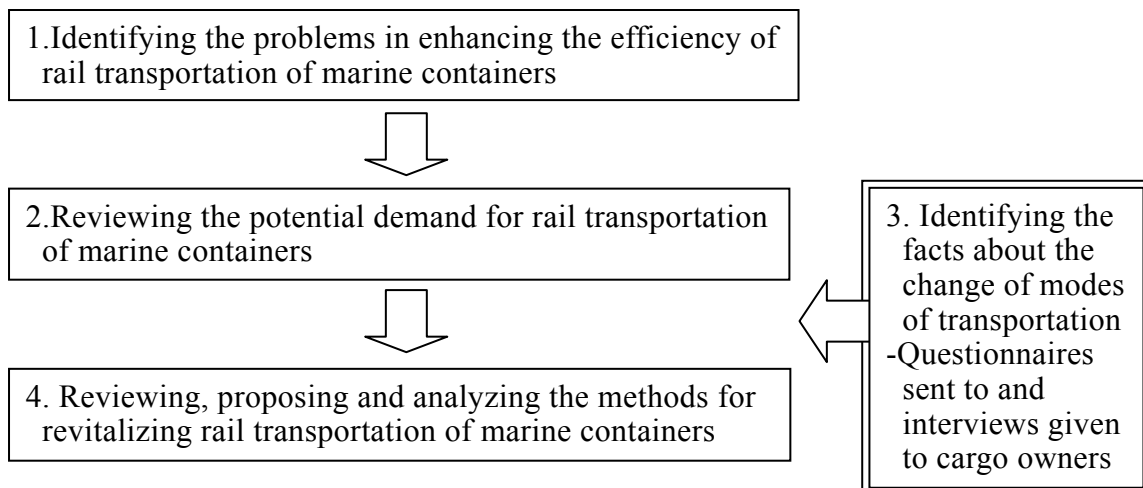


Fiscal 2006 study on the methods for enhancing the functions of the ports in the Tokyo and Yokohama areas by using information technology for ports and optimally locating port facilities (Rail transportation)

[Abstract]

Major Japanese ports have been seeing their competitive positions deteriorating while other ports in the Asian region have been growing remarkably. Strengthening their functions as "hub ports" with international competitiveness is required. Enhancing international competitiveness of the ports in the Tokyo and Yokohama areas, which handle approximately 40% of container cargoes in Japan in particular, is important. To that end, enhancing the capacity of goods transportation from the hinterland to the ports in the Tokyo and Yokohama areas and shifting to efficient means of transportation imposing smaller loads on the environment are required. In this study, the measures to enhance the efficiency of rail transportation of marine containers in the ports in the Tokyo and Yokohama areas were examined.

1 Study items



2 Study methods

- (1) The need and problems of rail transportation of marine containers were examined and requirements were identified.
- (2) The results of the "national survey of imported and exported containerized cargoes for fiscal 2003" were used to analyze and evaluate the state of and the potential demand for marine containers leaving or arriving in the areas around major freight stations capable of handling marine containers in the hinterland of the ports in the Tokyo and Yokohama areas (e.g. Sendaiko, Akita-freight and Utsunomiya-cargo-terminal Stations).
- (3) A questionnaire was sent to cargo owners in the areas referred to in (2) above to identify their need for rail transportation of marine containers. Operators that are highly interested in rail transportation and likely to change the mode of transportation were interviewed to learn the conditions for changing the mode of transportation.

(4) Methods were proposed to effectively deploy and use facilities for revitalizing the rail transportation of marine containers based on (1) through (3) above, and the effects were examined.

(5) Verification tests for revitalizing the rail transportation of marine containers at waterfront railway freight stations were planned and implemented and the effects of implementation were evaluated.

3 Results of study

(1) Identifying the problems in enhancing the efficiency of rail transportation of marine containers

The need for rail transportation of marine containers were identified from three viewpoints based on the existing data and the results of interviews given to stakeholders.

