ANNUAL REPORT 2012-2013

Railway Technical Research Institute

Foreword

Norimichi KUMAGAI
President

I took up my post as President of the Railway Technical Research Institute (RTRI) on June 13, 2013. I am well aware that each railway operator is now tackling various projects aimed at coping with large-scale natural disasters which could happen in the future. I feel all the more apprehensive in starting to bear this responsibility as the President of RTRI at a time when technical development is required in even greater measure in order to enhance the performance of railways even further. I am aiming at promoting innovation in railway technologies while affirming the guidelines which former President Hisashi Tarumi formulated in his quest to build up a "robust research company" in RTRI.

The prospectus of RTRI clearly states that the Institute should "challenge innovation in railway technology, from fundamental to applied research." Here, I will introduce our roles based on this rationale, with a focus on the following three points. The first one is to promote research and development in a dynamic way so as to contribute to the development of society and to the improvement of railway operations by providing service and support to railway operators. "In a dynamic way" means being innovative while following the changes of our times and especially meeting the various needs of our society. We are going to tackle our research and development by setting a higher goal. Second, as a neutral organization responsible for railway technologies, we will respond to the confidence that society places in us. We shall do this by investigating the causes of accidents and disasters, by proposing measures to prevent accidents happening, by supporting the development of railway technology standards, by providing consultancy services, by delivering information, and by implementing other measures in a rigorous way. Our third role is to engage in activities for enhancing railway technology on a worldwide scale while taking advantage of collaborative research or other opportunities with research institutes in other countries.

We have set the following priority subjects for our research and development, and we are going to tackle them in a strategic manner. First, we have to cope with "issues related to enhanced management of railway safety." Our goal is to bring about a railway system which can better withstand large-scale earthquakes, high winds, storms with heavy rainfall, and other natural disasters without accidents happening. Second, we have to cope with "issues related to energy saving of a railway system." We shall direct our research at further enhancing energy efficiency, including development of a power transmission method which utilizes superconducting technology and a railway vehicle with batteries for energy storage. Thirdly, we have to cope with "issues concerning cost reduction in maintenance and replacement of facilities." We are going to propose a method of achieving improvements at low cost, targeting the reinforcement of ground facilities and structures which show deterioration because of their age so as to use them for a longer period of time. Fourthly, we have to cope with the "challenge of increasing the speed of trains." We are going to support a technical development project aimed at running in commercial service at 360 km/h on Shinkansen lines, while satisfying both the goals of assuring safety and protecting the environment along railway lines, including noise reduction.

In addressing these challenges, I want to emphasize the basic key concepts for research activities at RTRI: "confidence" and "quality." We will keep our mindset tuned to provide highly reliable and high-quality solutions in return for the confidence placed in us by clients who use our research results or who ask for our consultancy services. Furthermore, taking advantage of our collective strength, namely human resources, test facilities, and accumulated data and knowhow, all the executives and regular staff of RTRI are going to spare no effort so as to present outcomes of study that are intended to be helpful for the railway business. Finally, I sincerely ask for advice and guidance from all of you who take an interest in our research work in RTRI.

