

Proposition to Construct an Intermodal Transport System for China-Japan's International Freights based on Hakata Port

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In recent years, the international freights which flowed between China and Japan were greatly changed in contents and quality, as a result that the international trade between the two countries increased intensely by industrial globalization and the international horizontal division of manufacturing industry.

In order to be adaptable to the seasonable fluctuations of market and match with the schedule of plant's production line, the shippers need the logistics services with greater sophistication and diversity. As the most important part of the entire logistics procedure, it is necessary to construct a new type of transport system with high certainty, punctuality, reliability and security.

In the study, the international freights between China and Japan are focused. Firstly, the situations of conventional marine container transport and relevant issues are analyzed. To meet shipper's demand of the freight transport, an intermodal transport system for the international freights with marine daily service is proposed conceptually, and its possibilities and realizations are described. Furthermore, with the advantages of the geographical location, the transport system mainly including the ship and rail container is constructed based on the daily service of RORO ship between Shanghai port and Hakata port. Finally, in order to supply the higher transport services with more efficiency and reasonability for shippers, some countermeasures for international logistics in the Hakata port are discussed.

■ **Keywords** : international trade and freight, Hakata port, intermodal transport, daily service of sea transport

1. Introduction

The international division of labor in manufacturing industry has being progressed intensely since 1980's. In the meantime, the market economy has been remarkably developed by the reform-open policy in China. Including the introduction of foreign capital, many foreign firms have entered China in various forms, and after 2000, China has being called the world "factory or plant" where produce products. With this kind of change, the main world trade has moved to east Asia area from conventional western area. In that, the China -Japan's international trade changed greatly not only in quantity but also in quality. And the economic relations between the two countries have become closer and closer from the simple trade to the daily production processes & activities of factories & plants. According to this situation, a new kind of freight transport system with more efficiency and more rationalization between China and Japan has being desired to meet the shipper's needs.

Therefore, in this paper, the economic relations' transition between China and Japan from the

trade-related change is firstly investigated. And the conventional marine container transport system to support traditional international trade and the relevant issues are analyzed. Then, with the geographical advantages among north Kyushu regions in Japan and east coastal regions in China, in particular, an intermodal freight transport system is proposed based on Hakata Port, with the use of the daily service of sea transport between Hakata and Shanghai port. Furthermore, the relevant feasibility about the realization of the proposed transport system is preliminarily discussed. Finally, some countermeasures to improve Hakata port as the connecting basis from the global logistics, the increase of cargo's additional value under transport service, and the creation of new freight service, etc. are roughly described.

2. World Trade Structure and the International Trade Transition between China and Japan

2.1 World Trade Structure

Since 1980's, the industrial globalization has become the mainstream in economical activities. As one of the results, the various types of international division of labor in manufacturing industry such as the perpendicular model, the horizontal model, and the dispersion type appeared, and have been developed greatly. And many manufacturing industries, especially labor-intensive industries, are shifted to China and other area in eastern Asia, for assembling and processing operation. With it, the conventional relationships of international trade led by EU and U.S changed fundamentally in structure, and the area of eastern Asia has become one of most important and active trade areas in the world trade.

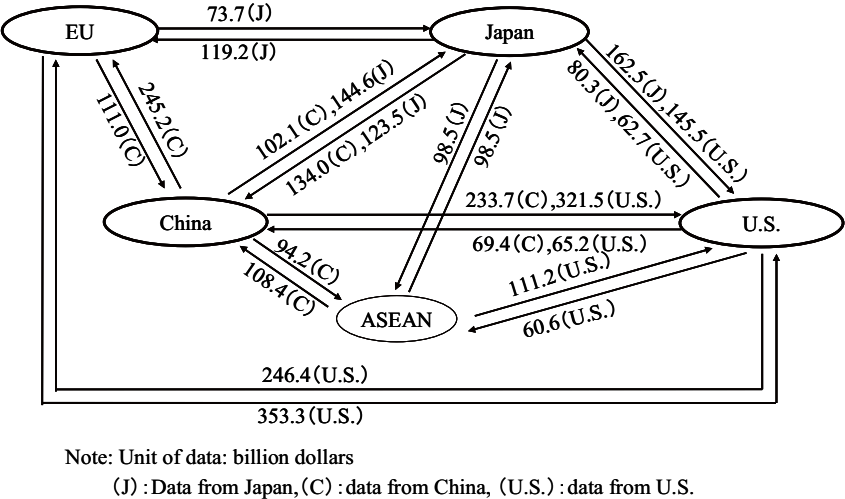


Figure 1 Fundamental structure of international trade in 2007

Fig.1 shows the fundamental situation of the main world trade in 2007. Based on U.S foreign trade statistics, the quantity of international trade between U.S.A. and the eastern Asia area including China, Japan and ASEAN reached about 766.5 billion dollars, and exceeded more about 160 billion dollars than that between U.S and EU, that is, the quantity of trade between U.S.A and EU was about 599.6 billion dollars.

In the same time, the quantity of China’s foreign trade in 2007 exceeded 2,170 billion dollars only in the mainland area, and it was about 2 times of that in 2004. The main trade partners of China are the whole area of EU, U.S.A., Japan and the whole area of ASEAN. On the other hand, the quantity of foreign trade of Japan was over 1,510 billion dollars, and its main trade partners are China, U.S.A., the whole area of ASEAN, and the whole area of EU. According to the total trade quantity, it may be said that the east Asia area is becoming the most active area of world trade.