1) Environmental regulations, guarantee of transport safety and changes in number of truckload carriers

- Study of measures to appropriately lead the operators to rail transportation, and wider use of rail transportation
- Enhancement of transportation safety through safety inspection and repair and improvement
- Enhancement of efficiency of loading and unloading at freight stations, enhancement of drayage efficiency and refinement of transport services to meet the needs of cargo owners

2) Enhancement of cargo consolidation efficiency and convenience at freight stations

- Facilities improvements at freight stations such as the installation of additional marine container handling equipment and the extension of container yards
- Use of more "KOKI200" freight cars and improvements of comprehensive physical distribution functions at freight stations
- Efficient transshipment through integrated use of freight and ordinary railway stations, and securing of drayage points between freight station and container terminal

3) Partnership with other types of operators (e.g. cargo owners, forwarders, shipping agents, harbor transport businesses and land transport businesses)

- Identification of cargo owners' needs and demand, and the improvement of facilities and systems for transporting loaded import and export containers in the station
- Positioning of vacant containers, guarantee of profitability and discovery of new cargo owners to reduce unidirectional cargo transport
- Review of global inter-modal transport system using marine containers

(2) Reviewing the potential demand for rail transportation of marine containers

The potential demand for rail transportation of marine containers was estimated in the cargo collection zones within 25 m and 50 km of Sendaiko, Akita-freight Station and Utsunomiya-cargo-terminal Station in the hinterland of ports in the Tokyo and Yokohama areas based on the results of the "national survey of imported and exported containerized cargoes for fiscal 2003" and the responses to a questionnaire distributed to cargo owners.

Demand was also estimated based on the results of interviews given to the cargo owners in the hinterland of Sendaiko Port. As a result, demand of 17 TEU/day was estimated in addition to the present daily cargo transport of 34 TEU. The estimated demand is equivalent to approximately 10% of total volume of cargoes transported from the hinterland of Sendaiko Port to the ports in the Tokyo and Yokohama areas that was identified in the national survey of imported and exported containerized cargoes. The total demand (iii) in Figure 1 is equivalent to the potential demand in the case where 50% of cargo owners changed the mode of transport to rail.

A comparison was made in potential demand for rail transportation from the areas around the three major freight stations to the ports in the Tokyo and Yokohama areas.