Contents

Overview

Organization

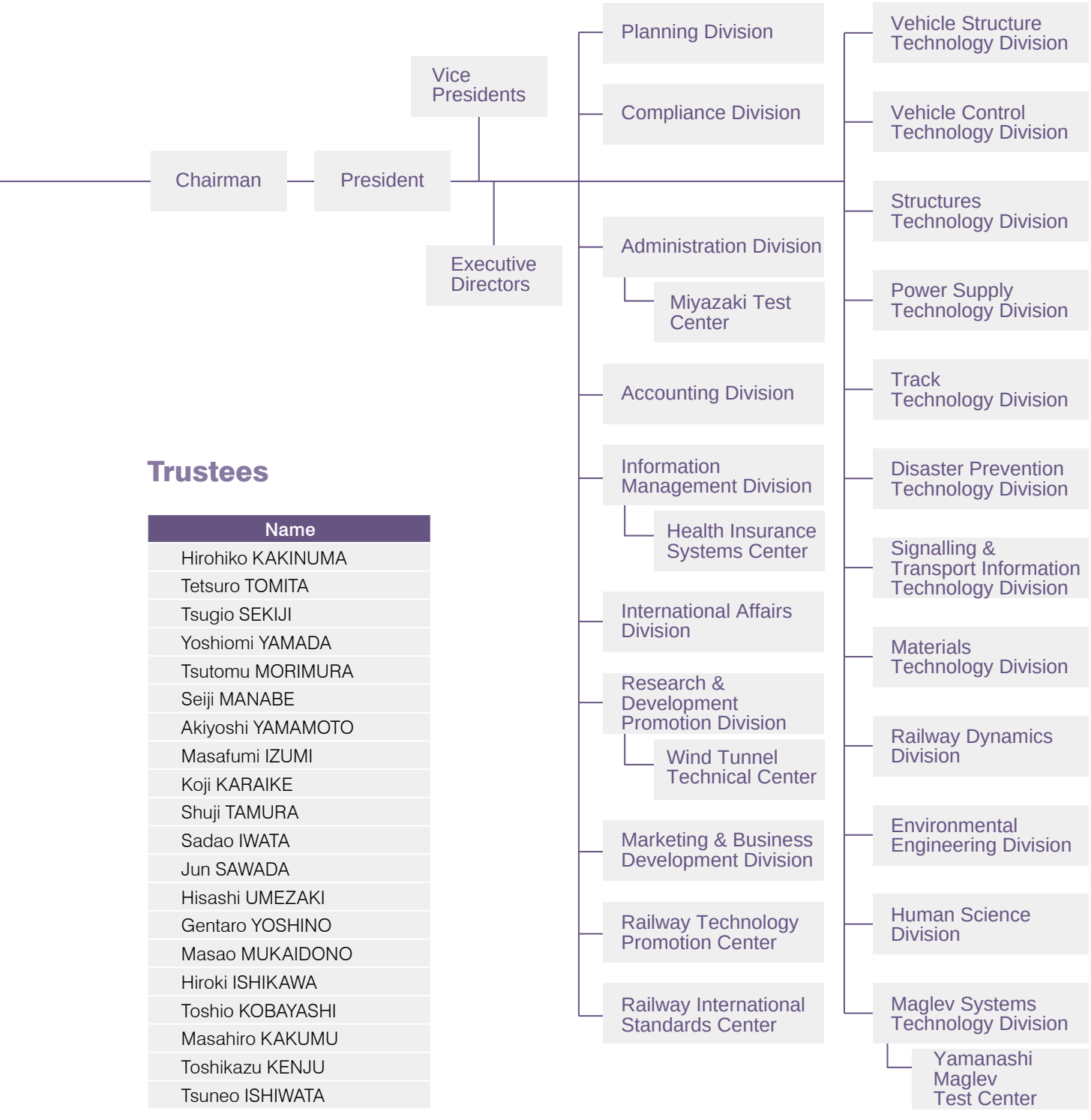
Board of Trustees — Board of Directors

Auditors

Board Members

Position	Name
Chairman	Eisuke MASADA
President	Norimichi KUMAGAI
Vice President	Atsushi ICHIKAWA
Vice President	Kiyoshi SAWAI
Executive Director	Atsushi KAWAI
Executive Director	Hideyuki TAKAI
Executive Director	Fuminao OKUMURA
Executive Director	Makoto NOJIMA
Executive Director	Takashi SAWAMOTO
Executive Director	Yutaka OSADA
Executive Director	Norihiko YOSHIE
Executive Director	Tsuguhiro NISHIMAKI
Executive Director	Toshihiko AOYAGI
Executive Director	Toji HAYASE
Executive Director	Yoshihiro SUDA
Executive Director	Mami AOKI
Executive Director	Kazuaki KANASUGI
Auditor	Mitsutoshi INAMI
Auditor	Hidenori FUJII
Auditor	Yataro KIGUCHI

(As of June 13, 2013)



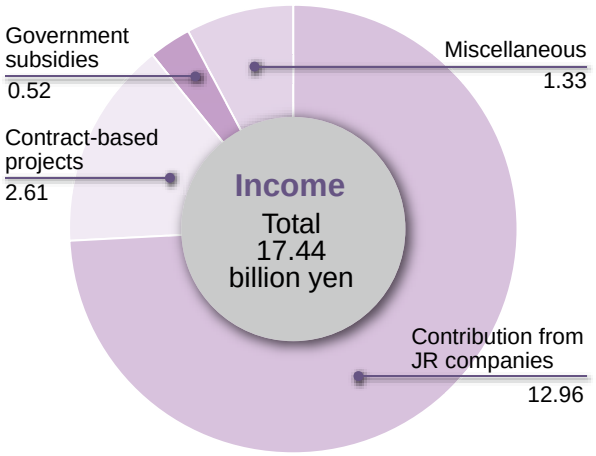
(As of June 13, 2013)

