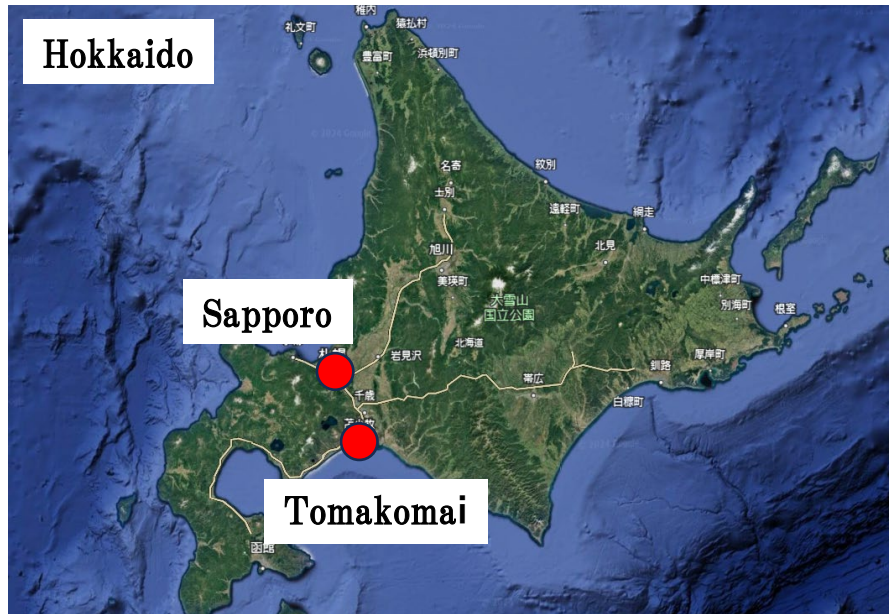


Enhancing Yard Trailer Operations within a Container Terminal

Tomakomai Kuribayashi Unyu Co., Ltd.



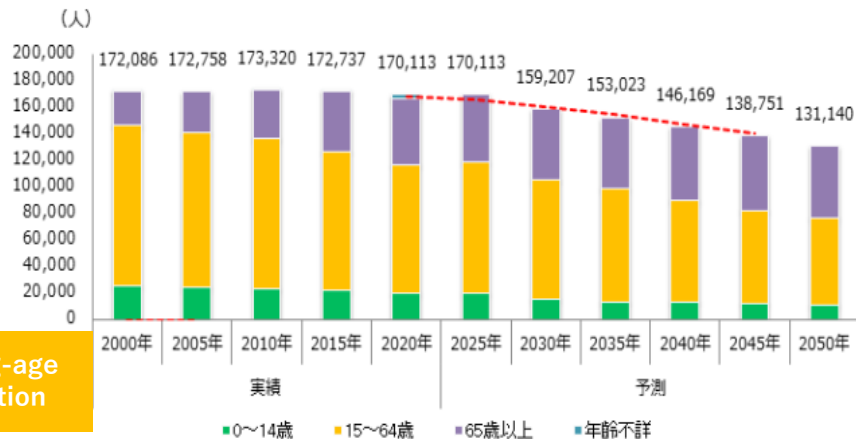
About Tomakomai Port



Tomakomai Port is located in the southwest part of Hokkaido, about 60 km south of Sapporo.

The port handles approximately 100 million tons of cargo annually, supporting Hokkaido's economy.

