Featured Articles

IP Management at Hitachi's Overseas Rolling Stock Business

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OVERVIEW: Hitachi is actively involved in the rolling stock business, not only in Japan but also overseas, particularly in the UK, having won orders for high-speed rolling stock for the HS1 line in 2005 and the IEP in 2012. Along with the overseas operations of its rolling stock business, an increasingly large proportion of IP management at Hitachi involves activities conducted in regard to overseas business. This article describes Hitachi's overseas operations, particularly in the UK, and the associated IP management.

INTRODUCTION

HITACHI is actively involved in operating its rolling stock business overseas. In the UK in particular, it has supplied high-speed Class 395 rolling stock for the High Speed 1 (HS1) line. With the recognition of this project as a success, Hitachi has also won an order to supply rolling stock and maintenance for the upcoming Intercity Express Programme (IEP).

Along with this active involvement in overseas business, an increasingly large proportion of the intellectual property (IP) management related to the rolling stock business involves activities conducted in regard to overseas business. This article describes Hitachi's overseas operations, particularly in the UK, and the associated IP management.

HITACHI'S ROLLING STOCK BUSINESS IN UK

History of Involvement in UK

When Hitachi first became involved in the UK railway industry in 1999, the UK rolling stock market was dominated by the "big three" of Bombardier, Siemens, and Alstom. However, the expectation of strong demand for the replacement of aging rolling stock indicated there was an opportunity for a Japanese supplier to enter the market.

Table 1 lists major milestones in the history of Hitachi's rolling stock business in the UK.

Hitachi bid on rolling stock projects in 2000 and 2001 but failed to win any orders. While possible explanations for this include differences in commercial practices and contract arrangements or problems with organizational structure[1], it has been suggested that it was in a large part due to the risk of adopting Japanese railway systems that were unproven in the UK, where the infrastructure is different. Subsequently, Hitachi embarked in 2002 on the V-Train 1 project for trialing existing UK rolling stock fitted with a Hitachi traction system (inverters and motors)[1), 2]. The successful completion of these trials demonstrated the high quality of Hitachi railway systems. With the success of these initiatives, Hitachi was able to win a contract for its first UK rolling stock project, the Class 395, in 2005 (see Fig. 1).

The separation and privatization of UK railways created a vertically separated model split between companies that own the tracks, catenaries, and other

Table 1. Hitachi's Rolling Stock Business in the UK
The table lists major milestones for Hitachi's rolling stock business in the UK.

2000 to 2001	Bid on two contracts but failed to win orders.
2002	V-Train 1 project implementation
Oct. 2004	Awarded preferred bidder status for Class 395.
June 2005	Signed formal contract for Class 395.
Mar. 2007	UK Department for Transport announces IEP.
2008	V-Train 2 project implementation
Feb. 2009	Awarded preferred bidder status for IEP.
Dec. 2009	Class 395 enters commercial operation.
Feb. 2010	UK Secretary of State for Transport announces freeze on IEP negotiations.
Mar. 2011	Resumption of IEP negotiations
July 2012	Signed formal contract for IEP.
April 2013	Additional options contract for IEP
Oct. 2014	Awarded preferred bidder status for ASR.

IEP: Intercity Express Programme ASR: Abellio ScotRail

Fig. 1—Class 395 Rolling Stock.
This Class 395 train is at the Ashford depot where Hitachi operates the maintenance services it has been contracted to supply.

Fig. 2—Class 800 Rolling Stock.
The first completed rolling stock was announced at Kasado Works in November 2014.

infrastructure and train operating companies (TOC) that provide passenger services under a franchise system. The infrastructure companies have a strong desire for lighter rolling stock to reduce track damage and energy consumption. There is also a requirement to comply with UK and European railway standards, including standards for collision safety. The Class 395 are based on the A-train concept developed in Japan, featuring lightweight and robust carbodies fabricated from aluminum using friction stir welding (FSW)[3), (4)], and have been modified to comply with UK railway systems, including the requirements of infrastructure companies and standards[(5)].

