shift to mechatronics field and first domestic all-electric industrial robot MOTOMAN was born. It allowed for mass production of automobile with the same quality level. When the era of digitalization such as PC and smartphone began before long and it required a large amount of electronic parts, faster and more accurate motors than the ones used in iron manufacturing and machine tools were needed and AC servo motors became an essential technology for manufacturing.

Yaskawa Electric's technologies and products led each era and we made right choices at the historical turning points such as the shift to mechatronics. I think these

are the reason why Yaskawa has been existing over 100 years.

The link between technology development and business strategy

We consider future technologies based on the vision of our management team on how the world will be changed. Yaskawa creates a vision that automation will make a progress not only in the traditional manufacturing industry but also in the fields such as agriculture, logistics, medical and welfare with the assumption that it will be required to sustain the quality of life while addressing lack of labor due to low birthrate and aging population and a variety of influences by climate change. Under this vision, Yaskawa group shares the concept of expanding the fields it can contribute to and the status of production, sales, and technology, of which I am in charge, are in the middle of innovation. Although AC servo, AC drives, and robots have been developed individually for the best performance in the world, to expand the fields we can contribute to, we need to actively make use of open innovation and cooperation with venture companies after clarifying what technologies are missed by aggregating the technologies. Also, it will be important for us to communicate our technologies to public and find the opportunity where others can make use of our technologies.

Direction of future technology development

While we will develop a base technology leading to reduced size and enhanced performance of AC servo and AC drives, and quality improvement of welding and painting of robots, we will also focus on development for realizing new things with combination of our technologies. For example, it is a technology which realizes productivity improvement in manufacturing through controlling a cell consisting of robots and machines in integrated ways and analyzing the data obtained from motors. This technology is already being developed based on the i³-Mechatronics concept for early realization. However, we need the greater speed and the ability to respond to diversity in order to provide solutions along with various business issues of our clients. Our products have been chosen because of high reliability and precision but factors such as usability and flexibility will be more important. In this industry with tough competition among engineers all over the world, the speed of development is becoming increasingly important. The above is the background of opening

YASKAWA Technology Center (tentative name). We will enhance the speed through aggregating our production technologies and quality assurance functions so that we can consider how to manufacture while we develop products at the same time.

Concept of technologies that will become a black box and those that will become open in the expansion of open innovation

Our technologies on production, design and control of motors, motor drive technology, controller technology and robot control technology, which are our core competence, are the fields we will continuously improve and make as black boxes. On the other hand, these applied technology need cooperation with external partners. For example, we should consider how to harvest with farmers when expanding to agriculture. I think that having many strong connections with external partners will expand the possibility of our technology for use in applications such as driving a motor based on the information from sensors and satellites.

For realization of Vision 2025

While we improve individual engineer's repertoire of skills and their vision with making more connections with external parties globally, we work on utilization of ICT and double productivity and output of technology development. This way, Yaskawa will expand the fields we can contribute to in solving social issues even outside the industry and realize our sustainable growth.

INTELLECTUAL CAPITAL

Positioning of Intellectual Capital in Management

The management principle of the Yaskawa Group is to continuously develop and improve world-class technologies, inheriting the founding spirit as a "company founded on technology." By developing technologies that

support the sustainable development of our businesses on a global basis and creating new value for society through these technologies, we aim to continuously improve our corporate value.

FY2018 R&D Results

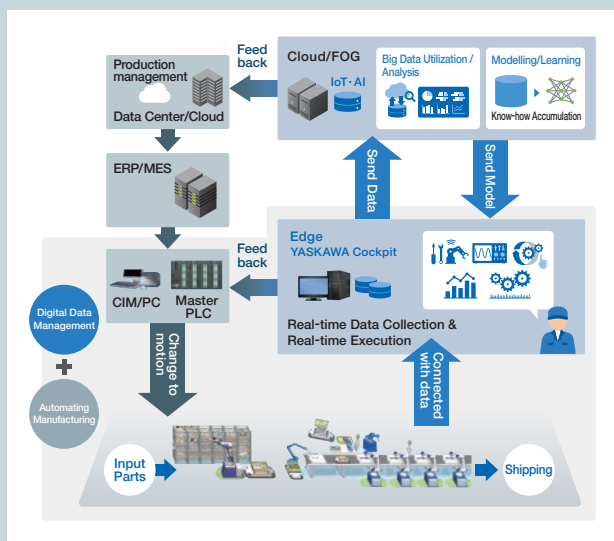
In FY2018, we continued to develop technologies to support the solution concept of i³-Mechatronics for the realization of revolutionary industrial automation. Yaskawa commercialized "YASKAWA Cockpit" a software tool that collects, visualizes, accumulates, and analyzes big data generated at various manufacturing sites through its globally competitive AC servo, AC drives and robot products. We support the evolution of our customers' manufacturing with solutions that utilize data, such as monitoring and diagnosis of production site conditions, failure prediction, equipment abnormality diagnosis, and quality defect detection. At the YASKAWA Solution Factory, which began full-scale operation at the Iruma Plant in December 2018, data detected from servo motors and other sources are linked with YASKAWA Cockpit in order to prevent equipment damage and improve product quality.

