

THE RAILWAY MARKET IN JAPAN

1. The structure of the railway industry in Japan

There are about 180 railway companies in Japan. The total length of Japan's railways for both passengers and freight is about 27'000 km, and about 1'180 million passengers are carried per kilometer daily. These facts say that Japan is one of the most railway-dependent countries in the world. [See Tables 1 and 2]

Many of Japanese railway companies are private ones. They are classified into three groups as shown in [Table 3] below: Japan Railways Group (hereafter, JR), which was divided from the government-owned Japanese National Railways in 1987; traditional private railways; and public railways run by local governments.

[Table 3] Major Japanese railway companies

Category		No.	Name
JR Group		7	JR Hokkaido, JR East, JR Tokai, JR West, JR Shikoku, JR Kyushu, JR Freight
Private railways	Major private railways	16	Tobu Railway, Keisei Electric Railway, Seibu Railway, Keio Corporation, Odakyu Electric Railway, Tokyu Corporation, Keikyu Corporation, Tokyo Metro, Sagami Railway, Nagoya Railroad, Kintetsu Railway, Keihan Electric Railway, Hankyu Railway, Hanshin Electric Railway, Nishi-Nippon Railroad
	Local private railways	120	Shin-Keisei Electric railway, Shizuoka Railways, Osaka Metro, Hiroshima Electric Railway, Toyama Chiho Railway, etc.
Public railways		13	Toei Transportation, Transportation Bureau City of Nagoya, Kobe Municipal Transportation Bureau, Fukuoka City Subway, etc.
Others		26	Freight railways, Cable railways, etc.

Source: Japan Private Railway Association <https://www.mintetsu.or.jp/global/>

Many of Japan's railways, particularly the major private railways, are concentrated in major metropolitan areas, and small private railways exist mainly in major regional cities. Public enterprises run bus business in addition to railway business. Local cities, such as Sapporo, Sendai, Yokohama, and Kobe, also run subways. The Shinkansen is a network of high-speed railway lines run by JR East, JR Central, JR West, and JR Kyushu.

What makes Japanese railway companies including JRs unique is that they also run business other than their main business, such as other transportation business like buses, tourism, real estate business, and commercial facility business.

Japanese railway companies, like their overseas counterparts, set specifications and standards for construction and expansion of vehicles, electrical facilities, signaling equipment, etc., but they do not perform actual work, which is carried out by private specialized companies.

Such system can be shown in a hierarchical [Table 4] as follows.

[Table 4] Industrial structure of rolling stock and signal manufacturers

Category	Group	(major) Companies
Category I	Railway companies	JRs, Major railway companies, Local railway companies, etc.
Category II	Vehicle assembling / Signal & Electric equipment companies	Hitachi Ltd., Kawasaki Heavy Industries, Japan Transport Engineering Company, Nippon Sharyo, Ltd., Kinki Sharyo Co., Ltd. Mitsubishi Electric, Toshiba Corporation, Kyosan Electric Manufacturing Co., The Nippon Signal Co., Ltd., etc.
Category III	Major suppliers	Toyo Electric MFG. Co., Ltd., Nabtesco, Mitsubishi Heavy Industry, Nippon Steel & Sumitomo Metal, KYB Corporation, etc.
Category IV	Other suppliers	Other, various

When new equipment or a new vehicle is designed and manufactured, Category I railway companies present the basic specifications of a new product to Categories II and III companies first. Then the lower category companies design the new product according to the specifications, and are responsible for manufacturing it in cooperation with many Category IV parts suppliers.

2. Barriers that block overseas companies from entering the Japanese market

The following are examples of barriers to entry into the Japanese market shown by overseas companies:

- No proven track record in Japan
- Not compliant with Japanese standards
- Unclear terms of a contract
- After-sales service
- Flexibility for localization and customization

Proven track record in Japan

Since the railway industry focuses on conventional techniques that are continuously handed down from generation to generation, many of traditional designs and manufacturing methods are still used. For this reason, when starting a new project, railway companies bear only the responsibility for the basic specifications and design based on its conventional vehicles and systems, while manufacturing is carried out by Japanese major companies who have abundant experience and are familiar with conventional specifications and designs. At this stage, it is difficult for overseas companies with little experience in Japan to enter the Japanese railway market, even if they have solid track records in other countries.