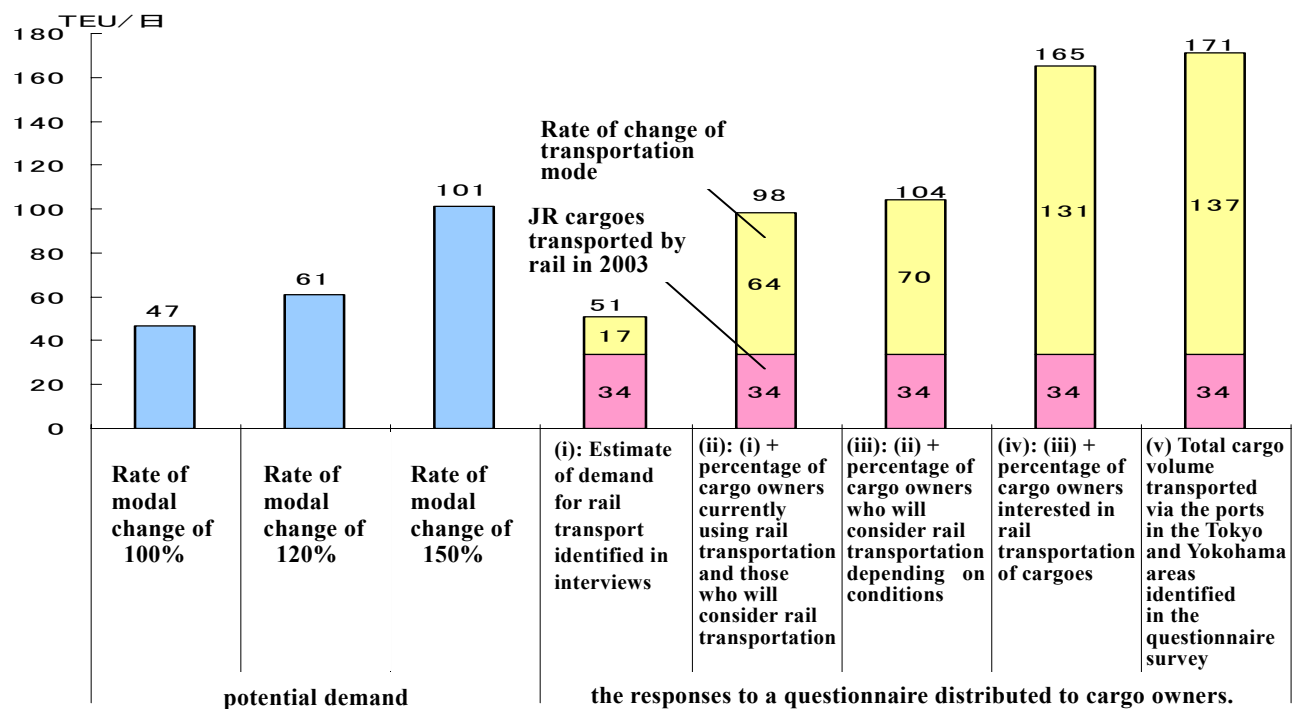


Figure 1 Demand (Sendai Port)

1) In the area around Sendai-ko Station, it was confirmed that the demand for rail transport at a rate of modal change of 10% was nearly equal to the demand estimated in the interview. Then, an annual demand of 15,000 TEU at a rate of modal change of 10% was regarded as a relatively reliable estimate of potential demand.

2) In the area around Akita-freight Station, only a few responses were received to the questionnaire and no cargo owners were interviewed. No demand was therefore confirmed. The potential demand was assumed to

be 1,000 TEU, the level where 20% of cargo owners changed the means of transport to rail, in view of the volume of cargoes actually transported (one TEU/day on an annual basis as data only in May and thereafter were available) and the response of cargo owners who wished to consider rail transportation.

3) In the area around Utsunomiya-cargo-terminal Station, no cargo owners were interviewed and no demand was confirmed. The volume of cargoes actually transported reached 5,400 TEU in fiscal 2005, 1.35 times higher than in fiscal 2003. A demand of 22 TEU/day, 1.7 times greater than 13 TEU/day actually transported in fiscal 2005, or 9,000 TEU per year, was assumed to be the potential demand in view of 9 TEU/day (JR containers) based on the response to the questionnaire stating "currently using rail transportation".

A combined total of 25,000 TEU in the three areas is equal to 25,000 TEU/year, outcome of the share of containers transported along the feeder using the ports in the Tokyo and Yokohama areas in 2015 specified in fiscal 2005 by the Kanto Regional Development Bureau.

The potential demand for rail transportation was assumed to be highest where approximately 30% of cargo owners changed to rail transportation in view of the considerable interest in the transportation mode.

(3) Questionnaire and interview concerning the facts about the change of modes of transportation

Responses to questionnaire distributed to cargo owners around Sendaiko, Akita-freight and Utsunomiya-cargo-terminal Stations

- The percentage of cargo owners in the hinterland of Sendaiko Station who wished to consider rail transportation unconditionally or under certain conditions was 29.4%. The percentage of cargo owners around Utsunomiya-cargo-terminal Station who wished to consider rail transportation under certain conditions was 30.2% but none in the area wished to consider changing the means of transport unconditionally.
- When selecting the means of transport, cost reduction, transport time reduction, transport at fixed time and damage to cargoes were considered important in the descending order of importance.
- A high percentage of 45.5% of cargo owners were interested in rail transportation in the three areas. The percentage was 49.1% in the area around Utsunomiya-cargo-terminal Station.