Combining the world's top class servo drive and robot control technology, we have also developed the robot module "RM 100" which enables industrial robots to be controlled by machine controllers. RM 100 attached to the machine controller enables industrial machines (equipment) and articulated robots to operate in collaboration with high precision.

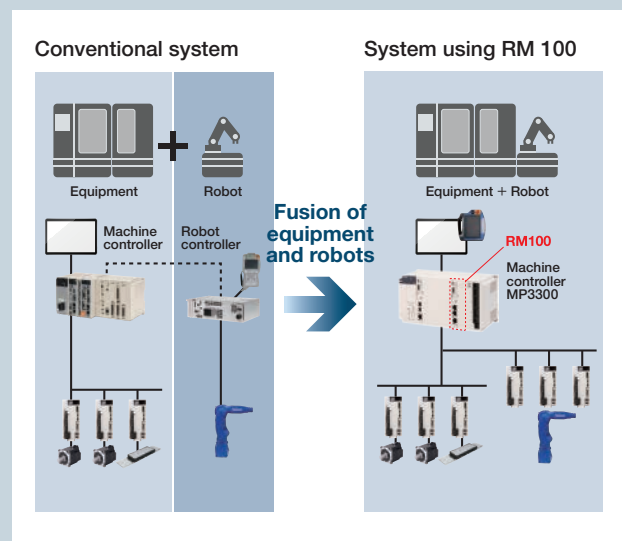
In addition, the data detection function of the servo drive has been improved to enable more detailed monitoring of a wide variety and a large amount of data than before. Sensing technology that uses the internal information of the AC drives has been used to improve the visibility of machines and equipment, as well as the ability to predict and detect failures.

We will contribute to our customers' high-value-added production lines by developing these technologies and products.

Factory where i³-Mechatronics is realized



Advanced cooperation between equipment and robots by robot module RM 100



Corporate Venture Capital Activities

Yaskawa Innovation Program (YIP)

In order to realize its Vision 2025, the Yaskawa Group launched a new business creation scheme called the Yaskawa Innovation Program (YIP) in FY2016. As part of the Yaskawa Group's CVC* functions, YIP solicits new business plans from around the world, and is promoting the creation of new businesses that will serve as pillars of future business through such steps as venture investment and the establishment of subsidiaries.

* CVC: Corporate Venture Capital. It refers to venture investment activities conducted by companies.

Venture investment

Portfolio					Exited
Factory automation / Optimization	Mechatronics applications				Mechatronics applications
	Energy Saving	Food & Agri	Clean Power	Humatronics	Clean Power
 AI, machine learning LOCIX IoT devices Wireless multistage relay communication network Large 3D printers Abnormal noise detection	 FLOSFIA Power devices		 TERA LOOP Storage system broadbit Sodium ion battery Energy Power Systems High power battery system Form Small EV	 ReWalk Exoskeletal walking assist system	 GM Luxury EV sports car Internal venture Factory automation / optimization AI3 AI for factory automation

YIP results

Since the start in FY2016, we have invested in 10 venture companies that have synergies with the Yaskawa Group's businesses, and established one subsidiary (AI³) from this collaboration, resulting in a business with sales of several hundred million yen. In addition, we have been selected as one of the CVC Cooperation Activities "alpha TRACKERS" jointly operated by the leading Japanese VC* Global Brain and Forbes Japan, and have begun sharing know-how and exchanging information with other leading Japanese CVC operating companies.

* VC: Stands for Venture Capital, an investment fund that specializes in venture investing.

Future policy

Under the current mid-term business plan Challenge 25, in addition to investment, we will expand our focus on business verification and business development by our internal startup team, and accelerate the creation of new businesses under the name YIP 2.0.



Members of the YIP Secretariat

Results of Intellectual Property Activities

Yaskawa received Clarivate Analytics "Derwent Top 100 Global Innovators Award"

Yaskawa has been awarded this award for 4 consecutive years for the "Derwent Top 100 Global Innovators 2018-19" announced in January 2019, which identifies the world's most innovative companies and organizations by analyzing intellectual property and patent trends based on patent data held by Clarivate Analytics, Inc. (Headquarters: Philadelphia, USA).

Based on the 4 evaluation axes "number of patents", "success rate", "Globality", and "Influence of patents in citations", this award is given to companies and organizations that lead businesses around the world by protecting original invention ideas with intellectual property rights and successfully commercializing them.

Yaskawa carries on the founding spirit of "being a company founded on technology" with a focus on research and development that is truly world-class. It is a great honor to

receive this award for the fourth consecutive year, and it encourages our future activities. Going forward, we will continue to develop intellectual property activities in cooperation with our business divisions and R & D divisions, with the aim of obtaining high-quality patents that contribute to our business on a global scale.



President Ogasawara receives the award from Timothy Neely (left), President of Clarivate Analytics