Also, since railway systems must ensure the safety of human life, the Japanese railway industry is particularly cautious about drastic changes in technology and introducing new technologies. It is also true that many projects involving a new technology have been rejected because sufficient evidence of safety has not been established in Japan. The above issue is caused also by a Japanese system, such as the Agreement on Government Procurement (GPA) of the WTO¹. This agreement stipulates that overseas suppliers should be treated as those in Japan regarding procurement by the government exceeding a certain amount of money. In the railway field, however, there is an exception that states: "Procurement related to operational safety is out of the scope." Therefore, purchases are often made from Japanese companies that have provided evidence of safety.

¹ <https://www.mofa.go.jp/mofaj/gaiko/wto/chotatu.htm> Since Switzerland has not accepted the revised GPA as of February 2019, refer to Article 23 of the 1994 GPA.

Not compliant with Japanese standards

In many countries, railway technologies are required to conform to international standards (ISO, IEC) and European Standards (EN), while many of Japanese standards are unique to Japan and different from the aforementioned standards. Furthermore, many of Japanese railway companies often request conformity to their own specifications and standards. Among Japanese standards, there are some unwritten ones like fire safety of railway vehicles. Thus, companies aiming to enter the Japanese railway market should research standards of both Japan and railway companies in advance and prepare for dealing with such standards.

After-sales service

In the event of vehicle failure, differences in response and after-sales service between Japanese and overseas companies often become a controversial issue.

In case of a Japanese company, a responsible person will respond to the problem immediately if anything occurs. On the other hand, in the case of an overseas company, it is needed to prove that the company is responsible for the cause of the problem, and it takes more time for the company to respond to it including repair or parts replacement than a Japanese company. This is the biggest concern of Japanese companies about overseas companies. Also, if a part is defective, Japanese companies not only check it but also investigate all vehicles using the same part and take preventive measures. While some overseas companies only replace the failed part and do not take any further action. For this reason, when the time for replacement approaches, many Japanese companies who once purchased parts from overseas companies procure parts from Japanese companies like before. If so, it is no exaggeration to say that those overseas companies will have almost no chance to receive orders from not only Japanese railway companies (e.g. JR or Tokyo Metro) and but also railway-related companies.

Issues of the current Japanese railway technology market and solutions

As mentioned above, Japanese railway companies are quite cautious about drastic changes in technology and introducing new technologies.

However, they are now facing various issues as follows.

- Decreased passengers and labor shortage due to Japan's declining birthrate and aging society
- Shortage of young engineers
- Harsh business environment of local railways
- Aging facilities
- Real-time provision of information at times of major disaster

The Japanese railway industry must imminently deal with technological transformation and the following are examples.

- Introduction of communications-based train control system (CBTC)
- Maintenance technology without manual operation (condition monitoring system)
- Advanced automation and self-driving technology using IoT and AI
- Response to new services like MaaS

Technologies in these fields are closely linked to the rapid advances in AI technology, ICT technology, and digital technology. In particular, regarding technologies such as self-driving technology, communications-based train control, and condition monitoring. European companies already have more experience and knowledge than Japanese competitors. Thus, they are likely to have significant opportunities to enter these fields. When a new system that has not been available in Japan or a cutting-edge technology is introduced, overseas companies considered as suppliers are actually increasing regardless of their proven track records. Some technologies of European companies have already been used in Japan. Examples are Ethernet transmission lines, building smart systems in large-scale electric facilities like substations, track maintenance, and condition monitoring technologies using AI.

- Ethernet transmission device: HARTING Japan (Germany)
- Communications-based train control system (CBTC): Thales Group (France)
- Smart power system: ABB (Switzerland)
- Bearing condition monitoring system: SKF (Sweden)

Concerning MaaS, JR East established the "Mobility Innovation Consortium" to solve social issues in

cooperation with transportation companies, Japanese and overseas manufacturers, universities, and research institutes. In the consortium, multi-modal services in urban areas are discussed. Odakyu Electric Railway (OER) is also aiming to build a network using next generation mobility.²

In order to expand opportunities to enter the Japanese market, it is very important to understand the characteristics of Japanese railway technology and to respond flexibly to localization and customization. Many European companies have already produced good results by understanding the characteristics of Japanese railways in metropolitan areas, including high-frequency and high-density train services.

- Connectors for Ethernet transmission devices: HARTING Japan (Germany)
- Circuit breakers for railway vehicles: Secheron SA (Switzerland)
- Current transducers for electric motors of railway vehicles: LEM Japan (Switzerland)
- Brake calipers for railway vehicles: Knorr-Bremse Japan (Germany)
- Batteries in railway vehicles: Saft Japan (France)

Another way to get the credit before entering the Japanese market is that their products are used by Japanese companies expanding overseas.