2.2 International Trade Transition and Relevant Freights between China and Japan

1) International Trade Transition between China and Japan

Fig.2 shows the transition of international trade volume between China and Japan from 1980 according to the Japanese foreign trade data. Because there are the differences of foreign trade statistics between the two countries, based on the Japanese data, the international trade volume imported from China was more than the volume exported to China, that is, the trade deficit in Japan appeared after 1990. But, according to the relevant data of Chinese foreign trade statistics, the export volume of international trade to Japan is always less than the import volume from Japan. In any case, as for the international trade value between China and Japan, it is clear that it is intensely growing up both export / import volume since 1990. The trade value between the two countries reached about 28 trillion Japanese Yen in 2007. It was 3 times of the trade value in 2000.

In addition, the international trade value between China (only in the mainland area) and Japan was over that between Japan and U.S.

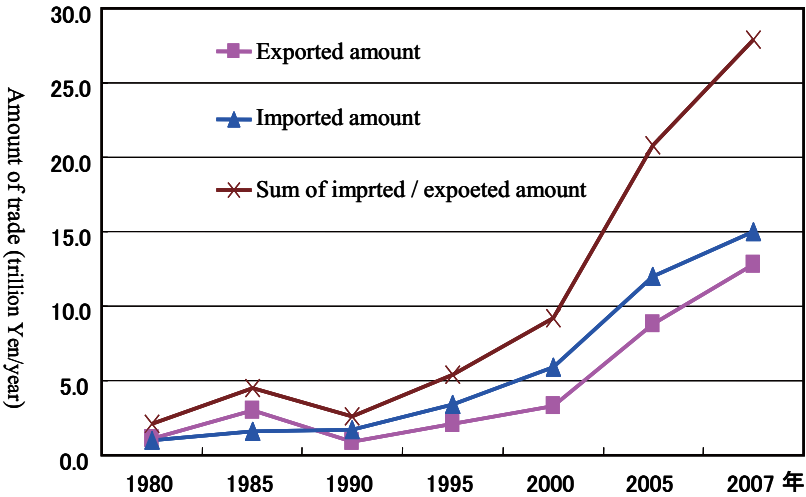


Figure 2 Transition of the amount of international trade between China and Japan

2) Trade Structural Change

The rapid growth of Chinese foreign trade in the recent years was closely related to openness and reform policy, the development of the market economy, the introduction and available adoption of the foreign capital, and the advance of the foreign firm.

After 1978, four special districts including Shenzhen City of Guangdong province for market

economy were founded, in order to make the examples for the introduction of the foreign capital, and the advance of the foreign firm and companies. These efforts were to find a type or model for the development of socio-economy. In the first stage, the many Japanese-affiliated companies went into the coastal areas such as Guangzhou city, Shenzhen city, etc. in 1980's. But from the latter of 1990's, the foreign companies have entered the in land area of China such as Chongqing city, Chengdu city, etc. And, after 2000, the foreign companies from various regions of the world have gone into China. The age of products made in China, namely China is the factory of world, is coming rightly, and as one of the main assembling and manufacturing bases in the world, China is sharing global industries. In the whole procedure, the Japanese-affiliated companies including the solely own enterprise, merger, corporate participation, or the business tie-up, etc., carried out an important role. Therefore, not only the quantity of international freights between China and Japan, also the relevant contents and quality have changed greatly.

According to Table 1, it shows that the change of international freight contents to export from Japan to China has been very great for the recent 20 years. In 1980's, the machinery products including the household appliances such as Japanese television receivers, iron and steel, and automobiles were the main export goods from Japan to China, and the relevant ratio of the occupation in export trade was absolute high.

In 1995, to be suitable for the various production in the plants established in China, the instrumentation including electric circuit article, fiber machine, the metalwork machine had occupied about half of the export volume from Japan to China.

Table 1 Commodities exported to China

Percentage	% in 1985	% in 1995	% in 2003
machinery	37.1	49.7	50.6
inside: TV receiver	8.6		
electric circuit arrangement		3.4	3.8
textile machine		3.2	
metalworking machinery		3.2	
integrated circuits			7.5
computer components			3.0
iron and steel	25.6	10.7	6.5
automobile	12.0	2.1	3.4
automobile parts			3.1
ship	3.0		
plastic	2.8	3.0	3.9
metal products	2.2	1.9	
organic pharmaceuticals	1.4	3.9	
organic chemical compound			5.1
yarn of synthetic fiber	1.3		
soft goods		6.9	3.8
pulp & paper	1.0		
precision equipment		2.0	4.8
others	12.5	19.8	18.8

Table 2 commodities imported from China

Percentage	% in 1985	% in 1995	% in 2003
oil	33.9	4.3	
oil products	9.0		
coal	2.8		
clothing	7.1	29.4	20.5
fish and sellfish	2.6	5.6	3.1
Corn	5.2		
fruits	1.2		
vegetables	2.2	3.3	2.0
cotton	1.2		
cotton textile	2.9		
The hair of the Angola rabbit	1.6		
metal products			2.2
machinery		11.8	32.5
inside: computer			11.4
iron & steel		3.3	
travel outfit and bag		2.7	1.
toys and games		2.0	2.3
footwear		3.6	2.8
furniture		1.8	2.3
precision equipments		1.9	3.4
others	29.8	30.3	27

After 2000, the electron components, machine parts and precision instruments etc. have become the main export goods. According to the relevant statistics, it may be said that products are made or assembled in China has entered the mature phase.