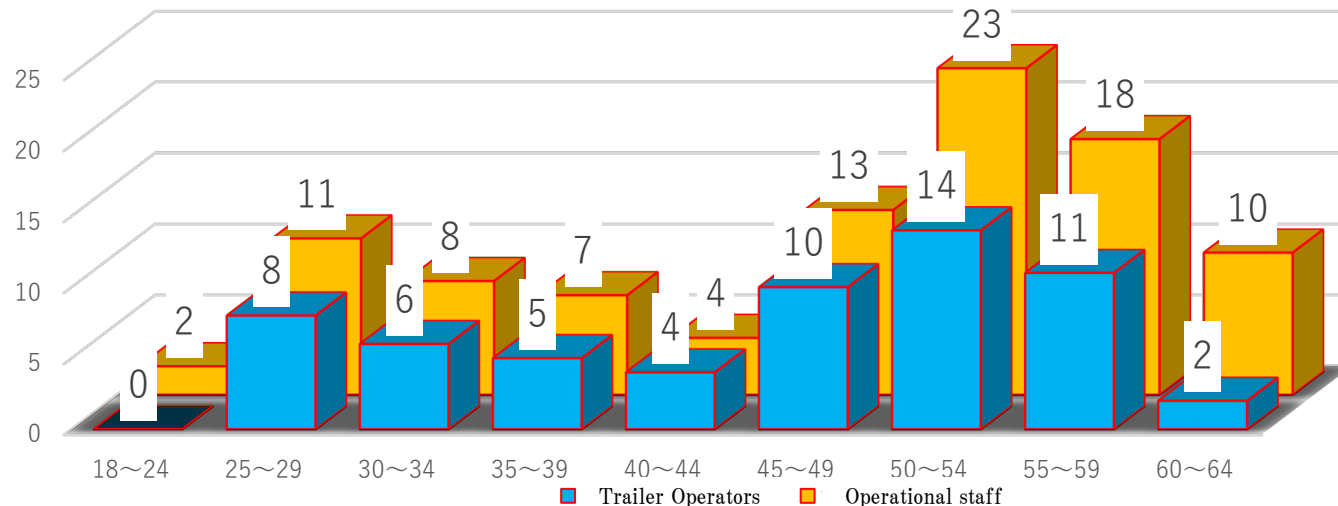
The population of Tomakomai City is 167,280 in 2023, but it has been on a declining trend since peaking around 2010. Also, the working-age population (ages 15–64) is expected to decrease significantly from the current approximately 96,000 people. If this trend continues, it is predicted that the population will drop to around 131,000 by 2050, and the average age is expected to rise from 48.1 years in 2020 to 54.8 years.



Why did we proceed with this development?

Our goal was not to develop autonomous driving.

Age distribution of operational staff (as of April 2024)



Workers aged 45 and older account for more than 60% of the total workforce, including both general staff and those holding towing licenses.



Challenges Facing Regional Ports



- Driver shortage
- Aging workforce
- Safety
- Working conditions
- Difficulty recruiting young workers



Currently, many drivers stop working as tractor-head drivers once they reach around 55 years of age. The reasons for this include difficulty reading paper-based work instructions and a decline in concentration due to long working hours.

By resolving these issues and improving working conditions, we aim to enable older workers to continue working.



How could a regional port develop this technology?

As a small to medium-sized enterprise operating at a regional port, we have limited resources for technology development.

Furthermore, we do not have the technical expertise to develop such a system independently.

Our idea was to develop a tractor head equipped with driver assistance functions.

Through the Ministry of Land, Infrastructure, Transport and Tourism's Port Technology Development Program, we were able to collaborate with Hino Motors, Ltd. and MITSUI E&S Co., Ltd.

Lead Organization for Technology Development



Tomakomai Kuribayashi Unyu Co., Ltd.

Organization Responsible for Technology Development



Hino Motors, Ltd.



MITSUI E&S Co., Ltd



Development Concept

1. No Major Infrastructure Modifications.

Use the existing TOS, yard, RTGs, and GCs as they are.

