

## Efforts in Fulfilling the Smart Station Vision

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JR East's Frontier Service Development Laboratory has launched the Smart Station Vision, a concept for creating next-generation stations. In that concept, we utilize advanced technologies and original ideas to project from the station new services that meet each customer's needs. With the Smart Station Vision, customer needs are perceived from the three viewpoints of highly convenient and amenity-rich stations, safe and secure stations and environmentally friendly stations. We are currently making efforts to R&D to achieve such stations.

### 1 Introduction

The Frontier Service Development Laboratory was established in December 2001 with an aim of improving customer satisfaction by developing service devices and the like. We are actively conducting R&D on two themes. One is innovating station and onboard services by cutting-edge technology and a customer perspective, and the other is achieving secure structures to support that. Those activities are performed in a two-team system consisting of service design and structural system design group.

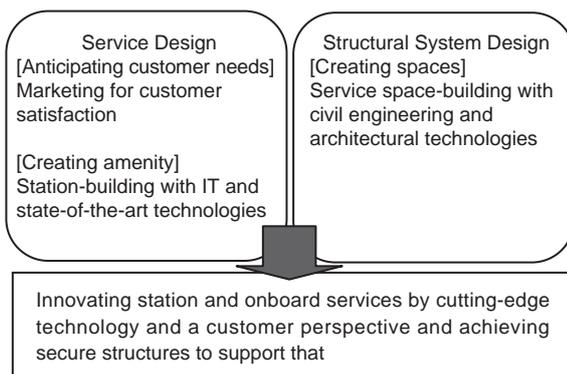


Fig. 1 R&D at Frontier Service Development Laboratory

For station services in particular, we have launched the Smart Station Vision whereby we aim to create next-generation stations utilizing advanced technologies and original ideas. We are currently working on R&D to fulfill the Smart Station Vision, and this article introduces specific efforts.

### 2 Smart Station Vision

#### 2.1 Background of the Smart Station Vision

The environment that railways are operating in is facing numerous negative factors. Immediate factors include lingering

recession, reduction and elimination of highway tolls, and long-term factors include a reduction in the working-age population with the dwindling birthrate and aging population. In light of the situation, it will be difficult to dramatically expand the scale of the market.

Looking at consumer trends, however, we see a glut of goods and information. With the expansion of product and service choices has come a refinement and diversification of consumer demands. And for us as a railway operator to continue to maintain competitiveness in such a changing external environment, we need to predict demands and provide services superior to those of our competitors.

The laboratory has thus launched the Smart Station Vision that is a concept for next-generation stations. And we set the theme for that vision as creating new services for stations with advanced technologies and original ideas.

Our image of next-generation stations is one that provides new services according to the demands of each customer. Such a station is also "smart" enough to provide services to customers as if the station itself understands their needs.

#### 2.2 Three Perspectives of the Smart Station Vision

So, what are customer demands for stations?

Perspective 1: From a customer standpoint, the station is a "place for procedures" to use trains. Customers must go through various procedures there to ride the train such as checking route and time table, purchasing tickets, having tickets validated and finding and moving to the boarding platform. Therefore, they come to have a need for a reduction in the hassle of procedures and for simpler procedures.

Perspective 2: The station used every day for commuting and the like also has an aspect of being a "place of daily living". Recent years have seen the emergence of services such as in-station shops and station childcare, and we predict the station to cover a greater scope of day-to-day services in the future. There, psychological

and emotional demands such as for safety, security and amenity are generated in addition to demands for convenience.

Perspective 3: A station also serving as a “public space” needs to meet social demands related to environmental friendliness such as reduction of CO<sub>2</sub>.

To meet those various demands and create customer satisfaction, the laboratory is going forward with R&D from the three perspectives of highly convenient and amenity-rich stations, safe and secure stations and environmentally friendly stations.