On the contrary, the main goods imported from China can also be divided into the three stages. The resource goods such as oil and coal, etc. occupied the most part in 1980's. The life consumption goods such as clothing, agriculture or fishery products became the leading position in 1990's. After 2000, the instrumentation including the household appliance, electron products, and personal computer accounted for over 30%, and then, the life consumption products including clothing took over 20%. It is obvious that the international trade between China and Japan has fundamentally changed in contents and quality shown as in Table 2.

The present situations of the international trade between China and Japan have become very interesting. A new kind of international trade relationships has been formed. The parts and components made in Japan are exported to China. And then the relevant products are completed or assembled in China's factories. Finally these goods are re-exported from China to Japan or other countries. Therefore, with the promotion of the international division of labor in manufacturing industries, in some meanings, the freight transport pattern between China and Japan shall be changed to meet the new needs of shippers. The conventional marine transport was to move the products from factory to the location of consumers. The new type of transport is to move the parts and components from one factory to other plants located in different countries, and to re-move the products back or to other countries. This transport system is strongly wanted to meet the demands of the schedule of production line, and be suitable for the seasonable

fluctuations of market with the certainty, punctuality and safety to increase the logistics efficiency and reduce the quantity of inventory of products.

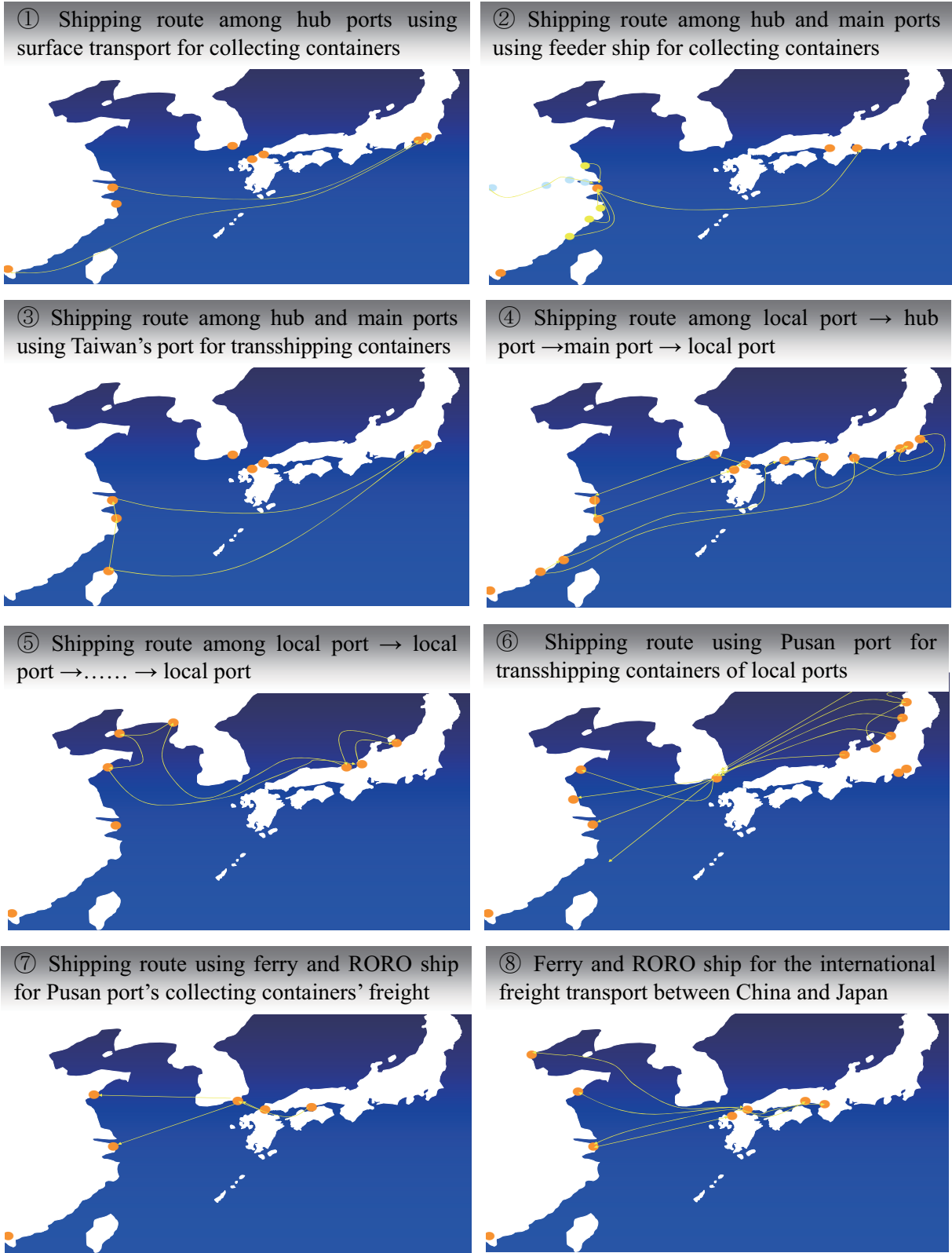


Figure 3 Shipping route of marine containers between China and Japan

3. Freight Transport System for International Trade and Relevant Issues

3.1 Marine Container Transport

After 1978, the harbors in China have gradually been opened to foreign countries and their enterprises. Since 1990, many modernized ports have been constructed, and by now, the construction of modernized ports has entered the rush age along the coastal areas from northern to southern regions.