Because the UK railway infrastructure still includes a considerable amount of non-electrified track, some express trains still use diesel locomotives. The IEP project is intended to provide a full replacement for these. It was initially assumed that non-electrified infrastructure would remain. Hitachi has experience with hybrid drive systems that provide superior performance (including fuel consumption) on non-electrified track, and was able to demonstrate their effectiveness through the V-Train 2 project, which involved trialing these systems in UK rolling stock[(4), (6), (7)]. Ultimately, however, use of the hybrid systems was shelved because most of the track used by the IEP will be electrified. Instead, to enable operation on the non-electrified track that will remain, Hitachi developed a new bi-mode drive system that fits locomotives with diesel generators to enable the same locomotive to run on both electrified and non-electrified track. This was part of the development of the Class 800/801 rolling stock for the IEP project[(8)] (see Fig. 2).

In this way, Hitachi has successfully proceeded with the project, by utilizing a number of key technologies to comply with the requirements of UK railways, and by conducting its own demonstration trials to gain the customer's trust.

Future of UK Rolling Stock Business

The Class 395 rolling stock have been operating successfully since they entered service in 2009. For the IEP project, the first trains have been completed and will commence trial operation in FY2015. With the aim of extending its product range to gain further overseas orders, Hitachi is also developing the semi-order-made, standard A-train for global market[(9)].

In July 2014, Hitachi presented a full-size mockup of its AT-200 rolling stock to railway industry officials in London as part of its efforts to win orders for suburban rolling stock projects, for which demand is anticipated to rise[(10)]. The AT-200 is part of a product range that includes AT-100 commuter, AT-200 suburban, and AT-300 high-speed rolling stock. In October 2014, Hitachi was awarded preferred bidder status for a suburban rolling stock project in Scotland[(11)]. It is also seeking to win orders from other parts of Europe in the future.

IP MANAGEMENT FOR ROLLING STOCK BUSINESS

UK Rolling Stock Business and IP Master Plan

When Hitachi's rolling stock business was primarily based in Japan, it formulated plans for Japanese patent applications relating to such technologies as carbodies and electrical components, and created inventions and applied for patents in accordance with these plans. To

reduce IP risk, Hitachi also reviewed patents taken out by other companies, particularly in Japan, and made an effort to develop its rolling stock in ways that respected other companies' patents.

Its practice when applying for patents overseas, in contrast, was to focus on applications that related to important developments. In the case of FSW referred to above, for example, Hitachi used technology from The Welding Institute in the UK as a base and developed it into a form suitable for rolling stock. It has built up an international portfolio of approximately 280 Japanese and 80 European patent applications relating to FSW[12]. Using this patent portfolio as a base, Hitachi has also taken steps to use FSW technology for rolling stock to help win orders by treating it as a proprietary technology that differentiates Hitachi from competitors.

However, the overseas operations of the rolling stock business require that IP management also shift from a domestic focus to include activities that take account of overseas business. In addition, it is necessary to strengthen Hitachi's portfolio of patents in the overseas markets where it operates in order to protect important technologies used in those markets. Another important consideration when entering new markets is to identify patents held by other companies and obtain clearance (confirming that Hitachi does not infringe on other companies' rights).

Accordingly, as it establishes and expands its rolling stock business in the UK, Hitachi's IP management needs to include a comprehensive review of its IP strategy and the formulation of a new IP master plan. This IP master plan is prepared by surveying patents held by Hitachi and its competitors in key markets based on its business plan for rolling stock. In the case of the rolling stock business, the two key measures are, (1) to strengthen its portfolio of UK patents, and (2) to ensure that comprehensive clearance is obtained for UK patents. An annual progress review and planning discussion is conducted for the IP master plan at an IP strategy conference attended by management from operational departments, research laboratories, and the IP department (see Fig. 3).

The following sections describe specific activities undertaken as part of this IP master plan.

Strengthening of UK Patent Portfolio in Conjunction with Establishment of Business in UK

When establishing its rolling stock business in the UK, Hitachi set up a new project for the development of rolling stock products. Fig. 4 shows the organizational structure of the project, consisting of operational departments, research laboratories, and the IP department, overseen by a project leader.