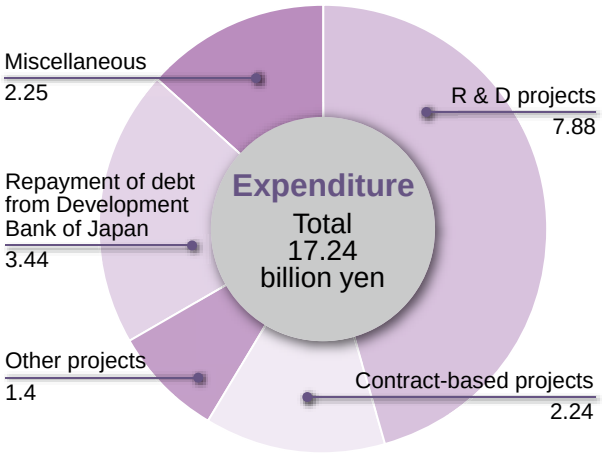
Trustees

Name
Hirohiko KAKINUMA
Tetsuro TOMITA
Tsugio SEKIJI
Yoshiomi YAMADA
Tsutomu MORIMURA
Seiji MANABE
Akiyoshi YAMAMOTO
Masafumi IZUMI
Koji KARAIKE
Shuji TAMURA
Sadao IWATA
Jun SAWADA
Hisashi UMEZAKI
Gentaro YOSHINO
Masao MUKAIDONO
Hiroki ISHIKAWA
Toshio KOBAYASHI
Masahiro KAKUMU
Toshikazu KENJU
Tsuneo ISHIWATA

(As of June 13, 2013)

Income and Expenditure in FY 2012





Human Resources

Number of employees	531
Number of PhD Degree holders	171

(As of April 1, 2012)

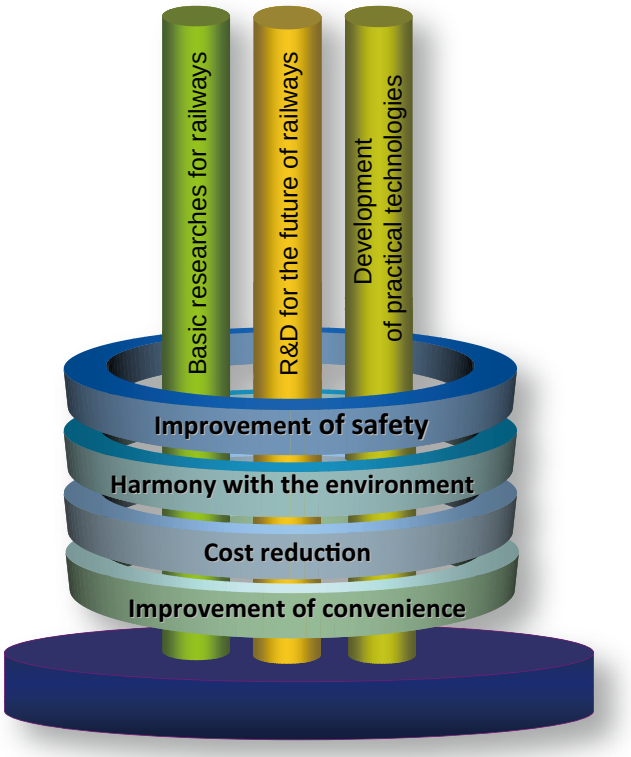
Number of On-Going Projects

Numbers of Themes

R&D for the future railways	62
R&D for practical technologies	109
Basic research for railways	111
Standards and surveys	
Total	282