In addition, with the predominance of coastal areas in Japan, in order to open up the international shipping route, almost each region with coast constructed one, or more one and multiple ports. By now, about 61 ports have operated the international scheduled services of marine container ships.

The marine container volume between China and Japan in 2005 reached over 2.8 million TEU, the increasing rate in the three years from 2003 (the volume was 2.2 million TEU) was 30%. The large part of these containers are concentrated on Shanghai Port, Tianjin Port, Qindao Port, Dalian Port, and especially, the container ratio of Shanghai port that occupied in the total volume was about 45%.

For the marine container transport between China and Japan, we can mainly divide the relevant international route of a marine containership navigating into eight patterns as shown in Fig.3.

- ① The marine transport among the hub ports of the two countries, where marine containers are concentrated on one or two hub port by land transport. For example, there is a marine container transport route between the Tokyo Port / Yokohama Port and Shanghai port, or between the Tokyo Port / Yokohama Port and Shenzhen port.
- ② The marine transport between hub port and main local ports with the help of feeder transport to concentrate marine container freight. For example, the marine containers from some main local ports such as Ningbo port, Wenzhou port, Lianyungang port, Nantong port, Nanjing port and Wuhan port are shipped to Shanghai port by feeders, and then transported to the Japanese port.
- ③ The route by the way of using the Taiwan's hub port, that is, one local port → the Taiwan's hub port → main important port → another hub port. For example, there is the marine transport route from Tokyo port → Yokohama port → Keelung → Ningbo port → Shanghai port.
- ④ The container transport route such as one local port → hub port → main local port → another local port. For example, there are the route of Shanghai → Ningbo → Hakata → Kitakyusyu → Pusan → Shanghai and the route of Xiamen → Fuzhou → Hiroshima → Osaka → Yokohama / Tokyo → Hitachi → Nagoya → Xiamen.
- ⑤ The international marine route between the two countries with the detour calls at multiple local ports as Local port → local port → local port.... For example, there is a transport route of Qindao port → Tsuruga port → Naoetsu port → Maizuru port → Dangdong port → Dalian port → Qindao port.
- ⑥ Marine containers from the local ports of the two countries are transported to Pusan port and operated for the transshipment in Pusan port. In fact, many Japanese local ports are using such an international route, and about 60% of the route from the Japanese local ports to China or the east Asia areas is transshipped in Pusan port.
- ⑦ Available use of international ferry and RORO ship between Japanese ports and Pusan port for the transshipment of the container freights among the ports of China and Japan

- ⑧ Direct transport with the use of the international ferry and RORO ship between China and Japan. For example, there are the regular transport routes such as the ferry between Shanghai port- Osaka port/ Kobe port, between new Tianjin port – Kobe port, and between Shimonoseki port - Qindao port, and RORO ship between Shanghai port- Hakata port.

As mentioned previously, the marine container transports between China and Japan except pattern ⑧ are the detour routes. Especially, Most of the international container routes such as Hakata port where is nearing to the eastern coastal areas of China are operated as pattern ④, which are calling at multiple ports. Although the distance of these routes is short, the transport time gets longer. With the change of trade relationships, the conventional patterns of marine container transport can not meet all the demands of freight shippers between China and Japan. Especially, with the international division of labor in manufacturing industries, more rapid marine transport service is required for component supply matching with the production line in order to keep the regular daily operation of a factory.

Since the international RORO ship route between Hakata port and Shanghai port started in 2003, the international intermodal transport with the Japanese rail containers to China grows rapidly. The better results can be shown that a new kind of function is needed at the Hakata port for all the China-Japan's international freights.

