

MESSAGE

Bringing Railway Systems Driven by Digital Technologies to the World

The Heart of Mobility Services that are Responsive to People and the Environment

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Demand for railways is growing, both in emerging nations suffering from worsening traffic congestion and in developed nations where social infrastructure has come due for replacement. Having undergone considerable development to address the demand for medium-to-long-distance public transportation due to the low environmental load and highly efficient transportation they provide, railways are expected to play a role in supporting sustainable societies, evolving into next-generation mobility in which the incorporation of the latest digital technologies will deliver even higher levels of efficiency and convenience. Seeing this trend, Hitachi is accelerating the global expansion of its railway business by pushing ahead and joining with customers via digitalization in many different areas, taking the lead in railway innovation. Shinya Mitsudomi, the vice president and executive officer who oversees the operational and sales divisions of Hitachi's Railway Systems Business Unit in Japan and the Asia-Pacific region, explained about how Hitachi is contributing to global society through its railway business and about the future of railway systems.



Major Changes in the Industry Landscape Brought about by Globalization

Demand for railways has grown in recent years as a form of mobility that has a low environmental load and provides highly efficient transportation. In terms of the market environment, meanwhile, at the same time as the world's largest manufacturer of rolling stock, CRRC Corporation, is becoming more active outside its home market of China, competition is also intensifying through ongoing growth in scale brought about by alliances,

including the announcement by Siemens AG of Germany and Alstom of France (the second and third largest manufacturers, respectively) that they would merge their railway businesses. On the technical front, the wave of digitalization has reached the railway industry, with innovations appearing that are derived from such technologies as the Internet of Things (IoT) and data analytics.

Having been quick to see these changes coming, the railway division of Hitachi has taken steps that include pivoting its business strategy and strengthening its internal structure. The largest pillar in this is globalization. While Japanese railway technology is recognized as world-leading and Hitachi has been playing its part in this for many years, it is also the case that the company needs to grow into a genuine global player if it is to continue to develop its business in the future.

As a first step toward achieving this, Hitachi in 2005 became the first Japanese vendor to win a contract to supply high-speed rolling stock to the UK. 2014 saw both the transfer of the headquarters functions of the Railway Systems Business Unit to London and the appointment of Alistair Dormer, former head of Hitachi Rail Europe Ltd., as CEO. Hitachi's overseas business also underwent a sudden expansion in 2015 with the acquisition of AnsaldoBreda S.p.A., a rolling stock manufacturer, and Ansaldo STS, a turnkey supplier and signals business, from Finmeccanica, a large Italian defense and aerospace company.

The Railway Systems Business Unit currently employs more than 12,400 staff, with Japanese in the minority, making up less than 30% of the total. The percentage of railway business sales made outside Japan switched around from 38% in FY2014, the year of the headquarters transfer, to 83% in FY2017. Diversity is also increasing. Of the business's top management, three are Japanese, three are from the UK, and four are Italians, one

of whom is a woman. In just the past 10 years or so, the company landscape has undergone major changes.

Number of Production Sites Increased to 11, Spanning Japan, USA, and Europe

One of the most notable overseas projects has been the Intercity Express Programme (IEP) for replacing ageing rolling stock on the high-speed railway between London and other major cities in the UK. In 2009, Hitachi won preferred bidder status on this major project, which includes the supply of 866 cars and maintenance services for 27.5 years. Overcoming the twists and turns of financial crisis and a change of government, the new Class 800 rolling stock commenced operation on the Great Western main line in 2017.

Hitachi's involvement with the UK dates back more than 20 years. Although the early days included failures to win orders, after much trial and effort, an order for 174 Class 395 cars was successfully obtained in 2005. I believe that the recognition we achieved through this initial project, including the quality of our products and our approach of building a relationship of trust with customers over the long term, was the major factor in winning out over intense competition in the IEP tender.

Along with work on winning the order in collaboration with the railway research and development (R&D) department at Hitachi Europe's European R&D Centre, the IEP also marked the start of local production of rolling stock. A new rolling stock manufacturing plant was opened in 2015 at Newton Aycliffe in the northeast of England and is now in full production. Although local manufacturing was not a condition of the tender, rather than just making railway services more comfortable, the plan was to show Hitachi's

strong commitment to local employment creation and to making a contribution to UK society.

As the UK manufacturing plant also hosts a design team from Japan and engineers from the former AnsaldoBreda (now Hitachi Rail Italy S.p.A.), it is a vibrant workplace with a mix of Japanese, English, and Italian engineers. Although the base design for the rolling stock was done in Japan, localization including the interior design and compliance with accessibility standards took place in the UK.

Orders have also been received for rolling stock based on the Class 800 to run on lines other than the IEP, with some production to take place at the Pistoia plant of Hitachi Rail Italy. As Hitachi Rail Italy also has production facilities in the USA, Hitachi's railway manufacturing became spread across 11 sites spanning three different continents.