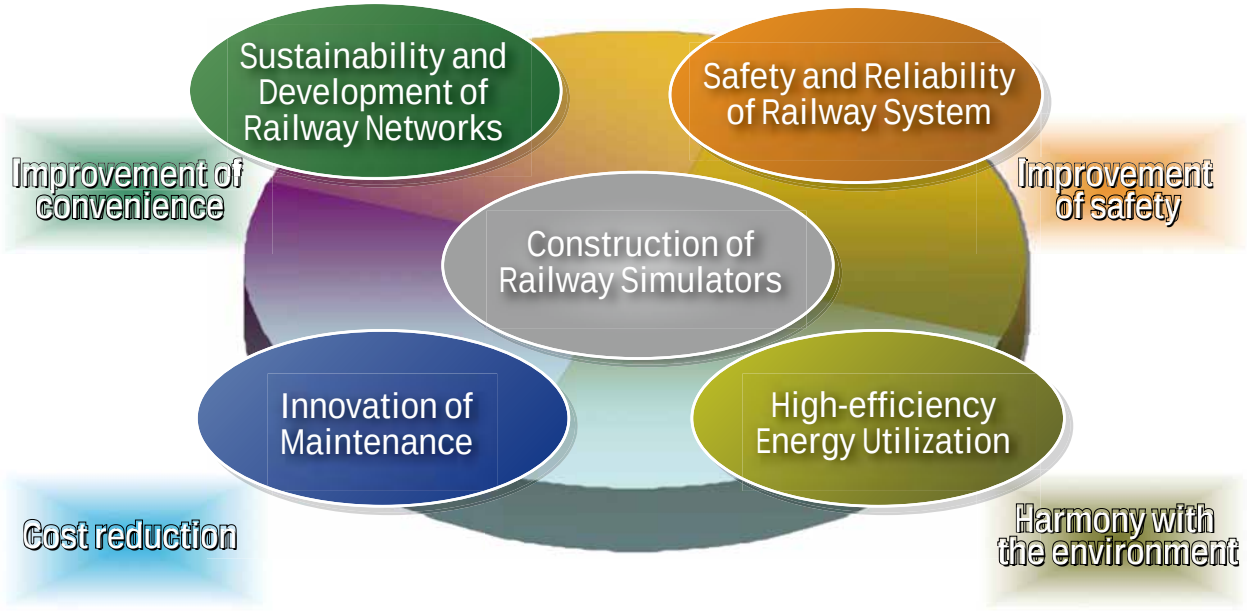
(As of April 1, 2012)

Objectives and Mainstays of R&D in Activities



Relationship with Organizations in the Research Fields

R&D for the Future of Railways



Medium and Long Term Master Plan – RESEARCH 2010 –

The master plan, RESEARCH 2010 was produced to describe research and development required for five years beginning in FY 2010 to effectively push ahead with activities to fulfill our commitment within various circles as a research institute capable of integrating many railway technologies. The plan is directed towards the sustainable development of railways, while considering progress in research and development in the past and changes in the circumstances surrounding the railway industry that have occurred in recent years.

1 Basic Policies and Objectives

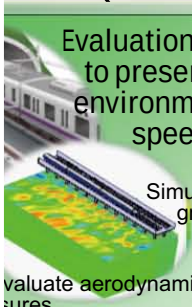
In preparing this plan, we adopted basic policies on its content in view of the circumstances surrounding RTRI and railways in Japan as a whole. Regarding the management environment of JR companies, changes in their financial contribution and other movements outside the organization, we set the term of the plan at five years from FY 2010 to 2014, to account for the fact that it will take a certain length of time to carry through the "research and development for the future of railways" as referred to later, though it is difficult to correctly predict the trend in long-term future needs.

For RTRI having responsibility to society as a public-interest corporation, it is important to effectively perform its commitment to JR companies and other stakeholders through publicly disseminating research results to support railway business in the future. To this end, we shall make efforts to freshen up the targets of research and development set in the past, such as the improvement of safety and reliability, development of solutions to environmental problems on a global scale, achievement of harmony with the wayside environment, decrease system costs and the

RCH2010 –Future-Oriented Challenges (Fiscal Years 2010 – 2014)

Safety and Reliability of Railway System

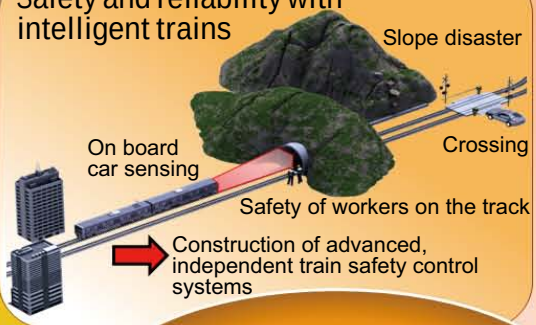
Evaluation/measures to preserve wayside environment for high speed operation



Simulation to predict ground vibrations

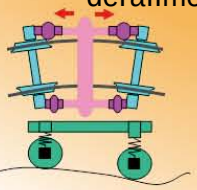
valuate aerodynamic noise/
sures
bration preventive materials