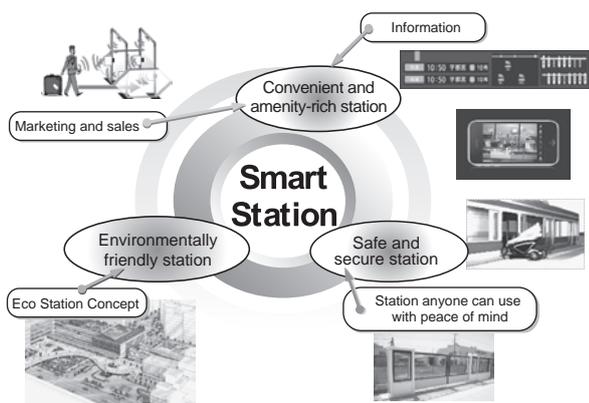


Fig. 2 Smart Station Vision

### 3 R&D to Achieve the Smart Station Vision

#### 3.1 Highly Convenient and Amenity-rich Stations

The laboratory is conducting R&D on making stations more convenient and on allowing stations to be used with ease. Such work includes identifying customer demands through marketing methods, providing information to individual customers through information technology (IT) and studying nursing care services provided by new technologies such as robot technology.

#### R&D on information services using IT

Stations provide various information related just to train use, such as time tables and operation status. The scope of information handled by the station is also expected to broaden in the future to include guidance on in-station shops, nearby sightseeing information and product information by digital signage and other advertising media. Extracting from that large volume of information just what the passenger needs and providing it in an appropriate manner can transform information into services.



Fig. 3 Information Services for Individual Passengers

Information services up to now such as information on transport disruptions have mainly provided the same information uniformly to all passengers. We are now working on extracting and providing information appropriate for each passenger using the latest IT to achieve services that guide their movement. For example, we are researching methods to provide information according to passenger needs such as providing transfer information and station guidance directly to the passenger’s mobile phone.

#### Surveys on Customer Demands through Marketing Methods

It is important to think from the customer's point of view and identify unconscious demands, so we can create services that will satisfy those customers. The laboratory is using marketing methods to research what to do about station functions and spaces that customers want. For example, we are analyzing customer behavior at terminal stations such as Tokyo and Shinjuku to research how to reflect customer demands in improvements to equipment and facilities such as guide signs and waiting spaces. We are also surveying foreign customer's awareness and values regarding railways, opportunities for them to travel by rail, obstacles they face and other factors in light of the increase in tourists from abroad and foreigners living in Japan. Research is also conducted to apply results of the surveys to station services.

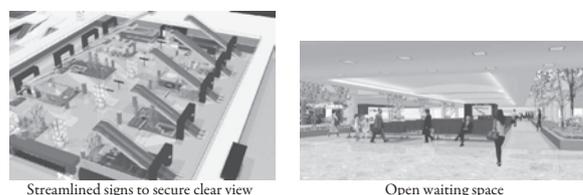


Fig. 4 View of Terminal Station Functions

#### R&D on Next-generation Ticketing

JR East’s Suica IC card ticket system has undergone a variety of improvements to its convenience since the start of service in 2001. The most significant of those is interoperability with IC card ticket systems of other railway operators, especially the PASMO system.

We have reached a point, however, where we need to reexamine the card media used for Suica and basic specifications of equipment so that we can create next-generation station services. The laboratory is conducting development on a Suica card with a display for showing stored fare balance and basic specifications of equipment so that we can create next-generation station services. The laboratory is conducting development on a Suica card with a display for showing stored fare balance and basic specifications of equipment so that we can create next-generation station services.