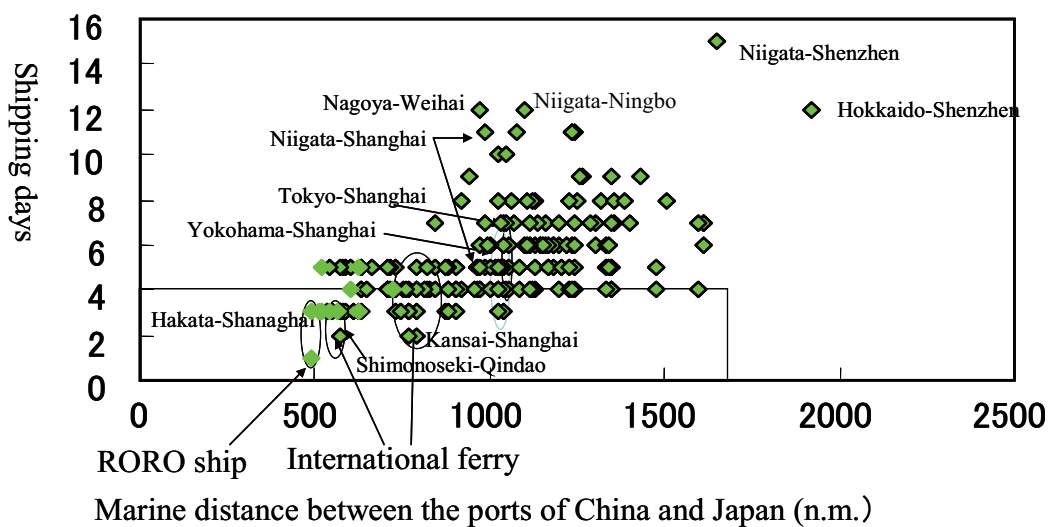


Figure.4 Shipping distance and relevant days of scheduled container ship distance between China and Japan

3.2 Issues in Conventional Marine Container Transport

1) Longer transport time due to the detour calling at a port

Fig.4 shows that the transport time of the container ship is spending in sea routes among the ports. Although the longest distance between the ports of the two countries is about 2,000 n.m., and based on the ship technology, the sea shipping time for all sea routes among the ports can almost be controlled in less than 4 days, actually, most of real routes suffer more than 4 days.

For example, the shipping days in a container ship from the Tokyo Port / Yokohama Port to Shanghai port are about from 3 to 7 days although the distance between the two ports is only about 1,100 n.m. In

addition, the sea route of the containership from Kobe port/ Osaka port to Shanghai port with about 800 n.m. needs about from 3 to 5 days. Especially, to the local port, there are a few of the sea transport routes more than 10 days among these Japanese local ports and the ports in China.

2) Longer operating time in the container terminal of port

In the case of marine container transport, the loading/unloading operations and the relevant handling process of the international freights are necessarily performed in the port terminal. It takes usually long time to complete these operations and process, and relevant import/export procedure of the foreign freights. In a Japanese container port, the average duration for container's staying in a port is 3 days.

Using some measures such as improvement of port's operating process and the information technology to promote the efficiency of the harbor, as the objective of Japanese port, the staying time of container freights is about 2 days.

3) Few international routes connecting to the local container port

Generally, there are few international routes for marine container services at a local port. For example, in many local ports, there are only 2, 3 shipping services per week. About 75% of all container ports is less than 8 shipping services per week. And in these shipping services from local ports in Japan to China or eastern Asia ports, about 60% of shipping routes is transshipped by Pusan port of Korea.

4) Issues concerning the surface transport of the marine container freights

Almost of the surface transport of marine container freights is with trucks or trailers. Based on this situation, there are many serious problems such as road congestion/the traffic jam around the harbor, and the environmental pollution. For example, the average degree of road congestion around the Tokyo port is approximately 100%, and that of many places are more than 150%. In addition, NOx density in the outskirt area around the Tokyo Bay is higher two or three times than the targeted value (0.06ppm) of the country. Hereby the strictness of the environmental situation around a harbor can be understood.

As stated above, in the present situation of marine container transport, we have to face these issues such as shortening the shipping time of sea route, improving the loading/ unloading operation and handling process of container freights at port terminal, increasing the numbers of shipping services through the consolidation of ports, supplying the convenient access to port, and easing the environmental problem, etc. To the international marine container freights between China and Japan, it is dispensable to construct a more effective transport system as one of solutions with the use of geographic predominance of the near sea transport.

In the Hakata port, there are the following advantages for the international freight transport around the Asia area.

- ① There is the shortest sea route between China and Japan. The conventional marine transport time between Hakata port and Shanghai port is 3 days, but the RORO shipping time is only 28 hours.
- ② In Hakata container port, the harbor work promotion of efficiency such as IT technology advances.
- ③ The rail container can be transported through the RORO ship. Using the network of railway, it is possible that the international freights with the nationwide of Japan can choose the rail container to import /export from /to China. The fact shows that the volume of rail & sea transport system

healthily grows

- ④ Containerized freight information system (HiTS ver.2) using IT technology is realized for the smooth access and egress of container freights at Hakata port terminal, and to reduce harbor traffic congestion

Furthermore, the Hakata port is justly located in the middle of Shanghai and Tokyo on geography. The surface transport access such as railway, express way, national highway, the seaside road is relative convenience, besides.

Therefore, How to effectively use these advantages of Hakata port is really worth considering as one of the available solutions for China-Japan international freight transport, to match with the changes of shipper's needs.

4. Intermodal Transport System for International Freights based on Marine Daily Service

4.1 Conceptual Framework

As described previously, to marine container transport, there are a few of measures in various viewpoints. Hereby, with the transport availability of nearing sea advantages such as shorter shipping time and possible frequency, we will propose and discuss the intermodal transport system based on the introduction of the marine daily service for international freights.

This system is not only suitable for the shippers' daily needs with the reasonable and efficient connection between marine daily service and surface transports, especially the environment-friendly railway, but also has a competitive power with the aviation cargo. The relevant characteristics of this system can be stated as follows.