Safety and reliability with intelligent trains

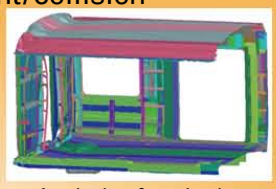


➡ Construction of advanced, independent train safety control systems

Improvement of safety against derailment/collision



Derailment-proof truck



Analysis of car body deformation behavior

Safety against meteorological disasters

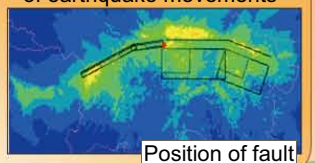
- Simulation of local meteorological conditions
- Techniques to evaluate hazards
- Technologies of disaster/hazard mapping

➡ Real-time hazard mapping

Safety against earthquakes

- System to predict large-scale earthquakes
- Evaluation of the safety of rolling stock running during earthquakes
- Earthquake-proof technologies/measures

Image of the prediction of earthquake movements

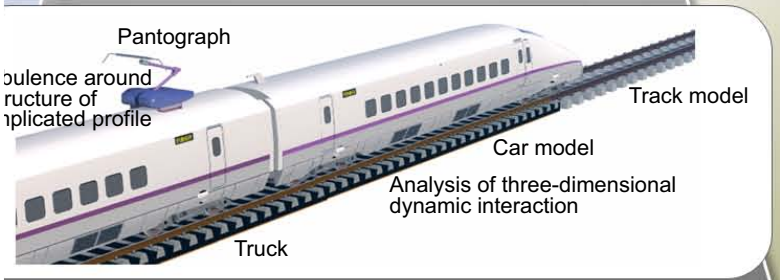


Construction of Railway Simulators

Design/development of a railway simulator core system

① Car, track and train-set models
② Simulation of phenomena between structure and wheel
③ Prototype virtual railway test track
④ Integrated air flow and aerodynamic noise simulator
⑤ Contact wire/pantograph simulator

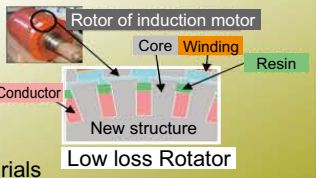
➡ Virtual railway test track



High-efficiency Energy Utilization

Reduction of car energy consumption

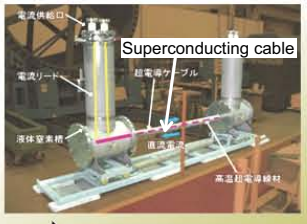
Nano-technology metallic material



Lightweight cars made of new materials
High-efficiency car components
Decreases in car aerodynamic resistance

➡ Simulator to evaluate energy consumption

New power supply system



- Application of superconducting technologies
- Use of semiconducting elements of low loss
- Utilization of natural energy

➡ Simulator of power consumption in train operation
Evaluation of train operation diagrams reflecting the constraint in power supply

pursuit of comfort and convenience of passengers. As a new research challenge, we shall also aim at improving our simulation technology and try to expand our core competencies. We shall also review the organization for research and development needs and capabilities at all times to respond to the changes in the internal and external circumstances and make efforts to enhance the efficiency of our activities based on financial situations.

As development needs in the future are quite uncertain in different countries, we will review this plan regularly to take into account changes in social and economic conditions in the world.

As a guideline for carrying out research and development aimed at achieving safe and assured, highly reliable railways, with low environmental impacts and featuring low-costs and high-level convenience for customers, we set forth the following as the basic objectives of RTRI activities.

(1) Creation of new technologies aimed at sustainable development of railways
(2) Quick and correct response to meet customer needs
(3) Timely transmission and dissemination of research results
(4) Continued pursuit of railway technologies and accumulation of basic technological knowledge
(5) Effective use of this knowledge within the community of railway engineers

2 Project Activities

2.1 Research and Development

(1) Promotion of Research and Development

(a) Targets of research and development

Amid the increasingly severe surroundings, we set the following four items as the "targets of research and development," in consideration of the serious accidents/disasters and difficult economic circumstances in recent years, based principally on the targets of research and development in the past.

