

# 01 Challenges of FURUNO

Challenges of FURUNO

1

## Zero Accidents at Sea! Digital Transformation of the Marine Industry

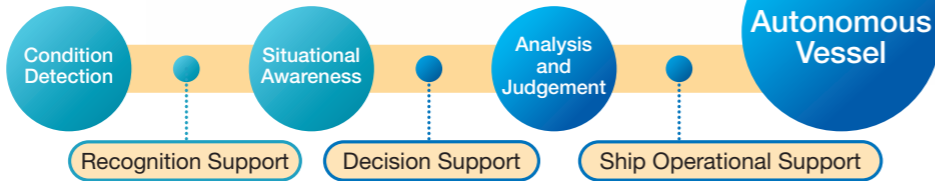
More than half of the seafarers in coastal shipping are over 50 years old, making manpower shortages a major issue. FURUNO believes that automated vessels can be one of the solutions to this problem, and is working to make them a reality.

### Autonomous Navigation

As in the case of automobiles, the environment and technological innovations for the realization and spread of automated vessels are gaining momentum in the marine transportation industry. FURUNO is working on new technological innovations to realize safer and more efficient autonomous ship operations.



### The Future of Digitalization Zero Maritime Accidents



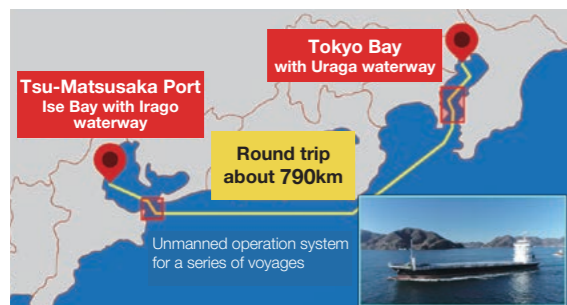
1 | A Recognition Support system, which makes use of marine electronic equipment and unique sensor technology to provide a better understanding of the surrounding situation.

2 | A Decision Support system that analyzes collected data and helps the operator avoid dangerous objects based on enhanced situational awareness.

### Toward Autonomous Vessels

“Challenge the Invisible” is also FURUNO’s business theme. To contribute to the automatic operation of vessels, FURUNO is developing two types of support.

### Successful Unmanned Vessel Operation



FURUNO is part of the MEGURI2040 Fully Autonomous Ship Program conducted by the Nippon Foundation. As a member of the Designing the Future of Full Autonomous Ship (DFFAS) consortium, we were mainly responsible for the development of onboard automatic navigation systems and onshore emergency response systems. This consortium successfully conducted a demonstration test simulating the actual operation of a future unmanned vessel on a round trip between two ports in 2022.



Onboard automatic navigation system



### Aiming for Unmanned Vessels

FURUNO is participating in MEGURI2040 and is taking on the following three challenges to achieve unmanned vessels by 2025.

- <Technologies> \_\_\_\_\_ Reach a partially automated operation
- <Rules> \_\_\_\_\_ Achieve continuous social implementation through deregulation and international standardization
- <Social understanding> \_\_\_\_\_ Foster understanding about unmanned vessels through education for young generations

### FURUNO’s Initiatives

1 | MEGURI2040 Stage 2 will be equipped with an autonomous navigation system on three vessels: a newly built container ship equipped with unmanned navigation and engine systems, an existing container ship equipped mainly with unmanned navigation systems, and an existing remote island shipping vessel. FURUNO is in charge of the development of automatic navigation functions (decision-making and planning) on the vessels and the development of the Fleet Operation Center.



Fleet operation center established in July 2024 at FURUNO’s head office and its booth to support navigation of specific vessels

### MESSAGE

I am in charge of “status management” of autonomous navigation systems installed on automated vessels. Status management is a function that judges if the autonomous navigation system works well and whether the vessel can be operated normally based on the surrounding environment, such as sea conditions.



2 | MEGURI2040 aims to strengthen Japan’s maritime industry by developing safety guidelines for unmanned vessels based on the results of the safety evaluation project for unmanned vessels and by gaining international consensus. FURUNO is contributing to the development of rules for these new instruments in addition to existing navigational instruments.