① Establishment of the marine daily service

The marine transport between China and Japan is controlled within 24 hours through the introduction of RORO ship to supply the transport service every day. This is for the correspondence to the changes of the shipper's needs between China and Japan. Due to the development of the closer economic relations between the two countries recently, the goods influencing on the citizens' daily life such as perishable food have increased very much. In addition, as for the freights such as parts, components of machine to the schedule of the factory production line, the necessity of a transport system balancing transport lead time and cost becomes higher. In the air cargo and marine container freights, there are many common items that show the increasing tendency under the present conditions of international freights between China and Japan. The shipper repeats to do changes to choose the marine container or air cargo, and a lot of cases changing from the marine container to air cargo occur recently.

② Reduction the sojourn time for the loading & unloading operations

With the use of the RORO ship, it is possible that the loading & unloading operations between marine and surface transport become simply and easy, because the chassis can be justly move in the ship, or the container can be loaded & unloaded by top lifters or folk lifters. The sojourn time of

freight in port is greatly reduced.

③ Environment-friendly transport

Because the rail and marine transport are organically integrated as a whole system, this transport system can be called as eco-transport. In addition, environmental load is low by the easiness of the movement of the harbor for the loading and unloading operations.

④ Convenience for surface transport

With the rail container as one of the intermodal transport units, the rail network and relevant facilities with the nationwide can effectively used. The accuracy, rapidness, and the appointed hour of delivery are also assured.

⑤ Matching the freight contents and lot loading size among various modes

⑥ Assurance of the quality of goods in transport

4.2 Possibility of Marine Daily Service for the International Freight Transport between China and Japan

There are already some examples about the international marine daily service, such as the camellia line between Hakata port and Pusan port. This marine route of 115 n.m. takes only 5.5 hours for international freight and passenger transports with the ship at speed 23.5 knots. In addition, in the case of the coastal transport, there is RORO ship daily service for domestic freight transport between Tokyo and Tomakomai. Because a ship with the greatest speed 30 knots is adopted, this shipping route with about 570 n.m. can be connected within about 20 hours.

Generally, in the case of a ferry, the length of shipping route with one day is about 650 n.m., and in the case of a RORO ship. It is about 600 n.m. And to a containership, it is less than 400 n.m.

Reversely, if the shipping time is established as 2 days, to RORO or Ferry ship, the length of shipping route can reach 1,000 – 1,200 n.m. In the spatial distribution, the shipping routes between the Chinese ports from Shanghai to Qindao, and the Japanese ports in the Northern area of Kyushu and Yamaguchi region are less than 600 n.m. The shipping route between Shanghai port and Hakata port with only 500 n.m. is less than that of Tokyo-Tomakomai. Therefore, it is possible that China-Japan's marine daily service will be realized only if the coastal shipping technology is used.

As stated above, in the shipping routes between Shanghai and the areas of North Kyushu and Yamaguchi, as an example, it is enough to complete the marine daily service if a RORO ship with the speed of 30 knots is introduced.

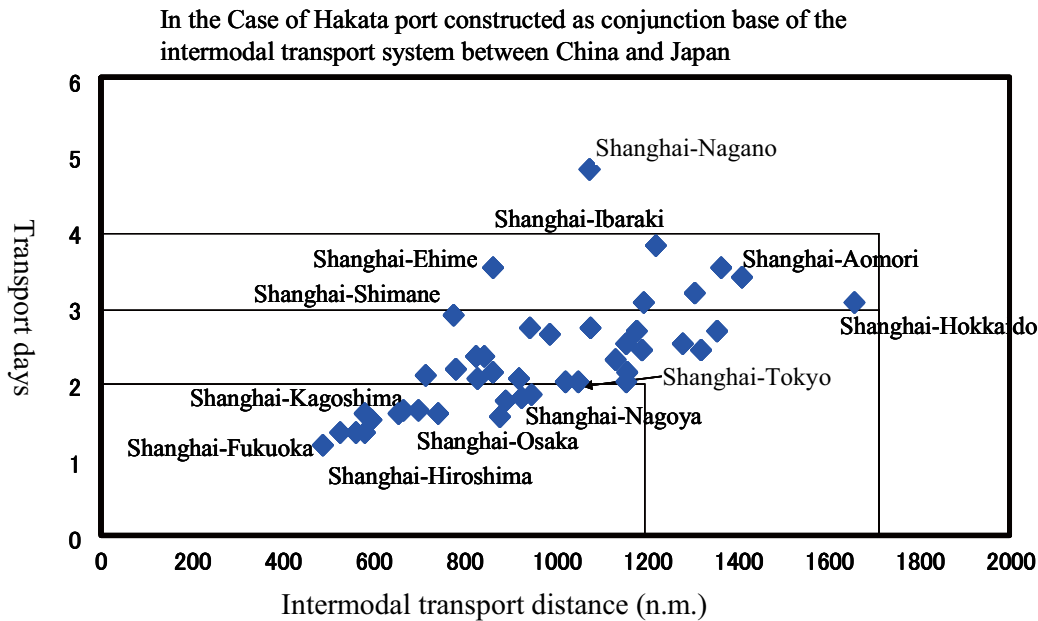


Figure 5 Intermodal transport distance and transport days between Shanghai and each region of Japan

5. Realization of the Intermodal Freight Transport between China and Japan based on Hakata Port

5.1 Reduction of the Freight Transport Time

The main effectiveness brought by the construction of the intermodal freight transport system between China and Japan is the reduction of door-to-door transport time from each area of Japan to China.