We further aim at achieving:

- Increased level of safety
- Harmony with the environment
- Low-cost railways
- Improved convenience for customers

(b) Poles of research and development

Recognizing that we have limited resources, to effectively carry out research and development, we set the following three items as the "corner stones of research and development," with efforts concentrated in particular on the enhancement of the simulation technology for all the three:

- Research and development for the future of railways
- Development of practical technologies
- Basic research for railways

(2) Research and Development for the Future of Railways

In the field of research and development for the future of railways, we undertake basic research to better understand phenomena and to construct tools from which a "game-changing" breakthrough is expected for research and development. We also carry out research oriented to technological development having a far-reaching effect after commercialization.

(3) Development of Practical Technologies

We are pushing ahead with the development of practical technologies in the following areas:

- Technological development specified by the seven JR companies (six under-taking passenger transport services and one devoted to freight transport)
- Contract-based research and development
- Development of practical technologies performed based on our own initiatives

(4) Basic Research for Railways

We believe the basic research for railways will lead to practical technologies, which are essential to solve various railway-related problems, and/or will lead to further work which we might define as "analytical research projects" and "those to explore further research."

(5) Others

(a) Transmission of information

We will positively collect, store and transmit information on railway technologies in Japan and abroad and present the results of these research/development activities in a timely manner.

(b) International activities

We will positively participate in various international conferences, make efforts to continue to exchange information on railway technologies with overseas researchers, and send staff abroad to survey the status of the railways and technologies in foreign countries. We will also push ahead with joint research projects, exchange researchers, strengthen the cooperative relations with overseas universities and research institutes and enrich the information transmitted to other countries.

(c) Railway Technology Promotion Center

Having a bird's eye view over the railway industry as a whole, the Railway Technology Promotion Center will assess the technological needs common to all its member railway companies and solve their problems so that they can correctly respond to the expectation of society.

(d) Railway International Standards Center

The Railway International Standards Center will integrate the discussions on wide-ranging international standards on railways, thereby contributing to railway companies as a whole, while positioning the discussions on the strategy of international standardization, reviews of international standards and collection/transmission of the information received.

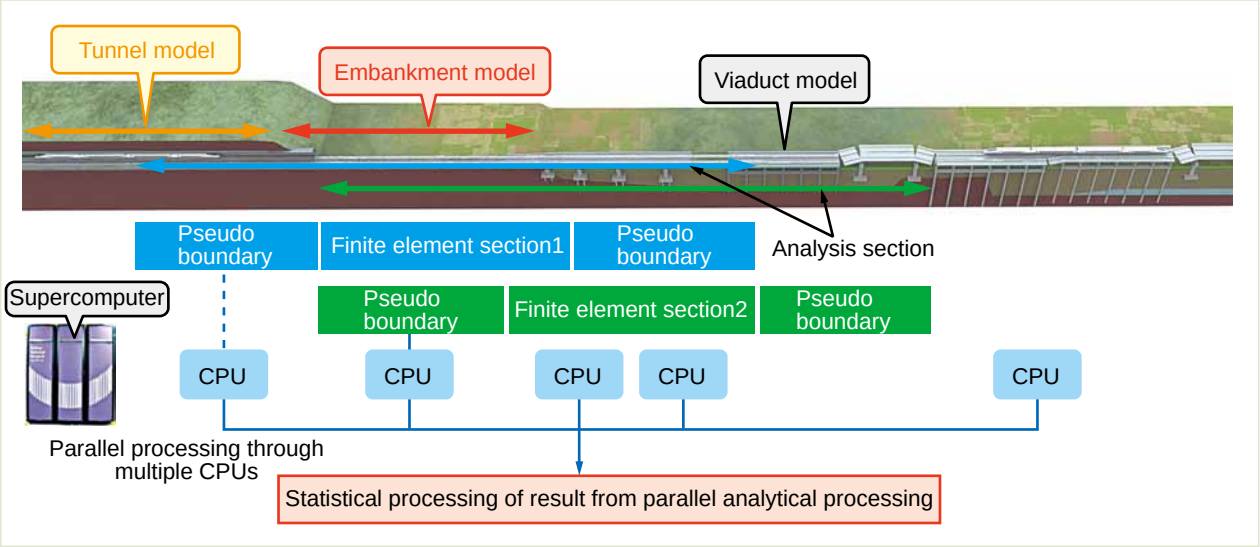
Major Results of Research and Development

In FY 2012, we pushed ahead with research and development projects on 282 themes and completed 115 projects. Major results of the research and development are shown below.