2. Utilize Existing Vehicles

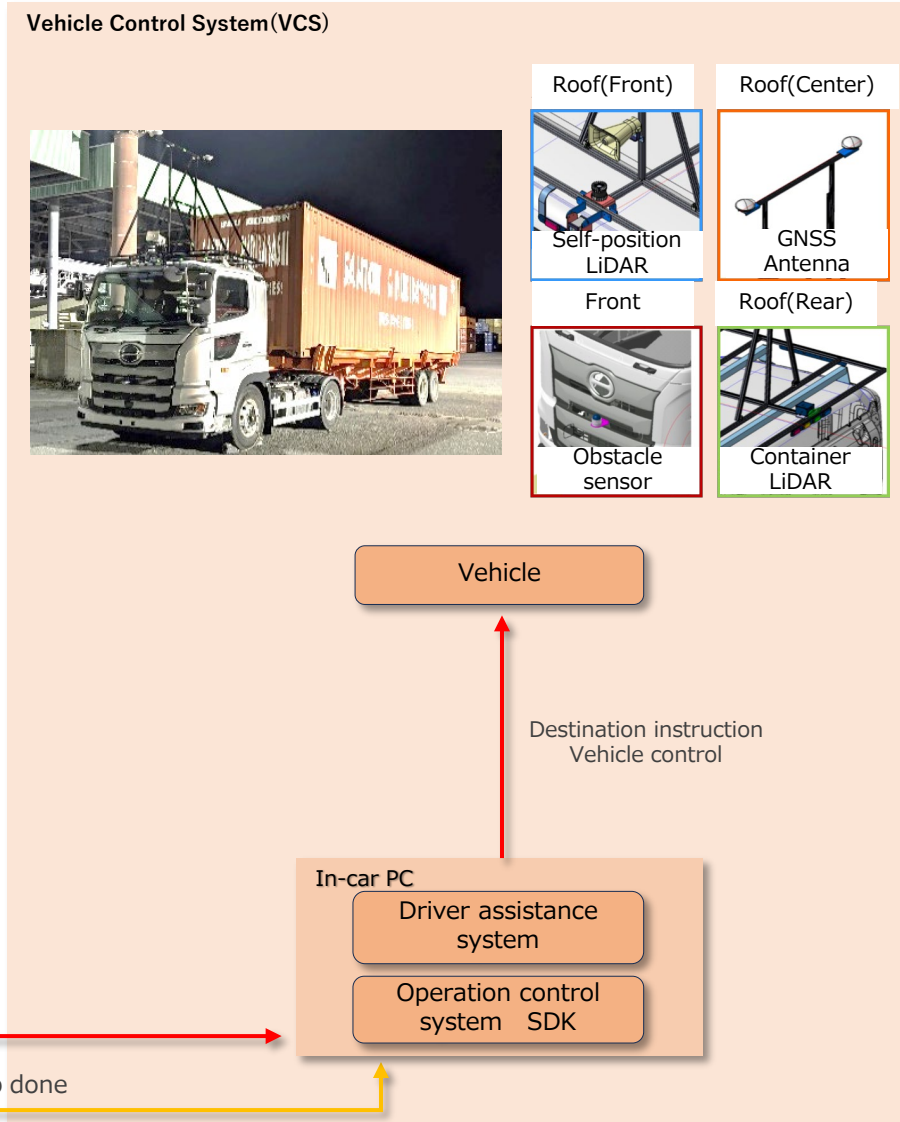
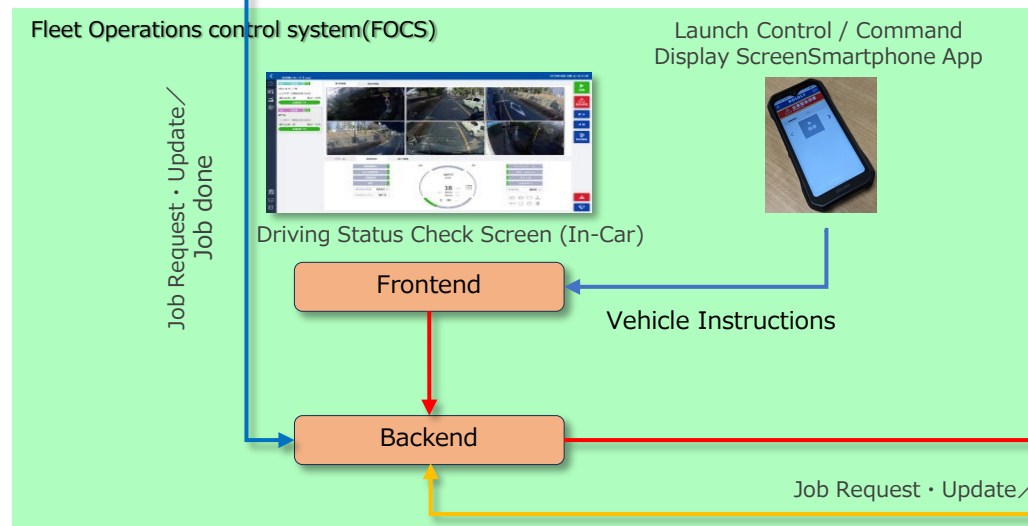
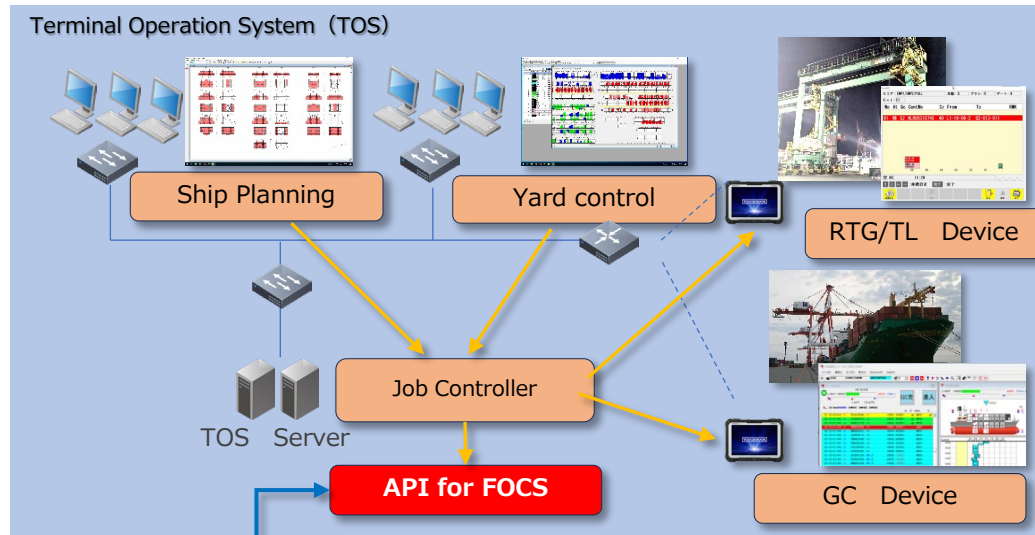
Modify existing tractor heads instead of developing new vehicles.