### Towards “Zero Accidents at Sea”

- AR Navigation System (Model: AR-100M), which uses augmented reality (AR) technology
- \*In 2019, in collaboration with Mitsui O.S.K. Lines, Ltd.



AR Navigation System



VR Navigation System



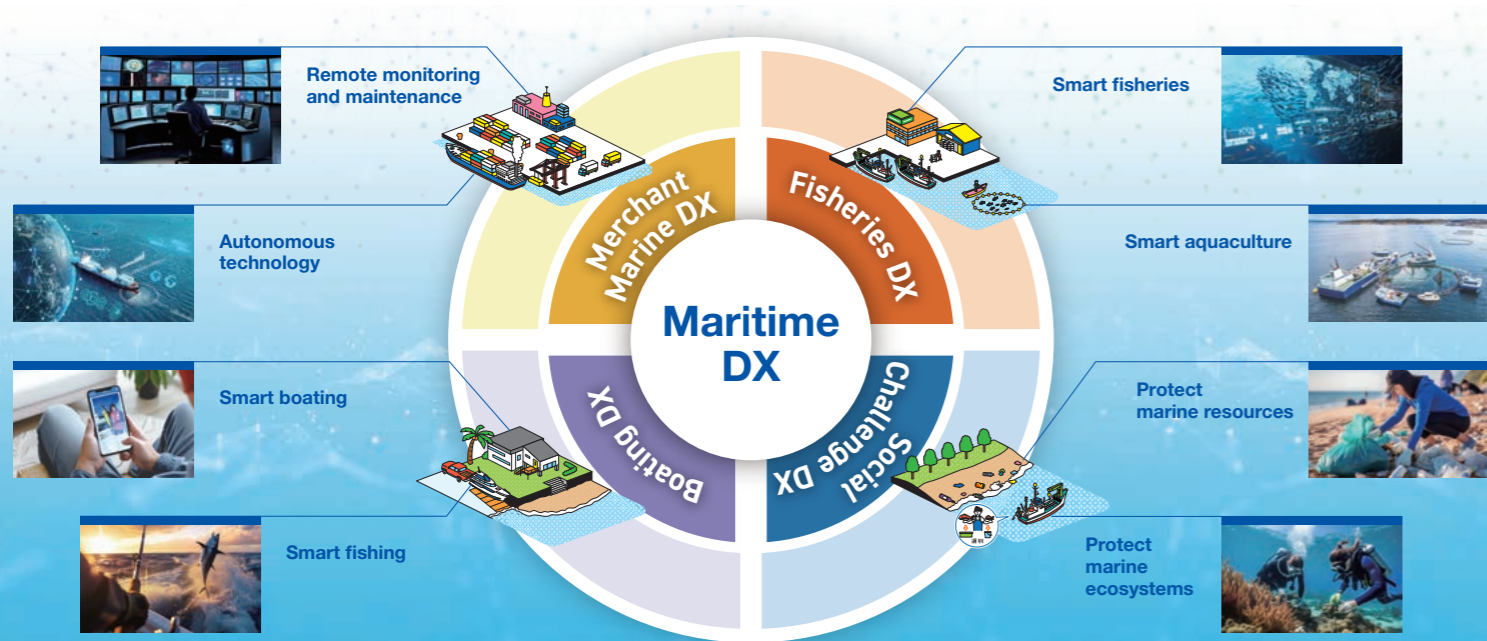
Berthing Support System

The following three product and solution certifications have been awarded by the Nippon Kaiji Kyokai’s Innovation Endorsement.

- VR Navigation System (under development), to support the planning of medium- to long-distance ship maneuvering plans
- A “Berthing Support System” (under development) that measures the exact relative distance and angle between the vessel and the quay using LiDAR, cameras, etc.

# Not Just Merchant Ships! Digital Transformation of the Sea

By connecting FURUNO's equipment and customers across the world's oceans with digital technology and consolidating ocean data, we will continue to protect the richness of the oceans and the lives of the people. With such a future in mind, the challenge towards "Maritime DX" has begun.



## FURUNO's Maritime DX

With the dramatic changes in the maritime communication environment, we are now approaching a world in which oceans and land are seamlessly connected. This will make it possible to collect and analyze highly accurate data from ships, to give customers new experiences and value never seen before.