In the case of the ports in the areas of North Kyushu and Yamaguchi as the conjunction base with the surface transport, and Shanghai port as the starting point of the transport system, the door-to-door transport time of the system includes marine shipping time, access time between Hakata port and Fukuoka freight station, the surface transport time between Fukuoka freight station and each region of Japan, the relevant freight import & export proceeding time, and freight loading & unloading time at port and station, in addition, delivery & picking up time of freights around station and port.

Based on these, the relationships of transport distance with the relevant transporting days are shown as Fig.5. According to this, it is possible that the freights from all areas of Japan except Nagano prefecture can be transported to Shanghai within 4 days. In that, the freights from many regions of Japan such as all areas of Kyushu, Yamaguchi, Hiroshima, Okayama, Osaka, Nagoya, Gifu, Shizuoka, Tokyo, Toyama, etc. can be transported to Shanghai within 2 days, the transport time. Almost of areas can be linked with Shanghai in 3 days. The freights from Hokkaido area can be exported to China in 3 days through the intermodal system.

Therefore, the intermodal transport system can reduce greatly the door-to-door time of the international freights than the conventional marine container transport.

5.2 Realization of the Transport System

The realization of the system-related intermodal transport can be discussed based on the following conditions.

- (1) About 45% of the marine container freights between China and Japan is concentrated in Shanghai port.
- (2) The containerization rate in the total freights between China and Japan can be set up 20%.
- (3) With the RORO ship at maximum speed 30 knots, the shipping time of ship can be controlled within 24 hours, because the length of marine shipping route is less than 600 n.m.
- (4) To the surface transport, In the case of the middle or long range, the existing railway network is actively used for freight transport, and in the case of the short distance, the delivery or picking up of freights is based on trucking.
- (5) The setting of the surface transport routes can use the freight railway schedule time table for references, from the rail station where is near to the port to the central district of each prefecture.
- (6) The relevant fares or rates concerning freight transports are assumed by using the actual conditions based on freights tariff rate and various list of charges.

Using these conditions for the transport system, we can estimate the sharing rate of the intermodal freight transport system from each prefecture to Shanghai outskirts area, by referring the choice model of the TSL built by the marine technical safe bureau of old Ministry of Transport, Japan in 2000.

Furthermore, according to national survey on import & export freight flow in Sept.1 – 7, 2001, the transport demand to shift freights of marine container from Japan to China to the intermodal freight transport based on Hakata port can be calculated. As a result, it is clear that the freight volume is enough for the marine daily service operated every day with the RORO ship that the loading capacity of 200 chassis and loading rate over 90%.

5.3 Countermeasures in the Hakata port

The Hakata port has more advantages than other areas because it is directly facing on Shanghai port and eastern coastal areas of China. Marine shipping distance between Hakata port and Shanghai port is about the same length with coastal transport to Tokyo. Hakata port is located in the midmost area between Tokyo and Shanghai. It can be said that Hakata port is just connecting the industrial area of the two countries where manufacturing production is most active. Therefore, how to practically utilize the Hakata port is concerning many countermeasures such as the global logistics, the increase of transport added value based on the SCM strategy and the creation of the new distribution service.

1) The strategies of Hakata port related to global logistics

The strategies concerning the global logistics are meant to the total optimization of the whole supply chains from the component supply, product assembling, wholesale, retail to consumers, and recycles of products. The whole procedure is needed to cooperate closely each other among the chains' members, through Supply Chain Management (SCM). The main purpose of SCM is the minimization of the cost of the whole procedure by the reduction and optimization of the stock under keeping the same service standard for customers. From this viewpoint, Hakata port is not only as the simply linkup function of

intermodal freight transport, but shall be as the logistics base that can support the activities of manufacturing industries and consumers between China and Japan.

Therefore, in order to maximize merits such as the reduction of freight lead time and the increase of the transport frequency, it is necessary to unify Hakata port into the seamless connection with the highway or the railway for the security, the stability, the certainty of transport system.

As concrete illustration, to the middle or long transport distance, the operations between railway and RORO ship such as trucking access, loading & unloading among rail, truck and ship under the present situations shall be eliminated completely. The seamless combination among surface means and ship is required to create for the global logistics. It is also one of measurements for the environment-friendly and energy-saving.

In addition, in the logistics and SCM, the freights in transport are seen as a part of the stock of shippers. Therefore, the real-time management of freights in transport is one of the most important objectives of the transport system. It is also necessary to seamlessly combine the highway with RORO ship for the local freight transport from Kyushu area and western areas of Japan, and for the safety of the transport path with the unexpected situations such as transport interruption because of the occurrence of the disaster.

2) Global logistics base with the "value-added growth" function in SCM strategies

Actually, the thought of global logistics management has gradually entered the production process of factory by SCM strategies, until the product is completed at the final stage of supply chain. From this viewpoint, as one of global SCM strategies of Japan, Hakata port shall include more important functions with "value-added growth" in transporting the intermediate freights for the production or the last process of goods.

Concretely, with the advantages of geography, the area of Hakata harbor shall constructed as the base of last processing of products, where the products with "Japan brand" are assembled finally to export to China. Reversely, to the import goods from China, some necessary processing is added for meeting the Japanese customers' demands at the base. To sum up, the developing direction of Hakata port is for constructing the global logistics base between China and Japan.