3. Support People, Not Replace Them

Driver assistance allows operators to focus more on safety.



System Configuration



Technical points

TOS integration

Paper instructions $\Rightarrow$ Data integration



Self-position estimation

GNSS+SLAM



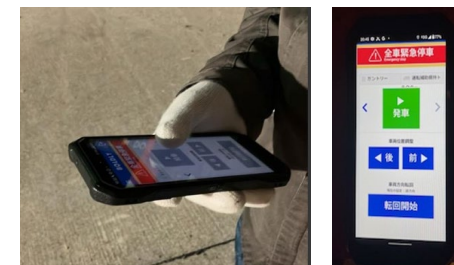
Stopping accuracy

± 120 mm stopping accuracy under GCs and ultra-low-speed control



Worker UI

Fine forward and backward adjustment



令和7年度 コンテナヤード内横持トレーラー運行の高度化に関する技術開発

実証走行試験

(2025年8月・9月・10月)

苫小牧栗林運輸株式会社
日野自動車株式会社
株式会社三井E & S



Verification results

We did test runs on January 13 and October 3, 2025.

First Test – Challenges in Snowy Conditions



In January, the vehicle sometimes recognized snow as an obstacle. This was a very important finding for us. Snow was not just a problem. It was valuable test data.

Second Test – Successful Verification



The October test was successfully completed, with good results in both vehicle operation and stopping accuracy.

We hosted around 50 groups, totaling about 120 people, over the course of a year.



Future Development

Regional ports need practical and affordable automation.

Our goal was to develop a practical driver assistance system for regional ports by modifying existing vehicles and integrating existing systems, without major infrastructure changes.

In this test, we only ran one vehicle, but moving forward, we plan to develop a system for monitoring multiple vehicles and tracking their positions, aiming to implement it by fiscal 2028.



Conclusion

We did not start by asking,
"How can we automate the terminal?"
We asked,
"How can regional ports use advanced technology realistically?"
Don't change the terminal.
Don't build a completely new vehicle.
Don't remove the driver.
Technology should support people, not replace them.

Finally, I would like to express my sincere appreciation to the Ministry of Land, Infrastructure, Transport and Tourism for its support of this project, and to everyone who has contributed to this development.
Thank you very much for your attention.