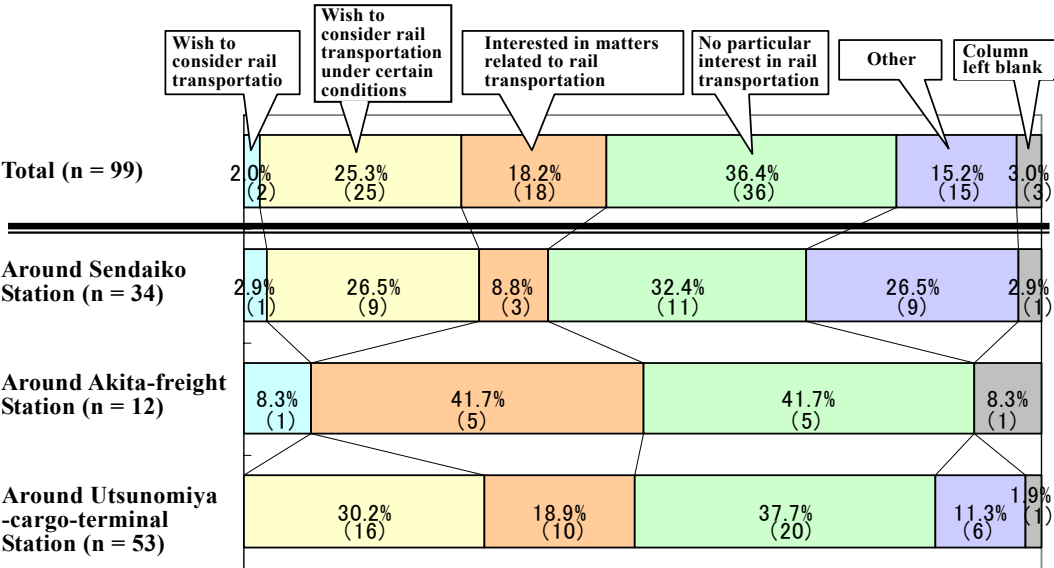


Figure 2 Interest in rail transportation

- Approximately 90% of cargo owners in the three areas were aware of the means of transport.
- The percentage of cargo owners who determine the means of transport to the port by themselves was 47.5% in the three areas and the percentage of those who had the forwarder or other operator select the means of transport was 46.5%. Nearly half of the cargo owners in the areas had others determine the means of transport.

Results of interviews of cargo owners around Sendaiko Station

- Low cost: This is the condition that the largest number of respondents wanted. Rail transportation of refrigerated containers is less costly than truck transportation. The cost of rail transportation is lower than the cost of feeder service from the ports in the Tokyo and Yokohama areas to Sendai Port in transshipment. Rail is the cheapest means of transportation. Reducing the waterfront drayage cost to compensate for the increase of JR cargo transportation cost is required.
- Shorter lead time: Rail transportation needs shorter lead time than transshipment via Sendai Port.
- Quality control during transport: Temperature should be kept constant during refrigerated transport of fresh food (fish) and the cargo should be free from any damage. Difficulties were once involved in finding refrigerated trucks for transporting fresh food to Shimonoseki for export to Korea.
- Bonded transport and packing and unpacking of containers: It should be made possible to put fresh fish for export into containers in a certain period of time. Bonded transport should also be made possible.

(4) Reviewing, proposing and analyzing the methods for revitalizing rail transportation of marine containers

In order to revitalize rail transportation, methods were classified and examined based on (1) through (3) above for implementing practicable measures in stages to efficiently locate and use facilities while estimating the demand.

1) Measures using existing facilities and rules

Practicable and urgent measures to actualize potential demand for rail transportation to meet severer environmental regulations and use the benefits of rail transportation such as transportation at fixed time, mass transport, prevention of damage to cargoes and safety.

Measure 1 Improving waterfront drayage

- Reduction of time required for railway vehicles carrying marine containers to pass the container terminal (CT) gate by giving priority to the vehicles when entering the CT.
- Reduction of picking time and enhancement of the rate of recycling drays by storing containers at a designated location that are scheduled to be transported by rail.

Measure 2 Improving and enhancing common depot/chassis pool in the wharf area

- Elimination of congestion in the wharf area and reduction of lead time by using common depot/chassis pool.
- Enhancement of efficiency of truck trackers operation by temporarily storing cargoes in the common

depot/chassis pool.

Measure 3 Eliminating unidirectional transport of containers

-Elimination of unidirectional transport of containers and stimulation of demand for export by installing and using inland depot and matching import containers with export containers to use vacant containers.

