Rail Freight in Japan—The Situation Today and Challenges for Tomorrow

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Introduction

Japan Freight Railway Company (JR Freight) was formed in 1987 when Japanese National Railways (JNR) was split up and privatized. For the first 6 years, its balance sheet showed promise, but since then it has been in the red due in part to the long recession dogging the Japanese economy.

Prospects for railways seem brighter as a viable way to achieve greater distribution efficiency and reduce global pollution. With these trends in mind, I will describe JR Freight's present efforts to improve its performance, and discuss some of the challenges it faces. The company hopes to bring its operations back into the black by implementing an improvement programme called *New Freight 21*.

Trends in Japan's Distribution Industry

The Japanese economy is finally showing signs of recovery after a long recession, but it is still not clear how the economy will fare in the future. The nation appears to be heading towards more structural reforms with more changes in corporate structure and mergers between unaffiliated companies. These developments are being promoted by the need for greater management efficiency as well as by the movement to internationalize and computerize operations and to rationalize distribution systems.

Like other industries, the distribution business is faced with the need for structural reform. Freight carriers now face more hurdles than before as the demand for consumer-friendly distribution systems grows.

Information technologies have developed over the last few years as a way to boost distribution efficiency. This trend is strong among manufacturing industries, which have embraced supply chain management (SCM) principles in the hope that they can optimize every aspect of their operations from procurement to production to delivery. Companies are also using the Internet and conducting E-commerce transactions, and are implementing electronic data interchange (EDI) systems and distribution information services. In another development, providers of third-party logistics services are assuming a larger role within the distribution business as a whole, offering ways for companies to reduce inventories and rationalize their operations through the use of information systems.

Freight by Transport Mode

million tonne-km (%)

Year	Railways	Motor vehicles	Coastal shipping	Domestic airlines	Total
1985	22,134	205,942	205,818	482	434,375
	(5.1)	(47.4)	(47.4)	(0.1)	(100)
1990	27,287	274,244	244,546	799	546,876
	(5.0)	(50.1)	(44.7)	(0.1)	(100)
1995	25,146	294,648	238,330	924	559,047
	(4.5)	(52.7)	(42.6)	(0.2)	(100)
1998	22,959	300,670	226,980	985	551,594
	(4.2)	(54.5)	(41.1)	(0.2)	(100)

Notes
Railways: JR Freight and private railway companies
Motor vehicles: 1985 figures do not include light vehicles.

Because of these developments, customers now expect faster delivery even while freight carriage fees have tended to decline. Meanwhile, the volume of goods transported within Japan shows no sign of increasing. Therefore, the situation for freight carriers is far from easy.

Japan's distribution market is valued at approximately ¥23 trillion (¥100 = US$0.84). About half this market is handled by road haulage. On one hand, truckers use roads that are built and maintained with public funds, they pollute the air, add to road congestion and cause traffic accidents. On the other hand, they offer door-to-door convenience and flexible routing, explaining why they have cornered 54% of Japan's transportation market, in tonne-km terms.

Although trucks play the most important role in goods distribution in Japan, they cause serious accidents, and emit nitrogen oxides (NOx), suspended particulate matter (SPM), and other pollutants. We can assume that local governments in many parts of Japan will push forward with stricter controls on emissions as demonstrated by the *Say No to Dirty Diesel Vehicles* campaign announced by the Tokyo Metropolitan Government.

For its part, the trucking industry suffers from a number of structural issues that have paradoxically supported its growth but must soon be resolved, such as low wages and long hours.

The dawn of the new millennium will not change the fact that Japan's distribution business is an essential part of the national economy. In the next century, Japan's population will continue to age and its birth rate will continue to drop, two factors suggesting no further expansion of the economy. The drive for environmentally friendly transportation systems will certainly grow and with the advent of new information technologies, customers will have even more reason to demand optimum transportation services.

If distributors and freight carriers are to meet the challenges of this new business

Freight carried by JR Freight

	Year	1985	1987	1990	1993	1995	1997	1999
Tonnes (10 million)	Containers	1.22	1.38	2.02	1.96	2.06	2.25	2.05
	Wagon load	5.64	4.15	3.82	3.35	3.09	2.48	1.90
	Total	6.86	5.53	5.84	5.31	5.15	4.73	3.95
Tonne-km (100 million)	Containers	107	121	185	184	192	201	187
	Wagon load	109	80	82	66	55	42	35
	Total	216	201	267	250	247	243	223

JR Freight Revenues

(¥100 million)

Year	1987	1990	1995	1999
Containers	809	1,155	1,202	1,080
Wagon load	758	704	508	288
Total	1,568	1,860	1,711	1,369

environment, they must work toward reformation and rationalization of the entire distribution system, and devise new strategies to help them survive.

