

Monday, September 27, 2023

MITSUI-SOKO Co., Ltd.  
Hitachi, Ltd.  
MITSUI E&S Co., Ltd.

**MITSUI-SOKO, Hitachi, and MITSUI E&S  
develop technology to improve terminal operations efficiency by  
AI-based planning for container placement and  
cargo handling procedures at ports**

*Entrusted by the Ministry of Land, Infrastructure, Transport and Tourism*

MITSUI-SOKO Co., Ltd., Hitachi, Ltd., and MITSUI E&S Co., Ltd. have been entrusted by the Ministry of Land, Infrastructure, Transport and Tourism to conduct technology development work\*<sup>1</sup> (hereinafter, the "Technology Development") under the Port Technology Development Program for FY2023\*<sup>2</sup>, to develop technologies to improve the efficiency of terminal operations by AI-based planning for container placement and cargo handling\*<sup>3</sup> procedures at ports and harbors. In this Technology Development, while leveraging MITSUI-SOKO's expertise in container terminal operations, based on data on the characteristics of container cargo and other factors, Hitachi's AI will predict the container delivery date and formulate plans for container placement and cargo handling procedures. The efficiency of these plans will then be verified and evaluated using a cargo handling simulator developed by MITSUI E&S.

The three companies plan to continue this Technology Development until 2025, after which they will promote practical application and introduction support, mainly for ports in Japan.

\*1 Promoting technology development to improve productivity and the working environment at ports and harbors!  
- Establishment of the "Port Technology Development Program" and the start of the open call -  
[https://www.mlit.go.jp/report/press/port02\\_hh\\_000168.html](https://www.mlit.go.jp/report/press/port02_hh_000168.html)

\*2 Port Technology Development Program: FY2023 Open Call Selection Results  
[https://www.mlit.go.jp/kowan/kowan\\_tk2\\_000075.html](https://www.mlit.go.jp/kowan/kowan_tk2_000075.html)

\*3 Cargo handling: Activities carried out in ports that involve the loading and unloading of cargo.

## 1. Background and Objectives

Sea freight transport accounts for 99.5% (in tons (t) as of 2021) of Japan's international trade volume. As a node of sea and land transportation, ports and harbors are an important part of the social infrastructure for trade and economic activities. When unloading and arranging containers from vessels at Japanese ports, containers tend to be stacked high in order to effectively utilize the limited land area. Generally, in order to minimize the amount of rehandling\*<sup>4</sup>, containers with early unloading timing are placed on the upper level whereas containers expected to stay longer are placed on the lower level.

Currently, planning for container placement and cargo handling procedures at ports and harbors is based on the experience and knowledge of skilled planners (hereinafter, the "Planners"). However, in order to cope with the increasing complexity of planning due to the growing cargo volume and ever-changing container cargo information, further advancement of work planning using digital technology is required.

\*4 Rehandling: Moving a container from one location to another, such as the container above it, for loading/unloading of a certain container.

## 2. Overview of this Technology Development

- 1) Based on various TOS<sup>\*5</sup> data, AI will be used to predict the container unloading date, and based on this, optimal plans for placement and work procedure will be formulated.
- 2) Based on the drafted plan, cargo handling operations will be performed in a virtual space using a cargo handling simulator which is to be developed in parallel. Quantitative evaluation of efficiency, such as reductions in the number of rehandling and waiting time for yard trailers, will be performed. Furthermore, based on the evaluation, the parameters of the AI will be changed to improve the accuracy of the plans.

\*5 TOS (Terminal Operation System): A generic name for information systems used to manage shipment and cargo handling operations at ports.

## 3. Role of Each Company in this Technology Development

Leveraging their Lumada<sup>\*6</sup> solutions, Hitachi provides multiple AI and mathematical optimization technologies to predict container unloading date and plan container placement and cargo handling procedures; develops software to link the formulated plans with a cargo handling simulator; and plays the role of the representative.

MITSUI E&S is the owner of products and technologies that make up CTMS<sup>®\*7</sup>, which holds the largest share in the domestic TOS market, as well as automated container terminals. The company offers services related to TOS function modification and cargo handling simulation for container cargo handling.

MITSUI-SOKO, which has long cultivated expertise in the operations of container terminals at major ports in Japan, accumulates and provides a wealth of experience and knowledge of the Planners, demonstration sites, and data that will contribute to this Technology Development.

\*6 Lumada: A generic name for solutions, services, and technologies that leverage Hitachi's advanced digital technologies to create value from customers' data and accelerate digital innovation.

<https://www.hitachi.com/products/it/lumada/global/en/index.html>

\*7 CTMS (Container Terminal Management System): A product name of TOS provided by MITSUI E&S with a registered trademark in Japan.

[About MITSUI-SOKO]

MITSUI-SOKO is a core operating company representing the MITSUI-SOKO Group that provides end-to-end integrated logistics solutions with its highly specialized and all-round logistics functions. With three business divisions—warehousing, port transport, and overseas logistics—we help our customers optimize their logistics operations.

One of its ancestral businesses, the port transport business, is the operation of container terminals at major ports in Japan, which are the nexus between sea and land. We will continue to evolve this traditional business, which has supported the history of the MITSUI-SOKO Group for more than 100 years, and will continue to play a role as an important infrastructure that supports the economy and people's lives.

For more information on MITSUI-SOKO, click [here](#).

## [About Hitachi]

Hitachi is promoting the social innovation business, which uses data and technology to realize a sustainable society. We are working to solve customers' and society's problems through Lumada solutions that utilize IT (information technology), OT (operational technology), and products under the business structures: Digital Systems & Services to support customers' DX; Green Energy & Mobility to help realize a decarbonized society through energy and railroad; and Connective Industries to provide solutions by digitally connecting products in a wide range of industries. Driven by digital, green, and innovation, we aim to grow through co-creation with customers. In the fiscal year ending March 31, 2023, consolidated revenues totaled 10,881.1 billion yen. As of the same date, Hitachi had 696 consolidated subsidiaries and employed approximately 320,000 individuals worldwide.

For more information on Hitachi, click [here](#).

## [About MITSUI E&amp;S]

On April 1, 2023, Mitsui E&S Holdings Co., Ltd. dissolved its pure holding company structure and started anew as an operating holding company under the name of MITSUI E&S Co., Ltd. With the Mission—We build trust and contribute to society through our engineering and services—the company aims to realize a decarbonized society and solve the problems of a shrinking population society in the marine domain, such as port logistics and marine propulsion. MITSUI E&S will further develop its core businesses of port cranes and marine engines, which boasts the top market share in Japan, each from both a green and a digital angle. We also aim to be an engineering supplier that can provide comprehensive services that include peripheral equipment and systems, rather than just products.

For more information on MITSUI E&S, click [here](#).

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## [For inquires]

(Matters related to the container terminal operations)

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(Matters related to the Technology Development in general and AI systems)

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(Matters related to the container terminal cargo handling equipment, TOS, and simulator)

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