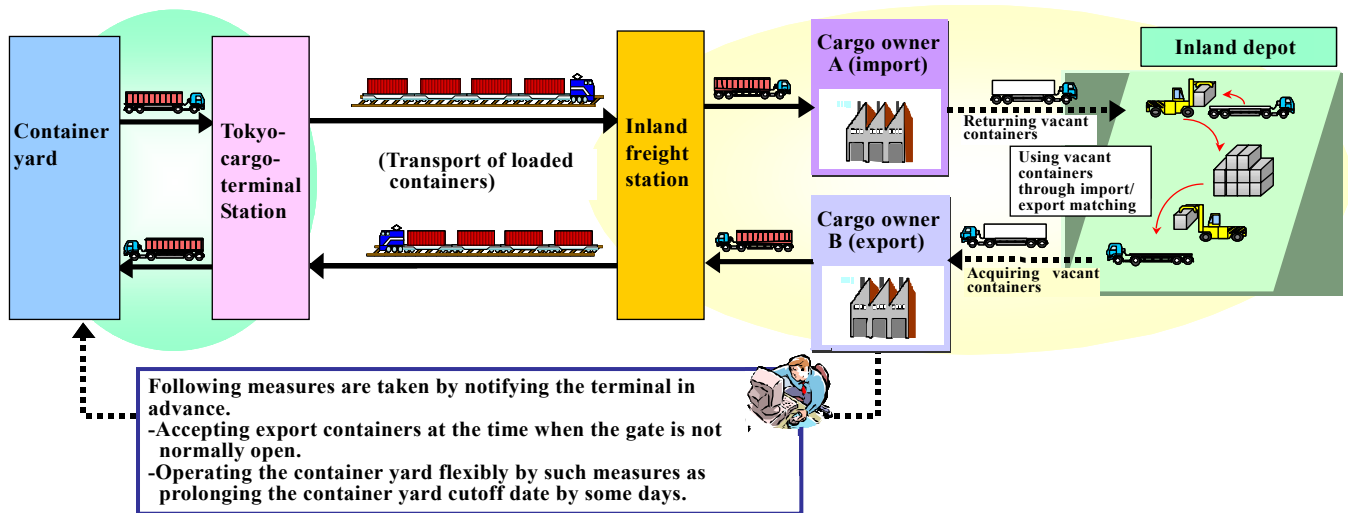


Figure 3 Use of vacant containers through import/export matching and flexible use of container terminal

-Increase of the volume of rail transport by meeting the needs of owners such as the delivery to container terminal overtime and a review of train diagram.

Measure 4 Using inland depot fit for rail transportation

-Reduction of drayage of containers by improving the functions of inland depot installed adjacent to the rail freight station.

-Acceleration of customs clearance procedure, elimination of transport of non-fully loaded containers and provision of services for low-volume cargo owners by improving the functions of inland depot.

Measure 5 Revitalizing transportation by using existing routes

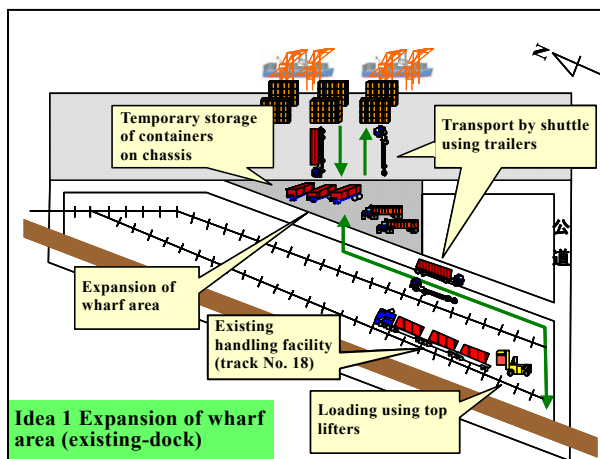
-Enhancement of transport capacity and reduction of transport cost by using freight cars exclusively for marine containers (*KOKI200*).

2) Measures involving the installation of new facilities and their effects

The ultimate goal is to install a system for loading and unloading marine containers on the dock by laying a freight line into the container yard. At present, however, no such system has yet been installed in the ports in the Tokyo and Yokohama areas because of numerous problems. Then, four ideas were examined for improving rail transportation between Tokyo-cargo-terminal Station and Utsunomiya-cargo-terminal Station, one of the stations in the hinterland, and the effects of improvement were also analyzed.