Overview of Rail Freight in Japan

JR Freight—Company profile and financial situation

When JNR was privatized in April 1987, it was split into six JR passenger railways and one rail freight carrier, JR Freight. Each passenger railway serves a specific region, but JR Freight offers services throughout Japan. This is because the policymakers felt that rail freight would be more efficient if one company had access to the entire national railway network[1].

JR Freight is capitalized at ¥19 billion, and operates on about 96,000 km of track that comprises the network covering most of Japan. The track used for freight services is divided into 86 track sectors. JR Freight transports freight in containers and in tankers and hopper wagons for bulky freight, such as petroleum, cement, and paper. The company is also trying to increase its revenues in related sectors—for example, by letting space in its freight stations to companies that need shipping facilities, storage space and sorting facilities. It is also involved in operation of convenience stores and other commercial business.

The company's corporate headquarters are in Tokyo and there are six regional offices, seven branch offices and 34 sales branch offices responsible for operations, business administration and sales promotion.

Responsibility for freight operations is separated between various entities in order to provide efficient services, ensure safety and offer on-time delivery. Freight stations serve as an operations base, each of which has its own locomotive and freight wagon depots, and rolling stock repair shops, which are responsible for freight train operations and inspection and repair of locomotives, freight wagons and containers. The operations base also located near maintenance centres to maintain and repair track, electrical equipment, cargo handling machinery, and other related equipment.

The company has 323 freight stations located in urban centres throughout Japan; 140 are container stations. There are about 9500 employees. It operates 856 locomotives and 17,582 freight wagons (of which 7726 are owned by other companies). It also has about 100,000 containers at its disposal (of which about 23,000 are owned privately).

The company's predecessor (JNR)

Profile of JR Freight

(1 April 2000)

Total revenue (¥100 million)*	1,644
Freight volume (10 million tonnes)*	3.95
Freight tonne-km (100 million)*	223
Transport density (tonne/day)*	6,376
Capital (¥100 million)	190
Total assets (¥100 million)	3,067
Length of line operated (km)	9,582
Freight stations	323
No. of trains (per day)	737
Train km (1000/day)	234
Employees	9,486
No. of locomotives	856
No. of freight wagons	9,862
Privately owned freight wagons	7,726
Containers	76,395
Privately owned containers	22,634

*in fiscal 1999

abandoned the marshalling yard system on 1 February 1984, before the division and privatization, replacing it with a direct transport system linking transport bases. Containers are used mainly to transport consumer commodities over medium to long distances, whereas tankers and hoppers generally carry large bulk cargoes over comparatively short distances.

An average of 737 freight trains operate each day throughout the country. Of these, 425 are container trains, while the remainder are trains hauling bulky freight in tankers and hoppers. The total distance travelled by these freight trains each day is about 240,000 km (190,000 km by container trains). About 90% of JR Freight's rail freight is transported at night. Although JR Freight and the six JRs operate on the same track and catenary using the same railway facilities, but they are all owned by the JRs. Although JR Freight does not pay track usage fees, it is responsible for the incurred incremental costs by operating freight trains on these tracks.

During the first few years after 1984, the company enjoyed rising demand thanks to Japan's 'bubble economy' and operating profits exceeded initial projections. But when the economy fell into recession in 1993, the JR Freight balance sheet went into the red. Soon after, Kobe was devastated by a major earthquake in January 1995, pushing the company further into the red.

In an attempt to achieve stable revenues and adopt a low-cost structure, the company is now promoting restructuring based on its *New Freight 21* plan. Some unprofitable businesses have been abandoned and attempts have been made to boost efficiency levels. In the last 3 years, the bottom line has been improved by cutting the labour force by about 1800 employees and by cutting costs by some ¥31 billion. As a result, the company is poised to return to the black this current fiscal year.