When Japanese railway companies expand overseas, their products must meet international standards or European Standards instead of their own standards. Since even individual parts are often subject to standards, it takes much time and work to obtain the certification for every single item. Many parts manufactured by European companies including Swiss ones are already compliant with European Standards or international standards (many of which are made based on European Standards). For Japanese companies, it is attractive to adopt European products when they expand their businesses overseas. In this case, European companies can get the credit, developing their opportunities to enter the Japanese market for their future business development in the country.

Examples

- Connectors for Ethernet transmission devices. Their specifications have become a Japanese standard after they were used in equipment for overseas development.
- Floating floor structure adopted in High-Speed Trains in the UK. JR companies are considering adopting it because the system has been improved to provide comfort to passengers.

Since private enterprises are more free in selecting suppliers than public ones, it is possible for many private ones including those from overseas to enter the market. The JR Group says that it would like to increase contacts with overseas blue-chip companies with the latest technology.

3. Summary

- There are differences in environment and standards between Japan and Europe. In particular, since Japan has a high population density, urban railways are required to provide high-frequency and high-density train services. Therefore, overseas companies must respond flexibly to localization and customization, developing products to meet the requirements and environment.
- Overseas expansion by Japanese companies can also be big business opportunities for overseas companies to enter the Japanese market in the future.
- When a new technology is introduced or a new system is built with digital technologies, overseas companies would have many opportunities for entering the market.
- Overseas companies should understand the importance of after-sales service and put it into practice.
- Mass-Trans Innovation Japan 2019 offers great opportunities to understand the current situation of the Japanese railway industry and business opportunities. Many railway technology suppliers will exhibit their products and many people from Japanese railway companies will visit the exhibition, where will be a venue for various interchanges and business negotiations.
- Swiss Business Hub Japan provides customized projects such as market research and searching for partners to meet the needs of Swiss companies.

²www.mlit.go.jp/pri/kikanshi/pdf/2018/69_1.pdf

4. Annex

[Table 1] Total length of railways in major countries

	Country (Year)	The total length of railway
1	U.S.A (2007)	224'792km
2	Russia (2006)	87'157km
3	China (2008)	86'000km
4	India (2009)	63'974km
5	Canada (2008)	46'552km
6	Germany (2008)	41'981km
7	Australia (2008)	38'445km
8	Argentina (2008)	36'966km
9	France (2008)	29'640km
10	Brazil (2008)	28'538km
11	Japan (2009)	27'182km
12	Ukraine (2012)	21'619km
13	Italy (2008)	20'255km
14	South Africa (2008)	20'192km
15	Poland (2007)	19'428km

Source: International Union of railways <https://uic.org/>
 UNIFE, European Rail Industry <http://www.unife.org/>

[Table 2] Annual passenger transportation volume in major countries

	Country (in 2012)	Annual passenger transportation volume (a million persons/km)
1	India	978'508
2	China	795'639
3	Japan	244'591
4	Russia	144'612
5	France	85'634
6	Germany	80'210
7	UK	64'324
8	Ukraine	49'203
9	Egypt	40'837
10	Italy	38'676

Source:
 International Union of railways <https://uic.org/>
 UNIFE, European Rail Industry <http://www.unife.org/>

[Table 5]

Breakdown of components for railway signal equipment and rolling stock related products manufactured in Japan.

Items	2015 in JYP (CHF)	2016 in JPY (CHF)
	Unit = 1'000JPY (1'000CHF)	Unit = 1'000JPY (1'000CHF)
Railway vehicle parts	323'616'916 (2'941'972)	326'108'686 (2'964'624)
Power generator	508'253 (4'620)	326'851 (2'971)
Diesel engine	508'253 (4'620)	326'851 (2'971)
Other power generator	-	—
Power transmission device	1'036'513 (9'422)	1'144'296 (10'402)
Liquid type transmission	117'236 (1'065)	317'100 (2'882)
Reversing machine	201'628 (1'832)	121'627 (1'832)
Propeller shaft	413'540 (3'759)	377'103 (3'427)
gear	30'410 (276)	328'466 (2'986)
Bogie and car body articles	76'280'440 (693'458)	72'561'151 (659'646)
Bogie	9'435'626 (85'778)	10'136'483 (92'149)
Coupling device	2'660'215 (24'183)	2'513'923 (22'853)
Spring	300'897 (2'735)	328'124 (2'982)
Oil damper	2'269'482 (20'631)	1'907'188 (17'338)
Wheel shaft goods	20'165'676 (183'324)	17'342'680 (157'660)
Shaft box	3'622'161 (32'928)	812'357 (7'385)
bearing	6'645'662 (60'415)	7'418'033 (67'436)
Other trolleys and car body articles	31'180'721 (283'461)	32'102'363 (291'839)
Brake device	37'393'582 (339'941)	36'807'309 (334'611)