Table 1 Benefits of transport between Tokyo-cargo-terminal Station and container terminal gate

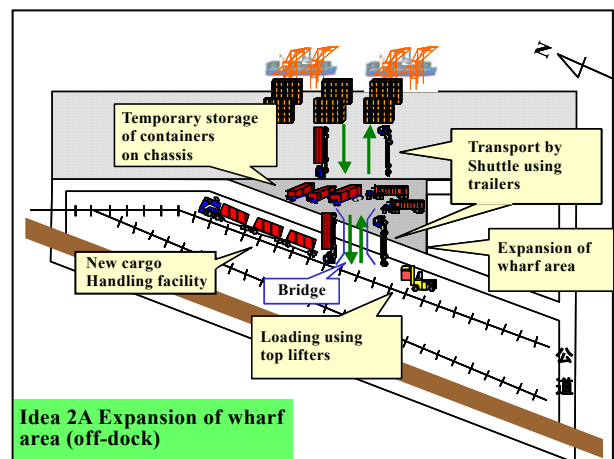
	WITH				WITHOUT
	Idea for improvement 1	Idea for improvement 2A	Idea for improvement 2B	Idea for improvement 3	
Number of trailers (a)	210 per day	210 per day	210 per day	210 per day	210 per day
Time for transport (b)	Ten minutes	One minute	Three minutes	None	98 minutes
Manpower cost (c)	2,763.4 yen/hr				
Cost: (a) * (b) * (c)/60 = (d)	96,719 yen/day	9,672 yen/day	29,016 yen/day	None	947,846 yen/day
Benefit (e)*	851,127 yen/day	938,174 yen/day	918,830 yen/day	947,846 yen/day	—
Annual basis**	255 million yen/year	281 million yen/year	276 million yen/year	284 million yen/year	



Idea 1 Expansion of wharf area (existing-dock)

Improvement: Marine containers temporarily stored in the expanded wharf area will be loaded at the existing facility (track No. 18). Port transportation businesses will travel in Tokyo-cargo-terminal Station across a Tokyo metropolitan road between the container yard and track No. 18 according to a special rule concerning port transportation.

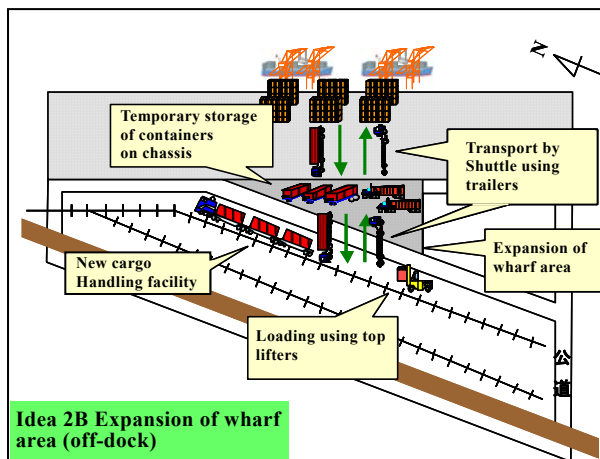
Effect: More beneficial than the drayage by road transport businesses in terms of cost and lead time.



Idea 2A Expansion of wharf area (off-dock)

Improvement: Marine containers will be handled at a new facility in Tokyo-cargo-terminal Station. Port transportation businesses have a direct access to the new cargo handling facility via the container yard and the bridge over a Tokyo municipal road (port-side road).

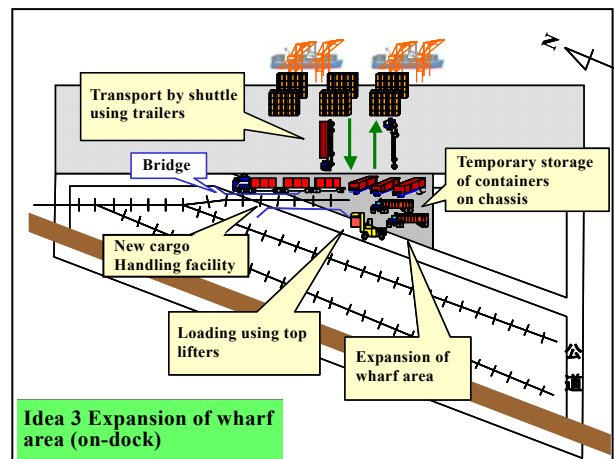
Effect: More beneficial than the drayage by road transport businesses in terms of cost and lead time because the new facility will be closer to the container yard than existing track No. 18.



Idea 2B Expansion of wharf area (off-dock)

Improvement: Marine containers will be handled at a new facility in Tokyo-cargo-terminal Station. Port transportation businesses have a direct access to the new cargo handling facility via the container yard and a Tokyo municipal road according to a special rule concerning port transportation.

Effect: More beneficial than the drayage by road transport businesses in terms of cost and lead time because the new facility will be closer to the container yard than existing track No. 18.