Rail Freight Volumes by Commodity (fiscal 1999)

(10,000 tonnes)

	Commodity	Freight Volume
Containers	Minerals (ore, etc.)	47
	Forestry products (lumber, etc.)	20
	Agricultural products (rice, vegetables, fruit, animal feeds, etc.)	219
	Chemical products (chemical fertilizers, pharmaceuticals, etc.)	375
	Machinery (equipment, parts, automotive parts, etc.)	110
	Foodstuff and other consumables (tobacco/cigarettes, beer, processed foods, etc.)	328
	Fibres (paper, chemical fibres, pulp)	323
	Other industrial products (electric/electronic products, books, cosmetics, etc.)	131
	Less than truck load (small freight, personal goods, postal freight, etc.)	188
	Others	310
	Subtotal	2,051
Bulky freight	Petroleum	1,001
	Limestone	66
	Cement	311
	Coal	30
	Chemicals	77
	Ore	21
	Paper and pulp	87
	Steel	2
	Lumber	17
	Others	290
	Subtotal	1,902
	Total	3,954

Fluctuations in rail freight volumes

During the company's first 6 years, its freight volumes increased steadily fuelled by the bubble economy. But tonnage started to fall as soon as the bubble burst in 1993. The main reasons were: (1) slumping demand during the recession; (2) a shift toward trucks, conventional and Ro-Ro[2] ferries prompted by stiff price competition; (3) greater efficiency in distribution as a whole through corporate mergers and restructuring; and (4) service disruptions caused by natural disasters.

Containerized freight varies greatly with the main types being agricultural produce, food, beverages (beer and juices), small sorted items, electrical and electronic products, auto parts, books, apparel, pharmaceuticals, and chemical products. The annual volume exceeded 20 million tonnes in fiscal 1991 and reached about 20.51 million tonnes (18.7 billion tonne-km) in fiscal 1999.

Container shipments comprise the major share (84%) of total freight and 78% of all container freight is shipped more than 500 km (915 km average distance). Clearly, containers play an important role in transport of medium- and long-haul freight. Much of this freight travels over two routes—the Tokaido and San'yo main lines linking Tokyo, Osaka and Fukuoka, and the Tohoku and Hokkaido main lines linking Tokyo, Sendai and Sapporo.

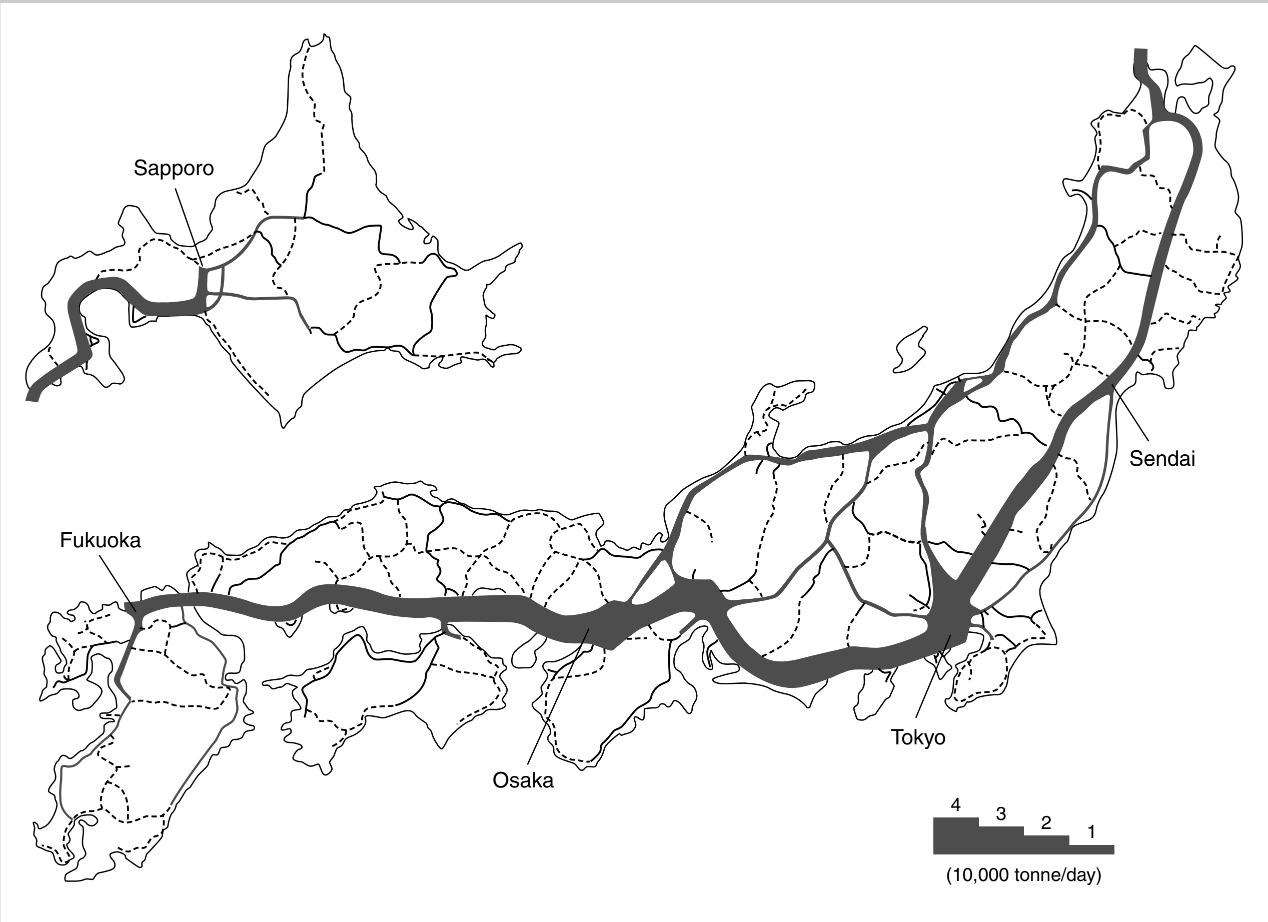
Bulky freight in tankers and hoppers is mainly petroleum, cement, limestone and chemical products. These goods are generally destined for coastal industries, so JR Freight must compete with coastal shipping that can carry bulk cargo very cheaply. Competition with trucks is also hard and the railway is losing business to large trucks every year. In fiscal 1999, the railway's tankers and hoppers carried 19.02 million tonnes (3.5 billion tonne-km) a decline of more than 50% since 1987. Tankers and hoppers are generally used for hauls between the coast and the interior and the average journey distance is only 186 km.

