

January 5, 2023

Kawasaki Kisen Kaisha, Ltd.

Agreement for Research and Development of the “Safe Berthing/Unberthing Assist System”

~To improve safe ship operation and realize autonomous ships in the future~

Kawasaki Kisen Kaisha, Ltd. (“K” LINE), Kawasaki Kinkai Kisen, Ltd. (“K” LINE KINKAI), and Kawasaki Heavy Industries Co., Ltd. (KHI) have agreed to carry out the research and development of the “Safe Berthing/Unberthing Assist System” to enhance safety and efficiency of vessel maneuvering, berthing/unberthing, and mooring operations in ports.

The research and development aim to advance and improve safety and efficiency in berthing, Unberthing, including mooring by combining expertise from “K” LINE and “K” LINE KINKAI with advanced technologies from KHI.

Currently, safe berthing/unberthing operations in ports are ensured by well experienced and knowledgeable shipboard crew about characteristics of ship specific maneuvering and mooring equipment features. For further improvement of safety, this system incorporates the latest technologies, including AI, to assist in safe berthing/unberthing operations. It will be the first system in the world that provides integrated support for all necessary operations from maneuvering in port, berthing/unberthing, mooring including mooring line monitoring. We will install the system on domestic vessels operated by “K” LINE KINKAI as a testing ground for this research and development and establish this system by spring 2025.

“K” LINE group is currently working on the “K”-Assist Project (“K” LINE Autonomous Ship with Safe and Intelligent Supporting Technology), which aims to further enhance safe ship operations through the integration of expertise in safe operations and advanced technologies. “Safe Berthing/Unberthing Assist System” is one of the components of the project.

“K” LINE will continue research and development to improve safety even further by providing more sophisticated support for shipboard crew and reducing their workload, as well as to realize autonomous ships in the future.



(Overview of “Safe Berthing/Unberthing Assist System”)

**Improve safety in maneuvering and mooring operation,  
Reduce required skill and crew workload**

**① Maneuvering in port**

This system uses advanced ship motion prediction models and the latest sensing technologies, such as precise ship position plotting and distance measurement to provide highly accurate information related to ship motion prediction, such as future course, speed, and stop position for the ship's commander.

**② Berthing/Unberthing operation**

The information related to the ship's motion prediction will be added to KICS<sup>\*1</sup>, which is a DPS<sup>\*2</sup> manufactured by KHI, to optimize the automatic control of the ship's speed and motion that are affected by various external forces such as weather and sea conditions.

**③ Mooring Operation**

This system manages and controls propulsion machineries and mooring winches to support safe berthing /unberthing operations. In addition, this system aims to eliminate accidents involving human injury through monitoring and visualization of mooring operations by cameras and distinct sensors.

**④ Mooring Management**

A new system will be developed to detect the tensions and stresses exerted on the mooring lines and monitor them remotely from any location onboard in real-time. Thus, it enables the shipboard crew to check the condition of mooring lines frequently and with high accuracy, especially in ports with large tidal differences and in cases where the ship's draft changes quickly. This system aims to prevent various problems related to mooring lines and reduce crew workload by using the remote monitoring features.

Maneuvering Assistance	Integrated Support in Maneuvering / Mooring Operations	Mooring Management Assistance
<p><b>Display of ship motion prediction</b></p> <ul style="list-style-type: none"> <li>• Prediction of future ship's course</li> <li>• Prediction of stop position</li> </ul>	<p><b>Automated control of ship condition</b></p> <ul style="list-style-type: none"> <li>• Automatic maintenance of Ship's speed</li> <li>• Automatic maintenance of ship motion</li> </ul>	<p><b>Integrated control of machineries</b></p> <ul style="list-style-type: none"> <li>• Remote operation of mooring winches and monitoring safety</li> <li>• Integrated control of propulsion machineries and mooring winches</li> </ul>
<p><b>Monitoring tensions of mooring lines</b></p> <ul style="list-style-type: none"> <li>• Remote monitoring of tensions of mooring lines</li> <li>• Monitoring safety in mooring operation area</li> </ul>		

\*1 KICS® (Kawasaki Integrated Control System) is a system that can comprehensively control multiple steering elements such as controllable pitch propeller, swivel thruster, side thruster, and rudder.

\*2 DPS (Dynamic Positioning System) is a system that maintains the vessel's planned position and heading by automatically controlling the vessel's propulsion system and rudder. It features real-time monitoring of the vessel's position through GPS or other position-measuring devices.

(For reference: <https://www.khi.co.jp/mobility/marine/machinery/kics.html>)