Idea 3 Expansion of wharf area (on-dock)

Improvement: Marine containers will be handled at a new facility in the expanded wharf area. Port transportation businesses will have a direct access to the new cargo handling facility to be installed along a spur track in the expanded wharf.

Effect: Direct drayage will be possible in the wharf area. More beneficial than the drayage by road transport businesses in terms of cost and lead time by the largest margin.

Figure 4 Ideas for improving Tokyo-cargo-terminal Station at Tokyo Port

Cost benefits were calculated for the four ideas for improvement based on the assumption of a period of two years for improving facilities (one year only for idea 1), a service life of facilities of 50 years and a social discount rate of 4% (Table 2).

Table 2 Benefit calculations

	Idea for improvement 1	Idea for improvement 2A	Idea for improvement 2B	Idea for improvement 3
Total project cost	20 million yen	2.159 billion yen	1.389 billion yen	2.687 billion yen
Total cost (with discount)	4.708 billion yen	9.521 billion yen	8.809 billion yen	10.009 billion yen
Total benefit (with discount)	14.604 billion yen	14.558 billion yen	14.459 billion yen	14.618 billion yen
Net present value	9.896 billion yen	5.038 billion yen	5.650 billion yen	4.609 billion yen
Cost-benefit ratio	3.10	1.53	1.64	1.46
Total rating	◎	△	○	△

Idea 1 should be implemented immediately because it can be implemented by improving the road between the container terminal and the freight station. Ideas 2 and 3 need to be examined over a long term while making detailed studies.

(5) Planning and conducting verification tests to revitalize rail transportation of marine containers

Stations and route used in the tests: Route between Utsunomiya- and Tokyo-cargo-terminal Stations.

Objective:

To conduct verification tests for the "enhancement of efficiency of short drayage between the container terminal and waterfront freight station" and "enhancement of efficiency of loading in the waterfront freight station" to verify the effect of reduction of transportation time and cost.

Period of verification tests:

Tuesday, February 13 through Friday, March 2, 2007 (14 days except Saturdays and Sundays).

Measurement of effects:

Feb. 9 and Mar. 6 before and after the tests. Feb. 16, 20, 28 and Mar. 2 during the tests.

Verification items:

- (i) Reduction of waiting time at container terminal gate
- (ii) Effective use of rail vehicles
- (iii) Reduction of waiting time for loading in the station
- (iv) Elimination of in-house movement of loading machinery and of distribution of work time. Elimination of space for temporary storage.

Outline of verification

- (i) Preferential entry of vacant trailers into the container terminal
- (ii) Transport by shuttle to the common chassis pool
- (iii) Total transport at fixed time of import containers temporarily stored in the chassis pool to Tokyo-cargo-terminal Station
- (iv) Transshipment of containers direct from the chassis to a cargo vehicle without temporary storage or waiting for loading in the station