JR Freight's Attempts to Improve Services

JR Freight is modernizing its transport methods in order to satisfy changing customer requirements and encourage a

Class EF81 freight locomotive hauling gasoline tankers on Joban Line (Author)

Rail Freight Volume (fiscal 1999)



modal shift away from trucks. The market for distribution of small commodities along high-density corridors will surely grow and container rail transport is an efficient way to move these and other types of goods. The company is convinced that placing more emphasis on container transport will boost its revenues. However, a number of container-related problems remain to be solved, including inefficient transshipment at freight stations, and inflexible shipping times and capacity. JR Freight is attempting to greatly improve these problems and slash costs. To encourage demand, rolling stock is being renewed, freight station equipment is being upgraded, and services are being tailored to shippers' needs by: (1) running container trains at faster speeds; (2) boosting transport capacity; (3) developing new locomotives; (4) developing faster freight wagons; (5) developing various new containers; (6) upgrading freight station facilities; and (7) improving information systems.

Faster freight trains

Speed is a priority throughout modern society. In the case of freight transport, speed can be increased by making infrastructure more efficient, and reducing distribution lead times. On the other hand, the delivery speed of consumer items, which are often sorted and delivered by door-to-door couriers, can be increased by overnight transport with trains departing late at night and parcels delivery early next morning.

JNR container trains were limited to a top speed of 95 km/h, but new locomotives and freight wagons manufactured since 1987 have boosted top speeds to 100 or even 110 km/h. These faster speeds are seen mainly on trunk lines.

Each day, an average of 183 fast, long-distance container trains shuttle between Tokyo, Sapporo, Osaka, and Fukuoka. Of these, 44 run at top speeds of 100 km/h or more. The fastest train covers the 554 km between Tokyo and Osaka in 6 hours and 38 minutes, departing Tokyo at 23:03 and arriving in Osaka at 05:41. The schedule speed of 84 km/h is possibly the fastest in the world for a freight train on narrow-gauge track.

Standing times of container trains at freight stations are being cut, and the hours for receiving and consigning container freight are being extended to offer customers better and more convenient services.

Boosting capacity and efficiency

Ease of use depends partly on transport capacity. Any company attempting to boost freight transport capacity must consider operating more and longer trains, boosting container loading and unloading efficiency at freight stations, and increasing the number of trucks used to collect and deliver freight.

Since its establishment, JR Freight has revised train schedules 11 times, and has increased daily runs of container trains from 182 to 425. Of these 425 daily runs, 183 are direct operations on trunk lines through two or more zones. As a result of these changes, the daily transport capacity of container trains is now equivalent to about 21,000 twelve-ft containers.