We are currently seeking to work with parts suppliers and other partners from around the world to establish a supply chain that incorporates these partners and is optimized from parts procurement to rolling stock production.

Business Expanding in both USA and Asia

Acquired at the same time as AnsaldoBreda, Ansaldo STS is a global player in signalling systems and in turnkey solutions that combine both design and engineering for entire railway systems. Contracts have been won in the USA by taking advantage of the ground occupied by both companies, including an automated driverless railway system in Honolulu, Hawaii as well as metro projects for Miami and Baltimore. There is demand in

TOPICS 1

UK Intercity Express Programme Rolling Stock Commences Commercial Operation

On October 16, 2017, Hitachi's first Intercity Express Programme (IEP) trains in the UK commenced commercial operation on the Great Western main line that links London to Reading, Bristol, Bath, Cardiff, and other cities.

The Great Western main line has yet to be fully electrified, with trains only able to run on electric power for part of its length. The method used to overcome this problem was Hitachi's bi-mode technology. The method uses rolling stock designed to run on both electrified and non-electrified track that are able to seamlessly switch between drawing power from the overhead lines and drawing from the diesel engine generator system, without affecting passengers. This means that the new rolling stock can operate even on non-electrified track where upgrade work has yet to be completed.

The entry into service of IEP rolling stock was a historic day for the railway industry in the UK.

The new Hitachi rolling stock replaced rolling stock that were manufactured 40 years ago and ran on track that was first laid down in 1838. With the UK welcoming investment in new rolling stock, the advanced IEP trains are emblematic of a new era in rail transportation in that nation.



IEP train arriving at a station

the USA for ways of improving railway safety and we hope to gain market share in that country in areas that include traffic management and signaling systems. Numerous other overseas projects are also proceeding, including turnkey projects in Taiwan and Vietnam, and driverless cars for Copenhagen Metro's City Circle Line in Denmark.

Turnkey solutions that integrate a wide range of different subsystems demand management know-how and a high level of skills. These are areas where Ansaldo STS has more experience and much is being learned from them. We also share with AnsaldoBreda a tradition of placing a high value on craftsmanship and are developing a growing sense of mutual affinity. Since the acquisition, progress on integration has been made on the basis of a positive relationship, including local staff who have expressed gratitude about the

efficiency improvements being made as a result of our actively investing in existing plants to update production lines, test facilities, and other equipment. While differences still exist over design and in our approaches to manufacturing, I feel both sides also have much to gain by learning from these differences and putting them to use.

Meanwhile, our business in Japan is also steady. Along with the commencement of operation in February 2018 of the new 20000 series rolling stock supplied to Sagami Railway Co Ltd., we have also won orders for the prototype of the N700S that will be the next-generation Shinkansen for the Central Japan Railway Company, E7 series rolling stock for the East Japan Railway Company, 1000-series and 1300-series rolling stock for the Hankyu Corporation, and a traffic management system for the Tokyu Corporation.

TOPICS 2

USA's First Automated Driverless Rail Transit System Project Underway in Honolulu, Hawaii

Ansaldo Honolulu Joint Venture (AHJV), the Hawaiian business vehicle of Ansaldo STS and Hitachi Rail Italy, has supplied the first trainset for the Honolulu Authority for Rapid Transportation (HART) contract that was awarded in 2011, making the announcement at the HART Rail Operations Center (the rolling stock maintenance depot) in Honolulu, Hawaii.

The Honolulu Rail Transit Project for which AHJV won the contract is a new railway line that will serve 21 stations and run for approximately 32 km from East Kapolei on the outskirts of Honolulu to the Ala Moana Center in the city center. The line will be the first automated driverless rail transit system in the USA. Operation will initially commence in 2018 serving nine stations, with services to all 21 stations scheduled to start in 2021.

By combining Ansaldo STS's experience of working on turnkey projects around the world with

Hitachi Rail Italy's advanced and highly reliable rolling stock, AHJV is helping to mitigate Honolulu's chronic traffic congestion while also contributing to safe and comfortable urban development that has a low load on the environment.



Unveiling of rolling stock at HART Rail Operations Center



Joined Hitachi, Ltd. in 1982. After being assigned to the National Railway Department of the Sales Division and working on railway sales in Japan, he was appointed General Manager of the Sales & Marketing Department, Global Sales & Marketing Division in the Transportation Systems Division in April 2004 where he worked in overseas railway sales. He was appointed CSO and head of the Corporate Development & Strategy Division of the Rail Systems Company in April 2012. In April 2014 he transferred to London as Corporate Officer, Global CSO of the Railway Systems Business, and CSO of the Rail Systems Company. After returning to Japan, he was appointed Managing Director (Japan Asia-Pacific) and CSO of the Railway Systems Business Unit in April 2016. He took up his current position in April 2018.

