

## Kawasaki Successfully Completes AUV Verification Test in UK

Kawasaki successfully completed a verification test for an autonomous underwater vehicle (AUV) in UK waters last November.

With a focus on the growing demand for pipeline maintenance in the offshore oil and gas fields, Kawasaki has been developing leading-edge component technologies of AUVs utilizing sophisticated underwater vehicle technologies fostered in-house over the years, with support

from a subsidization project by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT).\*

An AUV is capable of autonomously assessing and acting according to its surrounding conditions and circumstances while carrying out preassigned missions, which stands in contrast to the more widely used remotely operated vehicle (ROV), which needs a tether cable for its

operations. As a result, AUVs can be operated without dedicated operators on the mother ship or special onboard equipment. Furthermore, tasks

such as charging and transferring collected inspection data to the mother ship can be carried out while the AUV is underwater, which enables longer deployment time and reduces the frequency of launching and recovery work. These are expected to reduce the burden of the ship crew, offer greater safety, and reduce maintenance-related costs.

Kawasaki plans to pursue full-scale development of a pipeline-inspection AUV which utilizes the automated docking and other component technologies tested in Scotland, as well as control algorithms\*\* being developed in cooperation with the UK's Heriot-Watt University, with the aim of commercializing the AUV by the end of FY 2020.

\* AUV Technology Development for Marine Facility Maintenance and Improvements Project (FY 2013-17), a development-support subsidization project undertaken by MLIT to promote and facilitate the cultivation of technologies used in marine resource development efforts.  
\*\* Theoretical formulas to enable the AUV to make judgments/decisions while estimating close-proximity underwater pipeline locations using multiple sensors.



## New York City Transit Awards Contract for New-Generation Subway Cars

Kawasaki Rail Car, Inc. (KRC), Kawasaki's U.S. subsidiary based in Yonkers, New York, received an order for 535 new-generation subway cars, known as the R211 series, from the Metropolitan Transportation Authority's (MTA) New York City Transit (NYCT\*) in January. The order is worth approximately 1.4 billion dollars (158 billion Japanese yen).

Kawasaki will manufacture the R211 subway cars at its facilities in Lincoln, Nebraska (Kawasaki Motors Manufacturing Corp., USA), and Yonkers, New York. The state of the art Lincoln Nebraska facility, established in 2001, will manufacture the car body structure and install interior equipment, while final assembly and function testing will be performed at the Lincoln Facility and the Yonkers Facility, established in 1989, in Yonkers, New York. The cars are

scheduled to be delivered to NYCT from 2020 through 2023.

In addition to the base order of 535 cars, the contract will include options for up to 1,077 cars that NYCT may exercise, bringing the total number of the cars to 1,612, with a total contract value of approximately 3.7 billion dollars (403 billion Japanese yen). In the event all options are exercised, the R211 contract would be the largest rail contract ever awarded to Kawasaki, enabling Kawasaki to keep its US production line in operation up until the year 2025.

Kawasaki has successfully delivered over 2,200 cars to NYCT since receiving its initial order in 1982 for the R62 subway cars. The R211 subway cars are scheduled to replace the authority's fleet of R46 cars and Staten Island Railway's fleet.

The R211 cars are being introduced as a part of NYCT's efforts to modernize and improve reliability and service to NYCT's customers. The cars will be equipped with LED lighting, digital displays and wider doors, enabling passengers to enter and exit the trains more smoothly, thus reducing the time trains sit at the station. Twenty (20) cars of the initial contract will feature an open gangway design, to allow passengers to move freely between cars to reduce crowding by expanding capacity and distributing passenger loads more evenly throughout the train.

\* NYCT is a public authority that operates public transportation in New York City, and is part of the Metropolitan Transportation Authority (MTA), which includes the Long Island Rail Road and Metro-North Commuter Railroad.

## ABB and Kawasaki Announce Collaborative Robot Automation Cooperation

In November 2017, ABB and Kawasaki, two global industrial automation and robot suppliers, announced that the companies will join forces to share knowledge and promote the benefits of collaborative robots, in particular those with dual arm designs. This agreement took immediate effect.

Under the new cooperation, which is the world's first to focus on 'cobots,' both robot makers will continue independently manufacturing and marketing their own offerings while working together on joint technical and awareness opportunities. This includes educating policy makers, NGOs and the general public about the benefits of collaborative automation, and creating common industry approaches to safety, programming and communications.

Collaboration between people and robots, machines and processes is increasingly important as production in many industries has shifted from larger lots with little variation to low volumes with a high mix. This means more variability and more human intervention. Collaborative automation allows people and robots each to contribute their unique strengths — people offer process knowledge, insight and improvisation for change, while robots offer tireless endurance for repetitive tasks.

The cooperation also represents collaboration across borders, with ABB as Europe's largest robot supplier and Kawasaki, one of Asia's industrial giants.

The first output from this cooperation was a collaborative dual arm robot demonstration at IREX, held in Tokyo, Japan from November 29 to December 2, 2017.



Per Vegard Nerseth, Managing Director of ABB's Robotics business (right) and Yasuhiko Hashimoto, Managing Executive Officer and the then General Manager of the Kawasaki Robot Division (left).

## Kawasaki Starts Delivery of Fuselage Panels for Boeing's First 777X

Kawasaki started delivery of fuselage panels for the first 777X, Boeing's cutting-edge wide-body passenger airplane, in February. Those fuselage panels will be shipped by sea to Boeing's 777X assembly plant on the outskirts of Seattle in the USA.

Kawasaki is responsible for manufacturing the forward and center fuselage panels, main landing gear wheel well, aft pressure bulkhead, and cargo door sections in the 777X project. Final assembly of the forward and center fuselage panels delivered this time is conducted at the 777X assembly plant at Nagoya Works 1.

The 777X assembly plant, which was completed in February 2017, further advances facility automation through the introduction of newly developed equipment utilizing the latest in image sensing technologies and control technologies developed with the technical synergy of the company as a whole. The new equipment includes Kawasaki-made robots capable of automatically detecting

bore points and carrying out boring operations as well as auto riveters with an expanded operating range. Moreover, the assembly lines incorporate the Kawasaki Production System\* to achieve high-quality, high-efficiency production operations. Kawasaki is also actively promoting the improvement of facility infrastructure, including ICT, IoT (Internet of Things), and other technologies, with the goal of transforming the assembly plant into a smart factory.

\* **Kawasaki Production System (KPS)**  
Based on the Just-In-Time system, the KPS uses Kawasaki's proprietary logical production management techniques, which were developed and proved effective in-house by being applied on production lines. The system can be implemented in any production line, regardless of whether it is a mass-production or make-to-order production line.



### Major equipment (robots):



Drilling robot (large-bore drilling robot)



Tacking robot (robot for frame tacking)