Many of JR Freight's container trains on trunk lines depart at night. However, the company realizes that container train departure and arrival schedules should be based on client-friendly distribution cycles, so it has adopted a policy of adding more freight wagons to trains that operate in high-density time slots. In the past, one train had a maximum of 20 wagons (400 m), but a maximum of 25 or 26 is now possible due to the introduction of more powerful locomotives, improved freight station facilities, and upgraded electric power equipment. Twenty-eight freight trains run each day on the Tokaido and San'yo lines where demand is heaviest.

The company also operates 312 bulky freight trains of tankers and hoppers. It is cutting costs by increasing the tonnage and reducing freight train hours. Generally, freight locomotives pull a maximum load of 1200 tonnes in tankers and hoppers but introduction of more powerful locomotives in early 2000 raised the maximum load for gasoline to1400 tonnes.

High-performance Electric Locomotives

Class	EF200	EH200	EH500	EF510
Power supply	1.5 kV dc	1.5 kV dc	1.5 kV dc 20 kV ac	1.5 kV dc 20 kV ac
Axle arrangement	B_0-B_0-B_0	(B_0-B_0)+(B_0-B_0)	(B_0-B_0)+(B_0-B_0)	B_0-B_0-B_0
Length (mm)	19,400	25,000	25,000	19,800
Weight (tonne)	100.8	134.4	134.4	100.8
One-hour rating power (kW)	6,000	4,520	4,000	3,390
Starting tractive effort (kN)	350	460	420	330
Maximum speed (km/h)	110	110	110	110
First manufactured	1994	(scheduled for 2001)	2000	(scheduled for 2001)
Notes	Three-phase asynchronous traction motor PWM Inverter control (EF200: GTO thyristor EH200: IGBT thyristor) Electrically controlled air brakes (with dynamic braking)		Three-phase asynchronous traction motor PWM Voltage converter and inverter control (using IGBT thyristor) Electrically controlled air brakes (with dynamic braking)	

Class EF210 electric locomotive hauling high-speed container train on Tokaido Line (Author)

Class EH500 AC/DC dual-system locomotive (JR Freight)

Development of faster powerful locomotives

Most JR Freight locomotives running on trunk lines were built in the 1960s and their age prevents operation at high speed over long runs, or at high efficiency. After 1987, faster more powerful locomotives were developed using new technologies. The aim is to mothball the older locomotives, increase speed, and reduce maintenance costs. The company is mass-producing classes EF200 and EF210 (1.5 kV dc, 3400 kW) electric locomotives for the Tokaido and San'yo lines, Class EH500 (20 kV ac, 50/60 Hz; 1.5 kV dc, 4000 kW) electric locomotives for the Tohoku Line, and Class DF200 (2650 kW) diesel-electric locomotives for Hokkaido. Sixty-five of these new locomotives have already been introduced for high-speed container trains. All have inverter control systems and an AC asynchronous traction motor drive system that can haul 1300 tonnes at 110 km/h. Their actual speed and traction meet the design specifications for container trains and they now form an important part of the JR Freight fleet. The company has also begun to manufacture a new type of DC electric locomotive (Class EH200) with eight powered axles for use on steep-gradient lines as well as an AC/DC dual-system locomotives (Class EF510) with six powered axles for the Sea-of-Japan coast where there are heavy snowfalls in winter[3].

Development of new freight wagons for high-speed trains

Many of JR Freight's wagons were built in the 1960s and inherited from JNR. Because of speed and load limitations, these old wagons were not able to meet the demand for increased capacity, so JR Freight quickly developed new container wagons. The mass-produced Class *Koki* 100 of container wagons can carry 40.5 tonnes at maximum speeds of 110 km/h and have electro-pneumatic controlled air brakes with variable load control. The company operates more than 4300 of these wagons and depends heavily on them. The Japanese government recently relaxed regulations on import and export of container freight, and this has boosted demand for transport of ISO 24-tonne tank containers. To meet this demand, the company has developed and is mass-producing the *Koki* 200 of container wagons. Each wagon can carry two 24-tonne tank containers, for a total of 48 tonnes.

JR Freight is also conducting trial runs with *Koki* 72 low-floor container wagons capable of carrying 48 tonnes on a floor height of just 740 mm. When in full operation, all tracks will be able to carry 40 ft/9 ft 6 in containers landed in Japan from abroad.

