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IRSC 2025

Advancing Railway Safety through Innovations and Collaborations

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As railway automation advances and multi-functioning workforce is promoted, how can we create safe and punctual rail transport?

Makoto Kato
EAST JAPAN RAILWAY WORKER'S UNION

1 ・Introduction

○Safe and punctual transportation is the advantage of Japanese railways

【Punctuality】

- "On-time performance rate" of 90% or more
- JR East (conventional lines) average annual delay of 48 seconds

【Maintain operation as much as possible even in abnormal situations】

- Additional windbreak fences installed in preparation for strong winds
- In preparation for a major earthquake, we have implemented earthquake-resistance reinforcement measures.

It has played a role as a social infrastructure

1 · Introduction

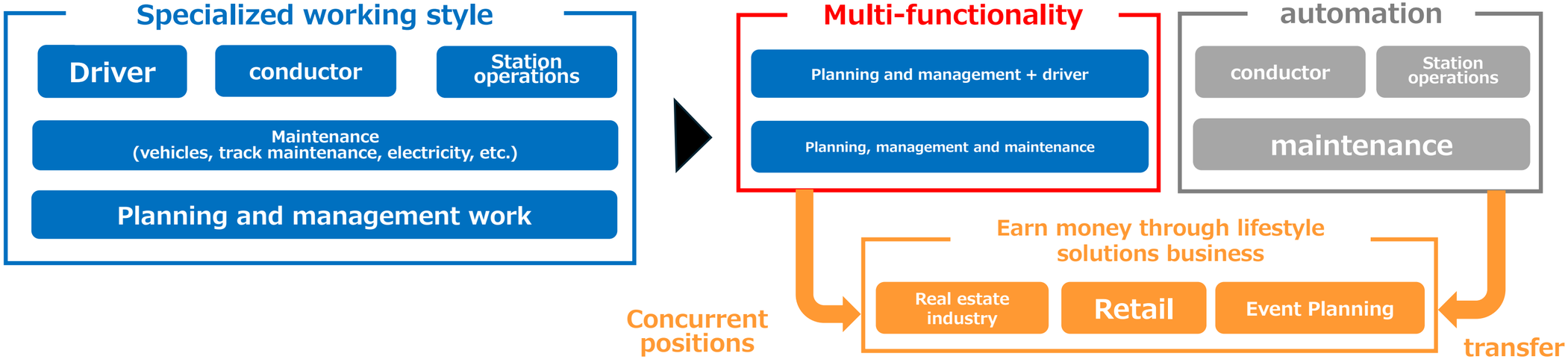
○Shift from railway business-based management : Labor-saving through the promotion of automation

【Present: Rapid population decline】

- Due to a decrease in users, railway revenue growth cannot be expected
- Difficulty in securing employees to maintain the railway

【Future: Two-pronged business of railways and lifestyle solutions】

- Since railways alone are not profitable, we are strengthening our "lifestyle solutions" business, including real estate and retail.



A policy to promote versatility through "fusion and collaboration"

1 · Introduction

○Advances in autonomous driving

【bullet train…Towards driverless driving】

- 2028: Autonomous driving (with driver on board)
- 2029: Driverless operation (deadheading trains)
- 2030: Driverless operation (commercial trains)

【conventional lines…From one-person operation to driverless operation】

- 2025: Start of one-person operation on extremely crowded routes
- 2030: Start of one-person operation with 11-car trains
- 2035: Driverless operation begins on conventional lines

Joetsu Shinkansen
ATO enables fully automated operation from departure to stopping. The aim is to achieve driverless operation without a train attendant at the front of the train.

Nambu Line
(very congested line)
Acceleration and braking are controlled by the driver. Automatic operation is performed only when the train is stopped using the TASC (Train Stop System).

Yamanote Line (11-car train)
ATO allows for fully automated driving from departure to stopping. Driverless driving is planned for the future.

2 ・Frequent transport disruptions and train delays

○Long-term suspension of Shinkansen services and regular train delays on conventional lines

【Problems with one-person operation on the Nambu Line】

Problem① Door opening and closing time lag

- ▶ It takes time to coordinate the driver's cab door opening and closing system with the station's platform door system.
- ▶ After the train stops at a station, there is a 6-second time lag before the doors open.
  This cumulative trend has led to train delays of more than 10 minutes becoming the norm

Problem ② Door opening/closing switches can easily increase fatigue of the driver

- ▶ To shorten the time required for the Nambu Line's renovation, a door open/close switch function was added to the driver's cab touch panel.
- ▶ You have to be careful not to press a wrong button, which increases the mental fatigue from operating the door.