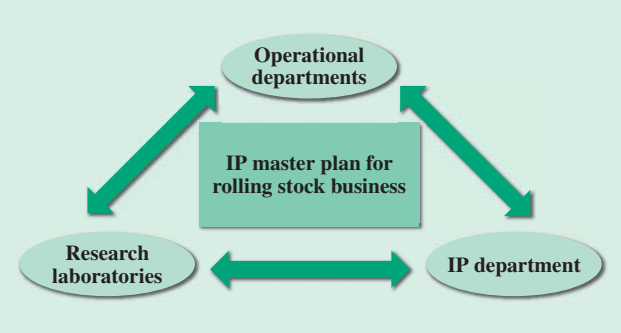

Fig. 3—Organization for Implementing IP Master Plan. Operational departments, research laboratories, and the IP department work together to implement the IP master plan for rolling stock.

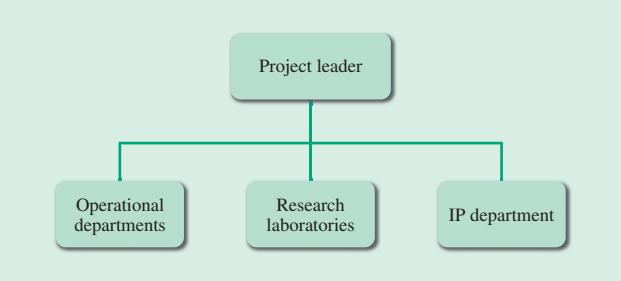

Fig. 4—Organization for Implementing Project. Operational departments, research laboratories, and the IP department work together to handle sales, development, and other tasks associated with entering the UK market.

This project included operational departments, research laboratories, and the IP department working together to facilitate Hitachi's entry into the UK market by strengthening its UK patent portfolio. It was selected as a "flagship patent activity," designating it as one of the key areas for patenting at Hitachi, with patent application plans being formulated annually and the results evaluated over a four-year period starting from 2010.

Specifically, these "flagship patent activities" involved, (1) surveying patent applications filed by Hitachi and its competitors (particularly applications filed in the UK and Europe) that included both macro and micro analyses (respectively, the analysis of trends and of specific technical issues), (2) preparing a map of development work and technical issues, creating inventions that resolve issues from a medium- to long-term perspective, and applying for patents throughout the world, starting in the UK, and (3) designing and

reviewing design documents and specifications for projects in the UK to identify whether they contained any practical inventions that could be applied to actual products, and issuing patent applications for them prior to commercialization.

This work led to patent applications for key technologies such as the bi-mode drive system used in the Class 800/801.

Hitachi also plans to undertake similar activities for its AT-100 commuter, AT-200 suburban, and AT-300 high-speed rolling stock, for which it anticipates future orders.

Achieving Comprehensive Clearance

The project described above included "clearance" of UK patents.

In contrast to Japan where it has traditionally operated its rolling stock business, being a new entrant to the UK market means that Hitachi faces greater IP risks. Accordingly, the IP department, in consultation with operational departments and research laboratories, takes the lead in prioritizing which technologies, competitors, and other factors need to be reviewed, assesses competitors' patents in tandem with the development schedule for the project described above, and implements countermeasures.

Furthermore, protection of rights in the rolling stock business includes not only technologies, but also rights to the designs of carbodies and train interiors that play an important part in appealing to customers. Accordingly, in addition to patents, Hitachi also verifies that it is not infringing on other companies' design rights.

CONCLUSIONS

This article has described Hitachi's rolling stock business based in the UK and the associated IP management.

Hitachi moved the overseas headquarters and strategy formulation function of its railway systems business to London in April 2014. Furthermore, with its plan to establish facilities for the production of rolling stock in the UK, it is likely that the number of inventions coming out of the UK will increase in the future. While Hitachi currently has Japanese IP staff seconded to Hitachi Rail Europe, its UK railway industry subsidiary, to handle patent applications, acquisition of rights, and other IP management, it will be necessary in the future to adopt an IP strategy that is more closely integrated with its overseas headquarters.

Hitachi is also working actively to extend its rolling stock business to other overseas markets beyond the UK. Its intention is to make use of IP rights in its business by also formulating and implementing IP master plans for countries other than the UK.

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