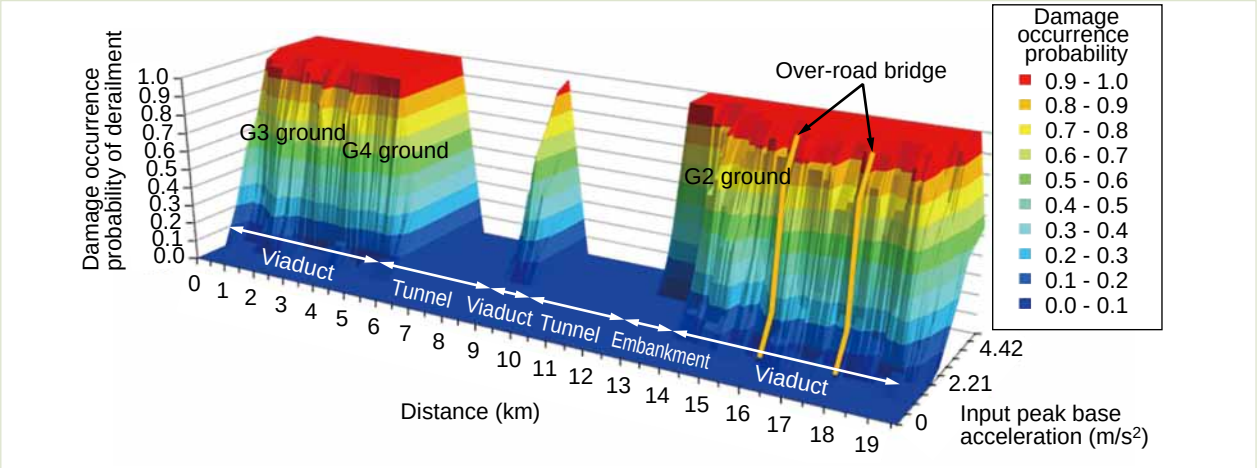
IMPROVEMENT OF SAFETY

Estimation method for damage occurrence probability of vehicle derailment on structures during seismicity

- An analysis method was developed to effectively examine train-running safety on a structure group of an entire railway line during seismicity.
- This method can be used to evaluate the influence of various parameters, such as vehicle speed, structure characteristics and countermeasure technique on the damage occurrence probability.



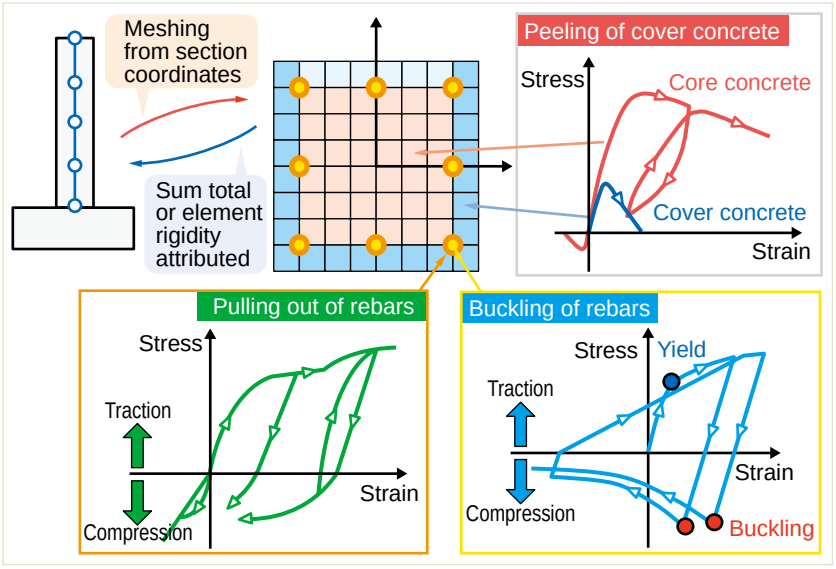
▶ Outline of analysis method



▶ Example of analytical result for model section

Method for evaluating structural safety considering residual resistance during a major earthquake

- An analysis method was developed which makes it possible to evaluate the behavior of major deformation areas for structures as a whole or individual components.
- A proposal was made for a practical safety assessment method which could be applied for both main shock and aftershocks of a major earthquake.