Although JR Freight is still using the tanker

New Container Wagons

Class	*Koki* 106	*Koki* 200	*Koki* 72
Length (mm)	20,400	15,000	16,000
Dead weight (tonne)	18.9	16.9	17.2
Maximum payload (tonne)	40.7	48.0	48.0
Floor height (mm)	1,000	1,000	740
Maximum speed (km/h)	110	110	110
Bogies	Two-axle bogies	Two-axle bogies	Two-axle bogies
First manufactured	1996	2000	1997
International marine containers	1CC x 1 1AA x 1	1CC x 2 1AA x 1	1CC x 2 1AAA x 1
JR Containers	12 ft x 5 20 ft x 3 30 ft x 2	20 ft x 2 30 ft x 1	12 ft x 3 20 ft x 2

Koki 200 container wagon with two ISO 24-tonne tank containers (JR Freight)

Loading 40-ft international maritime container on *Koki* 106 container wagon(JR Freight)

and hopper wagons it inherited from JNR, the company has developed a high-performance *Taki* 1000 tanker wagon for crude oil and gasoline. The new design takes into account the need for greater carrying capacity and higher speed. Its fish-belly tank has larger dimensions to increase the capacity to 45 tonnes. The wagons have an improved braking system and can operate at 95 km/h. They will be owned by private companies and JR Freight now operates 462 of them.

Development of different containers

Container size and structure vary greatly, depending on the goods, the pallet type, and the loading and unloading method. Most JR containers are 12-ft long, although some measure 20 or 30 ft. A 12-ft container can carry 5 tonnes and was designed to meet conditions unique to Japan where consignment lots are small, standard pallets measure 1100 mm on each side, and conditions may require use of medium-sized fork-lifts.

These small containers were used for many years by JNR. Recent types feature higher doors on both sides to permit easy loading and unloading of pallets and greater carrying capacity. The 30-ft containers for sorted items were first introduced 10 years ago and are about as long as a large truck body size. They are used on high-density corridors to transport freight consignments by trucking companies. A total of 805 privately owned 30-ft containers are registered.

The company also carries 20- and 40-ft containers from abroad, and also handles 40 ft/9 ft 6 in high containers on its Sendai–Tokyo–Yokohama and Osaka–Kobe–Fukuoka routes.

Dairy products, frozen foods and other refrigerated goods are carried in reefer containers with a refrigeration unit mounted at one end. The temperature in the container can be regulated to anywhere between -25°C and +25°C ±0.1°C. A total of 1235 privately owned freezer containers measuring from 12 to 31 ft are currently registered and in use throughout Japan.

A number of other containers have been developed and introduced to suit individual freight needs. These include containers with vents for air circulation, wing-roof containers, two-level containers for motorcycles, roofless containers, and tank containers.

Upgrading freight station facilities

JR Freight is investing heavily in measures to boost carrying capacity, improve routes and upgrade freight station facilities. These measures, which are being subsidized by the national government, will help improve the environment and bring socio-economic benefits.

The heaviest rail freight volumes are on the Tokyo–Osaka section of the Tokaido main line but many sections of this line are now operating near maximum capacity, making it difficult to run more freight trains in the corridor. One solution is to run longer trains and to meet this need, in 1993, JR Freight began upgrading the capacity of substations and lengthening freight station sidings. After completing this work in 1998, the company introduced new 26-wagon trains. It plans to introduce more in the future.

The old Kita Kyushu marshalling yard is now being converted into a modern container station. When this ambitious project is completed in 2002, JR Freight will be able to run more freight trains and reduce times between the Tokyo area and Kyushu. Container freight stations are also being developed in other parts of the country. Under the old system still used at most freight stations, container trains are switched to an out-of-the-way siding for loading and unloading. But under the new Effective and Speedy Container Handling System (E&S) method, container trains switch directly to a convenient subsidiary main track, stop for unloading and loading at a dedicated platform, and then depart as soon as loading is completed. Unloading and loading are faster, reducing standing time and allowing more container trains to stop at the platform. This E&S method is now used at 18 freight stations in Japan.