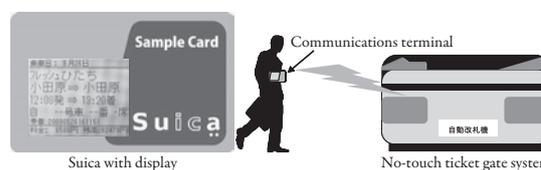


Fig. 5 Suica Development

## R&D on Making Station Spaces Amenity-rich

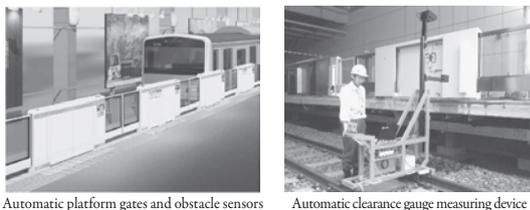
Stations are made up of a variety of spaces customers use such as concourses, platforms, waiting rooms and restrooms. The laboratory is making efforts in R&D on using technologies such as those for sensors to allow customers to use with ease the station as a whole and individual spaces. For example, we are researching methods using odor sensors in restrooms to identify and evaluate unpleasant odors. We believe this research will be helpful in building measures that are highly effective at reducing odors. In universal design research, we are surveying how guide signs are seen by the elderly and those with poor eyesight, as it will allow us to identify what colors and text sizes are easiest for them to read.

## 3.2 Safe and Secure Stations

JR East is working on achieving its top priority in safe operation: the ultimate level of safety. For stations, it is important to create the sense of security that comes from safety. This can be done by systems to prevent accidents such as falling from platforms or falling down in concourses and also by making barrier-free facilities even better.

## Research on Platform Safety

Maintaining safety on crowded platforms in rush hours is an important issue both in terms of station management and train operation. JR East thus introduced automatic platform gates at Ebisu and Meguro stations in the summer of 2010. The laboratory conducted long-term endurance tests and other reliability assessments at the introduction of automatic platform gates. We also developed safety sensors that can detect in a wider area than before and a device to automatically measure automatic platform gate clearance gauge. To identify the change in customer flow that occurs when setting up the gates, we are working on development of a customer flow measurement system that utilizes laser technology. We are also working on improving the accuracy of simulations that predict customer flow.



Automatic platform gates and obstacle sensors

Automatic clearance gauge measuring device

Fig. 6 Introducing Automatic Platform Gates

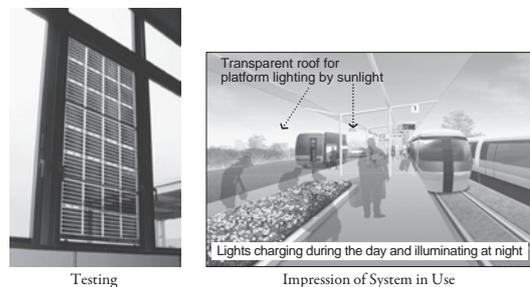
## 3.3 Environmentally Friendly Stations

Railways are a mode of transportation with good environmental performance such as having lower CO<sub>2</sub> emissions than automobiles and airplanes. However, much of that performance depends on the actual trains. So, for JR East with its approx. 1,700 stations, environmental responsiveness of stations will be a major issue in the future.

## Research on Energy Conservation

We are aiming for environmentally friendly stations through efforts such as research in creating and conserving energy at stations. For example, we are conducting basic research on use of photovoltaic film using plastic substrates with stations. Such solar cells are characterized by being light, thin, bendable and highly translucent. They can now be easily installed on windows and curved areas unlike before, broadening the choice of places where they can be introduced. And we can expect improved constructability and lower costs by introducing them to stations integrated with transparent roofing materials.

In the area of energy conservation, we are also carrying out research to improve the conditioning efficiency of stations by using cool air from tunnels.



Testing

Impression of System in Use

Fig. 7 Transparent Solar Cells

## 4 Conclusion

The Smart Station Lab was completed on the grounds of the Research and Development Center of JR East Group in June of 2010. That new test facility has the same spaces and equipment as an actual station.

There we can conduct proving tests on the flow of customer behaviors (line of movement from free passageway through ticket gate, concourse, stairways and platform to train) that could not be done in operating real stations and narrow laboratory confines. Thanks to the lab, we can conduct overall assessment of those behaviors. Utilizing the Smart Station Lab, the Frontier Service Development Laboratory is going forward with R&D on making stations of the future.



Fig. 8 Smart Station Lab