## Future with Maritime DX

FURUNO has launched in 2023 "DX Samurai," a project to promote DX. In the short-to-middle term, we have redefined the three main markets for the marine business (merchant vessels, fishery, and leisure), as "Merchant Marine DX," "Fisheries DX," and "Boating DX," and have drawn the path that FURUNO's DX should take. In the mid- to long-term, we have also begun to consider new business opportunities based on the theme of oceans and water as "Social Challenges DX." We are considering the value we can provide to different markets by utilizing the data we have collected with our existing businesses.



FURUNO promotes new initiatives with DX from two aspects: fishing to catch and fishing to grow (aquaculture).

## Smart Fishery

### For a Sustainable Fisheries Industry

The fisheries industry is facing various challenges, such as declining fish population and changes in the ecosystem due to changes in the marine environment. FURUNO is promoting smart fisheries that utilize data obtained from fishing vessels at various fishing sites to realize resource management fisheries, including improving the efficiency of fisheries operations.

**MESSAGE**

Takuto Hazama  
Marine Electronic Products Division  
Fishery System Engineering Section

To contribute to a sustainable fishing industry and the transformation of the fishing industry into a growth industry, we are developing an IoT service (Fishery Vision Series) that leverages the strengths of FURUNO's fishing equipment.

## Stationary net monitoring system

By transmitting acoustic echoes and other information from measurement buoys, fishermen can view fish and net responses and other information anytime and anywhere, to determine the optimal timing for leaving port and landing nets.



## Aquaculture Support

### For a sustainable fish-eating culture

As the depletion of marine resources becomes a global issue, there is a need for sustainable fishing, and aquaculture is supplementing these needs. We believe that FURUNO can contribute to this effort by developing an aquaculture support business.

### FURUNO's Initiatives

We can now quantify the ecological behavior of fish by analyzing sensor data such as depth of distribution, swimming speed, fish body composition, water temperature, and tides in the fish cage.

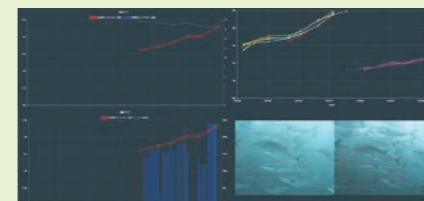
**MESSAGE**

Shun Kumakura  
Marine Electronic Products Division  
Aquaculture Business Support & Development Office

In today's aquaculture industry, where labor shortages are being called for, we are keenly aware of the need to standardize and streamline operations and to promote them more than ever before. To achieve this, we need to move away from experience, intuition, and tricks, and move to data collection and quantification of know-how, and we understand that this is why DX is so important.

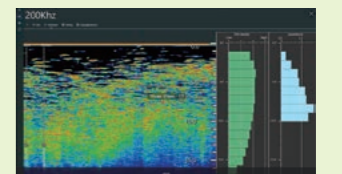
## Aqua Scope, an application for aquaculture management

In January 2024, we released Aqua Scope, an application for aquaculture farmers that integrates and displays data necessary for aquaculture management, as a new function linked to our fish weight estimation system.



## Visualizing the inside of a fish cage (Norway)

Together with our subsidiary FURUNO NORGE A/S, we are conducting cutting-edge research and development, promoting field tests and information exchange. In 2023, we exhibited a new sensor using ultrasonic waves, which can constantly monitor average fish weight, depth of distribution, and swimming speed.