Computerized rail freight services

JR Freight has introduced two efficient computer systems to improve its freight services: FRENS (FREight information Network System), supporting container transport, and NETS (NEtwork of Transportation and Strategy), supporting transport of bulky freight in tanker and hopper wagons. Both systems have been installed in about 700 computers in sales branch offices, freight stations and forwarding-agent offices, facilitating online access to and management of transport including:

- Container train reservations
- Current location and circumstances of containers
- Freight train arrival forecasts
- Information on container contents
- Information on freight forwarding companies
- Other detailed information

In other words, the two systems improve the management of container and bulk cargo transport, and customer services. The systems are linked via the Internet to information systems used by container freight forwarders and delivery companies to provide comprehensive and effective transport management.

The 1995 Kobe earthquake also prompted measures to strengthen the ability of railways to respond more rapidly to natural disasters. In 1996, JR Freight began installing a Global Positioning Satellite (GPS) system on the Tokaido and San'yo lines to verify the position and circumstances of freight trains when service is disrupted, and to facilitate communications between rail traffic controllers and train engineers. The system is also very useful when it is necessary to make schedule changes or establish a substitute transport plan after an incident. Train information is relayed to traffic control centres and to FRENS computer terminals, making it possible to give customers more accurate information on the whereabouts and condition of their freight. The company is presently installing GPS-based technology on three other important routes in the Hokkaido, Tohoku and Niigata regions.

Tokyo Freight Terminal at Tokyo Bay (JR Freight)

In spring 2000, a system was installed to read container numbers automatically at 47 major freight stations. In the past, container and freight car numbers were recorded manually, but now wireless tags are attached to each container and wagon and data from these tags is input to FRENS terminals. This system saves labour and provides more accurate and faster information on containers.

A system is also being installed to monitor freight wagon inspections and repairs in order to permit centralized and uniform control over inspection data, thereby ensuring better transport efficiency. Data on previous inspections can be used to improve parts management and compile optimum inspection schedules. The system also facilitates access to information on rolling stock. Another advantage is that this data can be linked to freight wagon tracking data from the FRENS system. This helps quick location of problems, permits coordinated scheduling of operation planning and inspection, and facilitates dispatch of freight wagons. The company is promoting this new system as a way to provide more dependable services, make operations more efficient, and reduce maintenance costs.

JR Freight has also started a system to monitor locomotive inspections and repairs in order to ensure company-wide uniform control and management for the purpose of preventing breakdowns and reducing repair costs.

Other systems to monitor maintenance of electrical equipment, tracks, machinery and other infrastructure have been introduced to reduce costs.

Development of new intermodal systems

In 1986, JR Freight launched piggyback services for small trucks of up to 8 tonnes gross weight and by 1993, an average of 396 trucks were being carried each day across 13 sectors. However, the service was abandoned in spring 2000 because it was becoming too unprofitable for the following reasons: (1) the shortage of truck drivers eased; (2) large trucks could not be piggybacked because of loading restrictions; and (3) loading procedures were inefficient.

However, the company has been carrying swap bodies between Tokyo and Fukuoka since 1999. Swap body transport means carrying large truck bodies (without cab) on freight wagons. The purpose is to encourage a modal shift from road to rail. This type of intermodal system has spread in Europe, but has been modified in Japan to meet unique conditions where body length is limited to 30 ft, volume to 51 m^3, and weight to 12.5 tonnes. Swap bodies are lighter than containers, offer easy loading, and tend to keep their contents stable. The company intends to promote these advantages and encourage greater use of the intermodal swap body method.

Future Challenges

In the 21st century, Japan's distribution business will see a decline in freight volumes and an increase in demands for better service and more efficient transport. These demands will be prompted by adoption of third-party logistics and SCM, and use of advanced information technologies.

During this century, Japan must address a number of difficult challenges, including traffic congestion, atmospheric pollution and other environmental problems, dwindling energy resources, a labour shortage brought on by a falling birthrate, and an aging population. Some can be alleviated through a modal transport shift in high-density corridors, and transport policies have been promoting this shift for some time.

In light of the above, JR Freight believes that rail freight will probably play an important role in transportation of goods in high-density corridors in the future.

The short-term strategy is to develop into a rail freight company that offers the best services for minimum cost. This strategy envisages JR Freight as an efficient carrier providing high-quality rail services in high-density corridors and working in closer coordination with trucking companies that deliver door-to-door.

The medium-term strategy is to evolve into a logistics rail freight system with comprehensive distribution capabilities. This can be done through affiliations with trucking and marine shipping interests using network information systems, but four conditions must be met:

- Provide excellent rail freight services meeting SCM principles.
- Improve customer services and promote up-to-the-minute sales activities, taking advantage of networking technologies.
- Develop competitive rail freight system.
- Provide low-cost transport services.