3) Creations of the new services in international freight transport

After 1990's, with the marked changes of the contents of the international freights, the shippers want the new transport services to meet the international freight transport. According to the investigations concerning specifications of the international voyage type TSL and relevant transport demands by the association of shipbuilding industry and business in 2000, although about 53.8% of shippers was still without the changes in choosing the transport means, the shippers changing means from air cargo to marine container were about 13.4% and from marine container to air cargo were about 32.8%. Actually, in the air cargo and marine container freights between China and Japan, there are many common items of goods as shown in Fig.6.

Based on Fig.6, the average unit price of the air cargo is expensive with 10,000 yen per 1kg, and the average unit price of the marine container freights is low with 300 yen per 1kg. It is easily judged that there are the massive niche needs between marine container and air cargo. Corresponding to the niche

market, it is necessary to create the new transport services which freight charge, schedule of production or customer’s demand, freshness for citizen’s daily life, lot size of goods, added value, quickness required and transport cost are taken into considerations. In this point, the intermodal freight transport system based on the Hakata port will contribute to shippers’ niche demands between air cargo and marine container.

As a good example, the Shanghai super express RORO ship with 28 hours’ shipping time can be used to explain the necessity of the transport system. The growing rate of the marine container transport to China handled by the Hakata port from 2005 to 2007 was about 30%. On the other hand, the growing rate of the intermodal transport volume by combining the rail freight with Shanghai super express RORO ship reached about 51% in the same period. Therefore, the proposal for constructing the intermodal freight transport system with marine daily service is suitable for the change of the international freight between China and Japan. And also the transport system suggested in this study as one of the ways of the development for Hakata port can be expected to contribute to the creation of the more transport services in future.

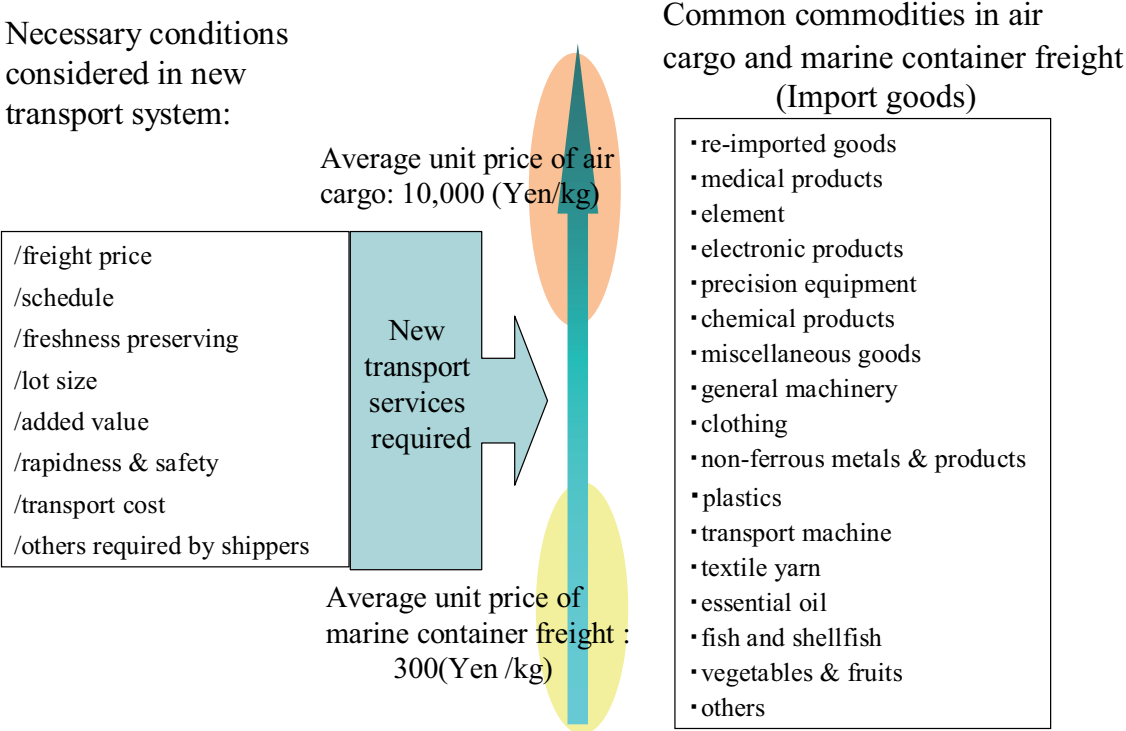


Figure 6 New Transport Service matching with the Changes of International Freight

6. Conclusions

In this study, based on the variations of international freights between China and Japan, the conventional marine container transport system and relevant issues are analyzed. With the advantages of Hakata port in geography, an intermodal freight transport system in that the rail network is combined organically with marine daily service is proposed.

In addition, the realization of the proposed system and its relevant effectiveness are discussed

synthetically.

Furthermore, some development measures of the Hakata port from the viewpoints of the global logistics are investigated. In order to complete the proposed transport system, it is necessary to promote the integration of governmental policies in international freight transport, and make the efforts on the creation of new services of Hakata port.

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