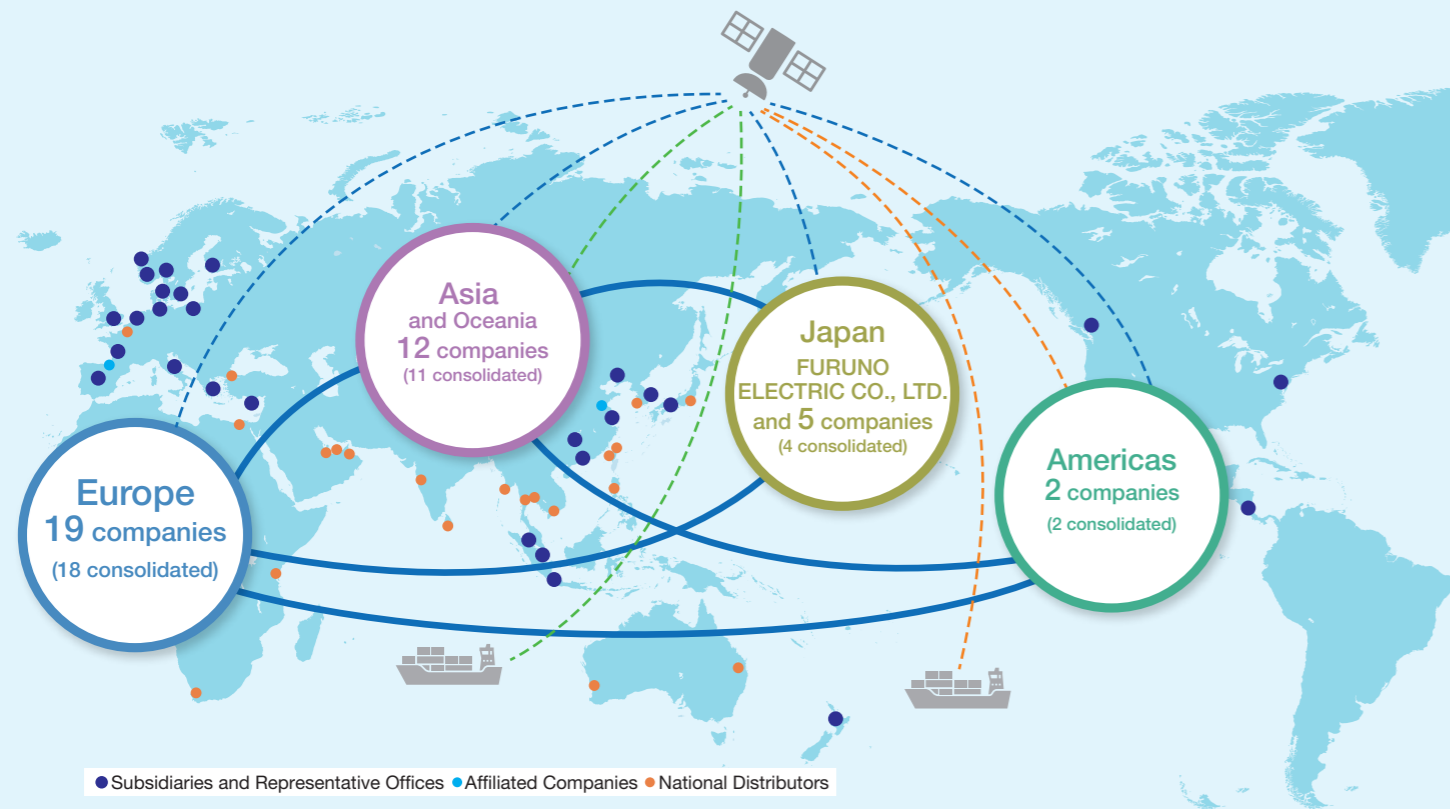


# Transformation into “Proactive Service (Remote Service)”

## We want to provide “more prompt” service

FURUNO provides prompt and high-quality maintenance service by visiting customers’ vessels around the world with 34 domestic bases, 22 overseas group companies, and numerous third-party distributors. To realize “more prompt services,” we will add “remote service” to our maintenance service which is based on our global network.

### Remote Monitoring through our Global Network



## Remote service realized by rethinking premises

Maintenance service that requires a visit to the ship after equipment malfunctions takes time, and requests made from offshore require waiting for the ship to call at port. We have developed a system that enables remote monitoring and operation of the equipment with server security-enabled Internet communications. By continuously monitoring the condition of equipment, it is possible to identify and predict deterioration, adjust malfunctions remotely, and update programs at sea without visiting the vessel.