Rail freight services meeting SCM principles

Manufacturing industries are rapidly taking the lead in introduction of SCM principles. JR Freight intends to establish information systems that meet these principles with the goal of being able to rapidly develop optimum rail transport schedules that meet customers' daily requirements for container shipments. To achieve this goal, the company must use an information system that will help it to predict how many different types of containers and how many delivery trucks will be needed during individual time slots at each station, and to predict when goods will arrive. Such a system would ensure accurate and efficient container handling decisions. The system must also provide accurate data on location of containers, which means establishing another information system linked via the Internet to customers' distribution information systems, permitting online container tracking.

Loading Swap Body at Tokyo Freight Terminal (JR Freight)

SCM requires short distribution cycle lead times, meaning further cuts in times between major cities. Therefore, JR Freight plans to introduce super-express cargo trains travelling at schedule speeds of at least 90 km/h in the high-density corridor between Tokyo and Osaka, and to raise the schedule speed of container trains to 80 km/h between other major cities. The company is continuing R&D into high-speed freight trains in order to increase locomotive and freight wagon speeds further.

Improving customer services and boosting sales potential

To further improve services and distribution efficiency, the FRENS system should be fine-tuned to permit JR Freight to coordinate online, real-time processing of a wide variety of information using the Internet and electronic data interchange (EDI) systems with customers.

As the information revolution continues to make strides in tandem with the Internet, more-and-more companies will conduct online commerce with customers. Rail freight companies should also use email to determine customers' needs, expand their market and develop new customer-friendly services. A homepage and email communications with customers would make it easier to answer enquiries about the location of a specific container, expected arrival time, etc., especially when schedules are disrupted.

JR Freight intends to develop business support systems that will permit processing of a wider variety of sales-promotion information, including customer profiles, previous customer shipments and business, complaints, inquiries, marketing information, and information on products and services. This would facilitate prompt and efficient sales activities, and raise customer confidence.

Developing competitive rail freight system

Over the last few years, deregulation has facilitated the development of trucking and coastal shipping interests, encouraging use of large trucks, semi-trailers and high-speed ferries. Trucks and ships have become more efficient in moving goods, and are now transporting larger volumes of commodities over longer distances to the detriment of rail freight.

To reverse this trend, JR Freight must develop an advanced rail container system. With this in mind, the company is presently studying a wide range of issues, including container loads and volumes, specifications for container trains, transportation networks, transport scheduling, collection, delivery and information systems.

Cost reductions for customers and company

The two factors considered first by every customer are service quality and price. Customer demands may change, but price will always remain an important factor. This means that JR Freight must adopt low-cost transportation methods. Tomorrow's railways will be able to cut costs partly through use of information technologies.

The first step is to develop information systems that will permit the efficient use of locomotives, freight wagons and other railway resources. If the company uses each locomotive and freight car efficiently, and knows the location of each unit, it can cut costs by allocating rolling stock in the optimum manner. The same type of information processing systems can be used to assign containers and trucks serving freight stations. This will greatly cut costs for all operations, including cargo collection and delivery.

The next step is to re-engineer freight station operations by introducing support systems. An automatic container number reading system has already been introduced and the company intends to develop other information systems to raise the efficiency of all freight station operations and cut labour costs. Some of these systems will support container loading and unloading, container relay operations, freight wagon allocation, and ledger entries. ■

Notes

1. JR Freight is not the only rail freight carrier in Japan. Another 11 private rail freight companies serve ports, and eight private railways carry cement, limestone, coal and other commodities. These 19 companies transport about 20 million tonnes of freight each year.
2. Ro-Ro means roll-on roll-off ferries in which trucks drive on at one end and drive off at the other.
3. In Japan, the maximum axle load is 17 tonnes to prevent excess load on tracks and other infrastructure. This is why freight locomotives have six to eight powered axles.

Katsuji Iwasa

Mr Iwasa is a Senior Executive Director and Director General of Logistics Headquarters of JR Freight. He joined JNR in 1962 after graduating in mechanical engineering from Keio University and was appointed Safety Manager in the Train Operation Department in 1985. He became Technical Director of JR Freight in 1987 where he was also Executive Director of the Tokai Regional Office in 1990. He was appointed CEO and President of Fukushima Coastal Railway in 1995 before assuming his present post at JR Freight in 1999.