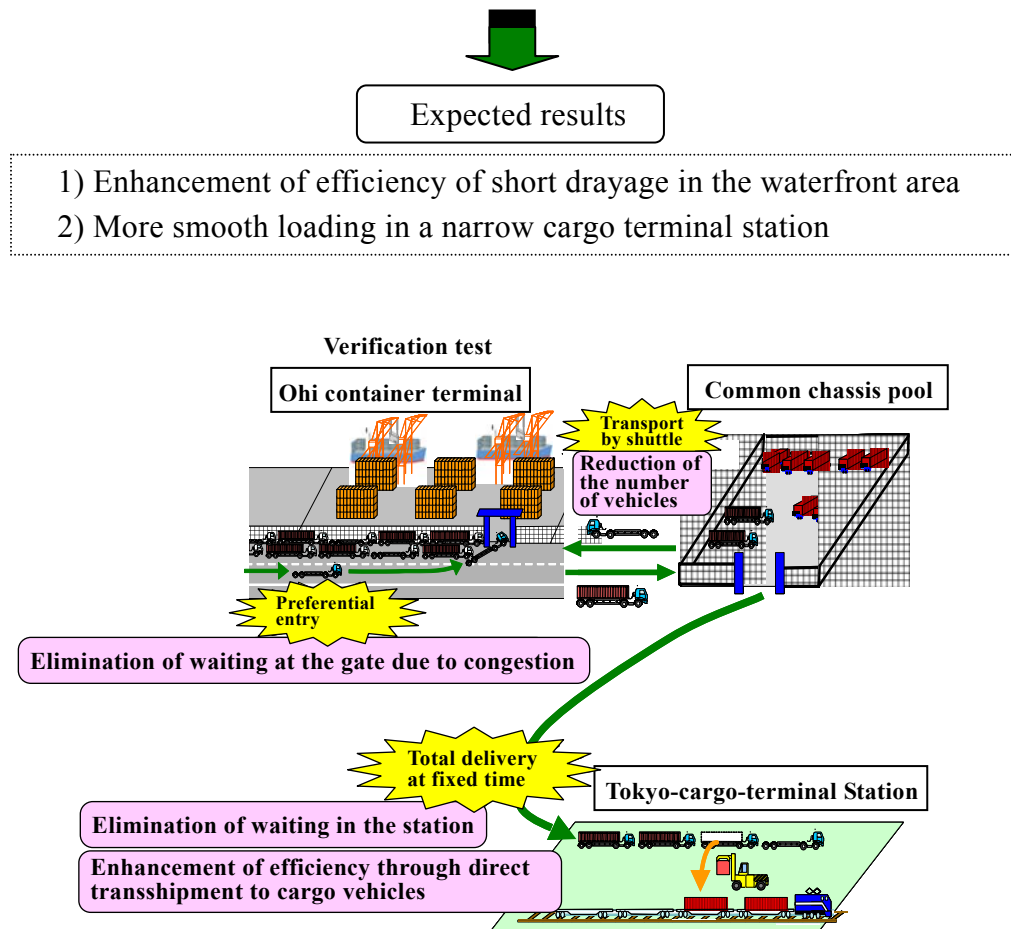


Figure 5 Outline of a model for verification

Verification of test results

- (i) Preferential passage through the container terminal gate
 - Time of waiting at the container terminal gate was reduced by approximately 22 minutes per vehicle on the average.
- (ii) Installation of a common chassis pool in the vicinity of the container terminal and total loading at the freight station
 - Time for waiting for loading and moving top lifters in the freight station was reduced by approximately 17

minutes.

-Loading space in the freight station could be used effectively. The number of containers temporarily stored was remarkably reduced.

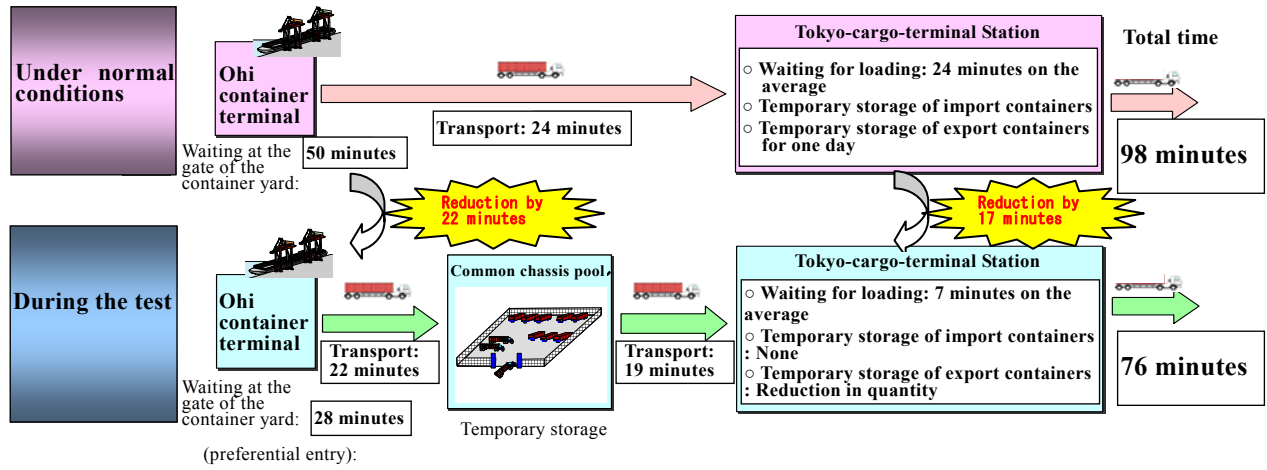


Figure 6 Reduction of short drayage time