## “HermAce,” the key to remote service

HermAce is a Cyber Security and Remote Monitoring Platform that uses digital twin technology to remotely monitor the status of electronic equipment on board a vessel from shore while ensuring security on the vessel’s network. Data from Furuno’s navigation and communication equipment can be collected, distributed, notified, and monitored in real time, enabling prompt support of ships in operation from shore. HermAce can also deliver voyage equipment information, automatically update ENC charts, remotely update software, and even help reduce the time required for voyage data recorder (VDR) annual performance tests (APTs), depending on the customer’s needs.

### MESSAGE



Theodoros  
Katemidis  
Managing  
Director, FURUNO  
HELLAS S.A.



HermAce is a Cyber Security and Remote Monitoring Platform, which has been developed by Furuno Hellas\*1 with the support of FURUNO group companies in Japan, Norway and elsewhere. This system, which complies with E26/27 IACS\*2 requirements for cyber security, will be installed on all newly built vessels contracted after July 1st, 2024. It protects vessels against cyber-attacks but also offers a state-of-the-art monitoring tool for the shipping companies. Through HermAce, VDR remote APT is possible, while after sales support can provide an additional tool to Ship Owners for flawless operation of their Navigation / Communication equipment. The FURUNO HELLAS R&D team collects comments and requests from users of the system and works continuously on HermAce development. It is our goal to install HermAce on all FURUNO equipped vessels.

\*1 FURUNO HELLAS S.A.: FURUNO group company in Greece.

\*2 IACS UR E26/27: regulations for cyber security issued by IACS (International Association of Classification Societies)



- Real-time remote monitoring of voyage equipment status from shore
- Recommendation of consumable parts replacement timing based on predictive maintenance
- Check and update settings via remote access
- Automatic tabulation and reporting of voyage data
- Digitalized troubleshooting of Furuno’s technical expertise
- Reduce annual VDR inspection time
- Capable of acquiring navigational equipment information for safe navigation while ensuring security

### Acquired the world’s first “Digital Twin READY” certification of Lloyd’s Register.

As a “Digital Health Management Provider,” we provide HermAce which can reproduce the operating conditions of onboard equipment in the real world in a virtual space (Digital Twin) to detect, diagnose and predict minor changes in the equipment. We have been certified by Lloyd’s Register as a “Digital Health Management Provider” based on the system’s quality and reliability.

## For the prompt service to support continuous operation of our customers.



Kenichi Mori  
Executive Officer  
Marine Electric Products Division  
Service Management & Commanding Department General Manager

Marine equipment installed on vessels undergoes thorough quality control from design to production to ensure safe and reliable navigation, but breakdowns still occur. In many cases, these malfunctions were discovered at sea, and we had to wait for the vessel to call on a port to provide onboard services (investigation and repair). However, recent advances in communication technology have made it possible to monitor and investigate the condition of onboard equipment while the vessel is at sea, and even remotely operate and repair equipment from land. It has long been a dream of our customers and service staff alike to be able to respond quickly to malfunctions at any time and from anywhere. By combining our global network with remote services, we will provide services that never stop our customers’ operations. We are beginning our transformation toward a “proactive service” approach.

# 4

## Smart Manufacturing



As the only production base in Japan for our marine business, the Miki Factory has begun working toward the realization of a smart factory.

The Miki Plant is working toward the realization of “a plant that is flexible to change” and “a plant that integrates open production and sales.” Visualization and quantification of production activities has been completed in most parts of the factory, allowing us to visualize issues in the process and at the same time monitor whether the improvement activities implemented are effective, leading to continuous improvement, day after day.

### The initiatives to realize a “smart factory”

#### A factory where things flow

- Better planning cycle (needed parts at the needed time)
- 1/2 manufacturing lead time (hourly production planning)

#### Daily finished production

- Start and complete manufacturing as planned
- Ensure production capacity for sales requests

#### Sites where anomalies can be detected

- Clear visualization of abnormalities on site
- Progress understanding through automatic recognition technology

MESSAGE



Yoshihiro Kanba  
Marine Electronic  
Products Division  
MIKI Factory  
Smart Factory  
Construction  
Project Leader

We believe that the Smart Factory Construction Project has led to the current results. Through this project, we will strive to develop as many human resources as possible to identify such overall optimization and lead reforms, and we will further promote reforms.