A brake shoe	4'836'189 (43'965)	4'518'258 (41'075)
Air Brake Supplies	28'840'249 (262'184)	28'768'566 (261'532)
Other brake devices	3'717'144 (33'792)	3'520'485 (32'004)
Electrical equipment	173'946'343 (1'581'330)	183'577'210 (1'668'883)
Main motor	12'928'622 (117'532)	12'086'208 (109'874)
Main transformer	1'061'858 (9'653)	850'590 (7'732)
Main converter	21'240'905 (193'099)	19'719'858 (179'271)
Auxiliary power supply	10'821'546 (98'377)	11'784'934 (107'953)
Control device	31'918'332 (290'166)	32'995'299 (299'957)
Current collector	753'662 (6'851)	727'184 (6'610)
Lighting device	1'236'046 (11'236)	1'495'225 (13'592)
Electric cooler / heater	6'984'695 (63'497)	4'322'244 (39'293)
Monitor device	20'764'196 (188'765)	21'368'146 (194'255)
Automotive train automatic control equipment	10'241'700 (93'106)	11'860'082 (107'818)
Other electrical equipment	55'994'781 (50'907)	66'367'440 (603'340)
Equipment for diesel engine	456'153 (4'146)	282'938 (2'572)
Auxiliary equipment	593'737 (5'397)	476'441 (4'331)
Container	2'372'001 (21'563)	2'167'706 (19'706)
Other rail car parts	31'029'894 (282'089)	28'764'784 (261'498)

1 CHF = 110 JPY as of February 2019

Source: Ministry of Land, Infrastructure and Transport Traffic statistics Annual report

[Table 6] Import/Export Data

2018

Tarif No.	Products	KG	JPY	CH
8605.00-000	Railway or tramway maintenance or service vehicles, whether or not self-propelled (ex. workshops, cranes, ballast tampers, trackliners, testing coaches and track inspection vehicles)	36'000	413'618'000	3'760'163
8607.19-000	Parts of railway or tramway locomotives or rolling-stock: Other, including parts: wheels, axles and metal tiers	150	3'431'000	31'191
8607.21-000	Air brake and parts thereof	130	3'174'000	28'854
8607.91-000	Hooks and other coupling devices, buffers, and parts thereof locomotives	20	1'223'000	11'118
8607.99-000	Hooks and other coupling devices, buffers, and parts thereof others	2'422	3'7304'000	339'127
8608.00-000	Railway or tramway track fixtures and fittings; mechanical (including electro-mechanical) signaling, safety or tramways, roads, inland water ways, parking facilities, port installations or airfields, parts of the foregoing	4'507	6'906'000	62'781

2017

Tarif No.	Products	KG	JPY	CHF
8604.00-000	Railway or tramway maintenance or service vehicles, whether or not self-propelled (for example, workshops, cranes, ballast tampers, track liners, testing coaches and track inspection vehicles)	40000	265'312'000	2'411'927
8607.29-000	Parts of railway or tramway locomotives or rolling stock: others	155	1'355'000	12'318
8607.99-000	Hooks and other coupling devices, buffers, and parts thereof others	1662	32'556'000	295'963
8609.00-000	Containers (including containers for transport of fluids) specially designed and equipped for carriage by one or more modes of transport	2435	903'000	8'209

Source: Trade Statistics of Japan <http://www.customs.go.jp/toukei/srch/index.htm>

*Any train technology related items from Japan were not imported in Switzerland in 2017 and 2018.

References:

- Toyo Keizai <https://toyokeizai.net/>
- Nikkei <https://www.nikkei.com/>
- Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
<http://www.mlit.go.jp/en/index.html>
- Trade Statistics of Japan <http://www.customs.go.jp/toukei/srch/index.htm>
- Rolling Stock & Technology (magazines)