Digital Solutions as a Means of Differentiation

The railway business currently operates in 27 different countries around the world, to the extent that it is spoken of within Hitachi as a role model for overseas expansion. The business portfolio has expanded beyond rolling stock and associated equipment to also include signals and signalling systems, service and maintenance, and turnkey solutions, with progress being made toward establishing the infrastructure to supply a full range of railway solutions.

However, as noted at the beginning of this article, the extreme intensity of competition makes it impossible to be complacent about the future. In seeking to differentiate ourselves from the major global players, one option I believe lies in digital solutions. There still remains much scope within the railway industry for using digital technology

to improve product connectivity and for putting data to work in maintenance and services. Such initiatives are already underway, and whereas other companies are using measures such as acquisitions to take on digital technology, a major strength of Hitachi is that we already have such technology.

A Dynamic Headway Solution being trialed at Copenhagen Metro, for example, works by installing sensors at stations to provide information on the level of crowding, analyzing how many passengers are present, and automatically adjusting the number of trains in service based on the increase and decrease of passenger numbers. This was made possible by a fusion of rolling stock technology from Hitachi Rail Italy, train control from Ansaldo STS, and digital technology from Hitachi. It represents a new digital solution that can cut costs and improve energy efficiency and operational performance for railway operators while also ensuring that passengers can travel in comfort.

While the operation of driverless freight trains has already been trialed in Australia using train control technology from Ansaldo STS, the potential also exists for further efficiency gains and to extend driverless operation to passenger trains by combining this technology with Hitachi's information technology (IT).

A Vision of Future Mobility, from "Mass" to "Personal" Services

For our Japanese customers also, we supply not only rolling stock, but also a preventive maintenance solution that uses the Lumada IoT platform. The latest rolling stock are fitted with hundreds of sensors that collect large amounts of data on equipment and vehicle movements. By analyzing these data to continuously monitor rolling stock

performance, thereby identifying the warning signs of faults and determining the best time to replace parts, this helps reduce maintenance costs and make design improvements. Hitachi is already utilizing data in its maintenance business and in processes from design to production as a way to improve the efficiency of its management.

Using data to improve maintenance productivity is likely to become essential as labor shortages become more severe, particularly in Japan. However, there is more to using data than just analytics. Also crucial to the development of genuinely useful solutions is the operational knowledge that Hitachi and our customers have built up through our business activities. Hitachi talks about operational technology (OT) × IT × products, by which we mean the collaborative creation of value by combining data and operational know-how from

TOPICS 3

Opening of Miami Plant and Commencement of Operation of New Rolling Stock

In another step in the accelerating global expansion of Hitachi's railway business, Hitachi Rail USA, Inc., the USA subsidiary of Hitachi Rail Italy, opened a new rolling stock plant in Miami-Dade County, Florida in March 2016. Located on a site of approximately 48,000 m², the plant is made up of five buildings, including production, testing, and office facilities, making it an important hub for Hitachi as it expands its business in the USA.

New rolling stock produced at the Miami plant commenced operation in November 2017. A ceremony held to mark the occasion was attended by numerous guests, including the mayor of Miami-Dade County and the consul generals of Japan and Italy. The project was a replacement for existing rolling stock used on the Metrorail transit system operated by Miami-Dade Transit and involved an order for 136 cars that was won in 2012 by Hitachi Rail Italy (at that time, AnsaldoBreda). Replacement

of the rolling stock is scheduled to be completed by the end of 2019.



Rolling stock plant opened in Miami and new rolling stock now in service on Miami-Dade County's Metrorail transit system

customers with Hitachi technology and products, with considerable effort going into our solution-driven Social Innovation Business. In the railway industry, our aim is to leverage our good relationships with customers in Japan and elsewhere to become a force for resolving both management and societal challenges.

Data utilization is also valuable for improving passenger service, as in the example of our Dynamic Headway Solution. Whereas railways in the past have developed as mass transit services, the spread of smartphones and other personal devices makes it possible to also offer personal services such as providing directions or other information to station and train users in ways that are only available in that particular time and place. The world that Society 5.0 seeks to create has the potential to provide mobility in a way that helps individual users get to where they want to go, and in which railways offer both on-demand services and seamless integration with

other modes of transportation. With a business that includes automotive equipment as well as railways, Hitachi is recognized for its potential to be a pioneer, working with customers to come up with such an all-encompassing vision for future mobility.

Mobility plays a vital role in the development of cities. To make it even better, Hitachi is contributing to “making cities and human settlements inclusive, safe, resilient, and sustainable,” one of the United Nations’ Sustainable Development Goals (SDGs), seeing this as a way of improving people’s quality of life while also reducing the load on the environment. Hitachi also intend to continue contributing to innovation and progress in railways by strengthening our collaborative creation and partnerships with customers to help overcome challenges such as the abnormal weather events that occurred in various parts of the world over the summer, and global warming, which has been implicated in causing them.