### On-site visualization tool “MDOS”

The MDOS uses AI to extract human movement from video acquired by a 360° camera and box type camera, and automatically determines whether people are staying or moving. By linking this to a system that automatically obtains the number of man-hours worked, it is now possible to check what causes variations in the man-hours worked on a product.



Work environment filmed by camera on the ceiling



Improvement activities using MDOS

# 5

## To Land and New Fields

### Beyond DX to SX\*, for a sustainable construction industry

#### Construction Tech

Digitalizing analog operations will not only improve efficiency, but also increase labor productivity. We have launched a technology and service business to support a sustainable construction industry in the hope of contributing to the creation of an environment in which everyone can work with vigor and enthusiasm.

\*SX: Sustainable Transformation

#### Seeing what we wanted to see

FURUNO offers marine sensing technologies that *Challenge the Invisible*, but at construction sites, visual confirmation on site is still the norm. If information can be visualized without having to go on site, travel time and costs can be reduced. We are currently providing a “Wi-Fi system for construction sites” for communication infrastructure and a “Bluetooth remote monitoring system for workers and heavy machinery” as a visualization tool.

MESSAGE



Shotaro Ishino  
Research and  
Innovation Center  
Business Lab

FURUNO is becoming known in the construction industry, and our products and services are being used more frequently. We will continue make efforts toward the transformation of the industry.

---



Atsuhiko Yamamoto

I try to develop products with a focus on quality so that they can withstand the harsh environment of construction sites.

---



Shota Miyazaki

We are committed to making this service the industry standard by having it used at many sites.

### Case Studies and Products



#### Linear railroad site operations support

Wi-Fi system was introduced to a tunnel construction site, to improve work efficiency.



#### Expanded scope of support with Starlink

The Wi-Fi system can be installed where cell phones cannot connect and can be used at various sites (disaster recovery, etc).



#### Remote monitoring system for civil engineering sites

We provide access control and location information within a large site.

## Coexistence of safe and secure offshore wind power generation projects with the fishing industry

### Offshore wind power generation

Offshore wind power is expected to become a major source of renewable energy. FURUNO provides total support, from the provision of equipment for assessment prior to construction to the management of offshore areas after operation begins.

MESSAGE

Kiyoshi Furuno  
Executive Officer  
Marine Electronic  
Products Division  
Vice General  
Manager and  
Marketing Head  
Office General  
Manager

The offshore wind power generation market in Japan has seen a great deal of activity over the past year, with several offshore operators already confirmed and expected to continue expanding. FURUNO offers its customers "safe and secure offshore management" and "measures to coexist with the fishing industry," utilizing the technology and trust that we have cultivated since our founding to provide solutions that address both energy security and sustainable coastal fisheries.



Integrated management of 3,000 access points ACERA

Up to 127 units can be connected simultaneously. (per 1 access point ACERA)

## Comfortable life for everyone with wireless LAN

### Wireless LAN Access point

The Tsukuba city Board of Education has been working since the mid-2000s to create an ICT environment to enable classes using learning terminals. Currently, access points have been installed in regular and special classrooms, including gymnasiums, of about 750 classes in 45 schools in the city, and a network has been constructed.

\*From the Tsukuba City Board of Education case study on the Furuno Systems website.

## Improving quality of life

### Biochemical analyzers and reagents

With the world's population rapidly aging and medical disparities becoming a major issue, FURUNO is applying its technologies to the medical industry to create optimal specimen testing solutions, especially for medical institutions in developing and emerging countries.



Biochemical analyzer



Digital Terrestrial Television Transmitting Station

## For a Safe and Convenient Society

### Time synchronization

GNSS receivers for time synchronization provide time information comparable to atomic clocks using signals from satellites. FURUNO's high-precision time synchronization technology contributes to the operation and maintenance of critical infrastructure.

## Addressing the 2024 Logistics Issue

### FLOWVIS (Vehicle Access Control Service)

Vehicles are reliably identified by hybrid authentication that combines ETC authentication technology with camera-based vehicle number reading. The system also contributes to logistics DX as a solution to the 2024 problem facing the logistics industry by reducing truck drivers' waiting time for cargo by dispatching vehicles on premises according to berth conditions at each location.