A touch panel with a door open/close switch function is installed in the driver's cab of the Nambu Line. The modification work took less time than installing a physical switch, but the panel is difficult to use.

3 ・Automation and multi-functioning lead to neglect of labor

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○Multi-functioning leads to increased administrator errors

① An incident in which operation was prioritized over safety

▶ The manager, who also serves as the conductor, was on duty while talking on his cell phone and checking the safety of the train when it arrived at the station (and reporting the problem to the control room).

▶ A manager who works at multiple stations was in charge of watching over trains without being familiar with the rules when igniting the snow melting device on a switch. He did not notice an approaching train and was almost run over.

Because of the large amount of work involved, the mindset of "I want to finish my work on schedule"
→When people are responsible for multiple functions, safety tends to become secondary, with people thinking things like, "It's okay if it's just a little bit."

3 ・Automation and multi-functioning lead to neglect of labor

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○Multi-functionality leads to increased administrator errors

② Incidents in which excessive stress led to aggression towards staff

▶ During re-education for a driver who made a mistake, the manager in charge of training made remarks that could be perceived as power abuse (although the remarks were deemed to be "passionate and appropriate training").

▶ When an experienced staff member at the station pointed out something to an inexperienced manager who had come from another station, the manager became enraged.

Blaming staff members will discourage them and prevent them from working as a team in an emergency.
→Even if you are responsible for multiple functions, you need to make sure you don't become stressed!

4 · summary

○Recommendations for promoting railway automation and multi-functionality

Recommendations①

When mechanizing, it is necessary to assume that machines will break down and to secure sufficient spare parts and establish a stable system for sharing parts.

- Eliminate transportation disruptions caused by "aging vehicles that cannot be repaired due to a lack of spare parts“

- For "fragile parts," keep plenty of spare parts on hand.
(Example: Touch panel for operating doors on the Nambu Line when trains are operated by one person)

- Shifting railway parts production from "high-mix, low-volume production" to "low-mix, mass production" and creating a system that allows parts manufacturers to ensure stable supply

As the touch panel in the driver's cab ages, problems such as "not responding to touches in cold winters" have occurred. The touch panel on the Nambu Line is expected to deteriorate faster than on other lines because it is touched every time the door is opened or closed.

4 · summary

○Recommendations for promoting railway automation and multi-functionality

Recommendations ②

When mechanizing, the design must take into account "human characteristics."

- Prioritizing cost over usability increases the burden on train crews and inconveniences passengers in the form of train delays.
- When designing, the structure should be intuitive and easy for humans to operate. Active communications between users, designers, and management are necessary.

Example of another line (Tsurumi Line)

Physical door switches are located independently for the left and right doors, making it difficult to operate them correctly.

4 · summary

○Recommendations for promoting railway automation and multi-functionality

Recommendations③

In preparation for machine break-downs, provide sufficient education and training so that workers can properly handle the equipment in the way they did before it was mechanized.

- Even if mechanization and automation allow humans to do different jobs, when machines break down, we still have to rely on human knowledge, skills, and judgment.

The Disney Resort Line (monorail) is usually operated automatically, but occasionally operated manually to maintain the driver's skills.

4 · summary

○Recommendations for promoting railway automation and multi-functionality

Recommendations ④

Even with multi-functionality, education and training must be enhanced so that employees understand the "line that must never be crossed."

- When people work in multiple functions, their knowledge of each job becomes weaker. However, in order to ensure safety, there is a line that must never be crossed.
- Education and training are important so that people can "err on the safe side when in doubt."

4 · summary

○Recommendations for promoting railway automation and multi-functionality

Recommendations ⑤

Ensure that multi-functionality does not increase employee stress.

- The increased workload caused by multi-functionality can lead to increased stress and the risk of communications between managers and staff becoming less smooth.
- Simplifying work to the extent that it does not affect safety and preventing long working hours will help maintain good communications between managers and staff.

5 · Conclusion

○If there is no warmth between machines and humans, the machines will not function properly.

- The words of the late Akira Matsuzaki, chairman of the EAST JAPAN RAILWAY WORKER'S UNION at the time he launched the International Railway Safety Conference
- A perspective that is important now that mechanization and automation are progressing

With safety and workplace first as our number one priority, we will propose and implement safe railway construction based on our safety philosophy of "moving from blame to cause investigation."

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