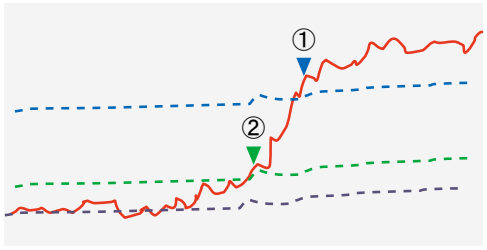
▶ Fiber model concept

Improvement of P-wave detection in earthquake early warning system

- Efficiency in detecting P-waves recorded during the 2011 off the pacific coast of Tohoku earthquake was raised from 26% to 44%.
- This allows faster estimation of earthquake magnitude, which in turn contributes to the goal of cutting the time before warnings are issued.
- Use of optimised parameters should improve the overall functionality of the earthquake early warning system.

	Traditional parameter (α_n=0.9998, α_u=0.98)	Proposed parameter (α_n=0.9999, α_u=0.96)
Tohoku off the pacific coast-seismic waves (2second data, within 250km of epicenter) P-wave detection rate	26%	44%
Seismic wave with instrumental seismic intensity of over 3.5 (2second data) P-wave detection rate	74%	80%
Noise wave (1second data) rejection rate	98%	95%

▶ Changes in detection function after altering parameters



Amplitude level (amplitude short time period average)
$UD2(s)=(1-\alpha_u)\times ud(s)+\alpha_u\times UD2(s-1)$
UD2:Amplitude level, ud:Vertical acceleration, s:Sample, α_u:Smoothing coefficient

Trigger level (constant factor of noise level)

Detecting level (constant factor of noise level)

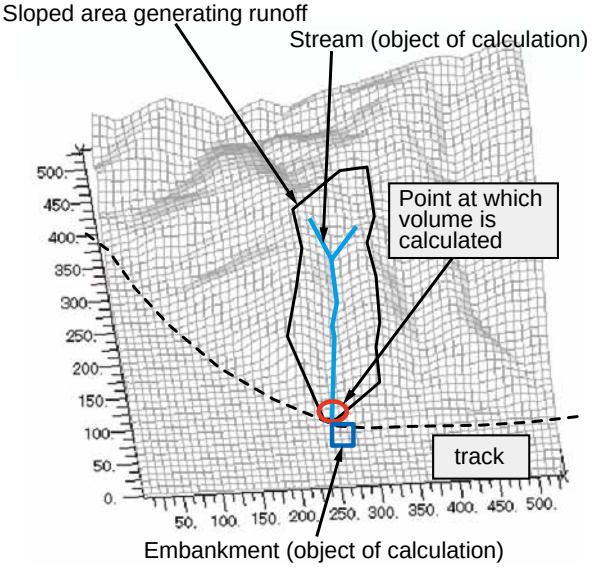
Noise level (amplitude long time period average)
$NL(s)=(1-\alpha_n)\times ud(s)+\alpha_n\times NL(s-1)$
NL:Noise level, ud:Vertical acceleration, s:Sample, α_n:Smoothing coefficient

① When the amplitude level exceeds the trigger level, P-wave detection processing begins
② The P-wave is measured atpoint 2 when the amplitude level falls below the detecting level, going back in time from point 1.

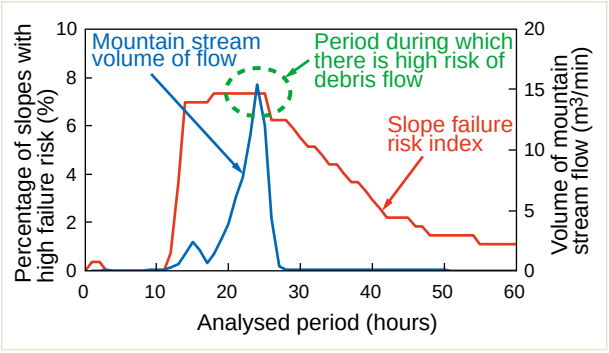
▶ P-wave detection method

Method for evaluating the danger of rainfall induced slope failure using topographical data

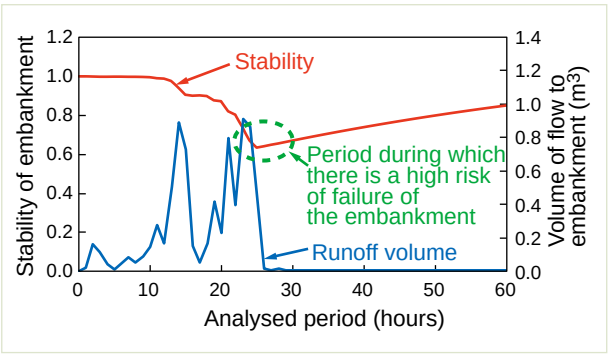
- A method was developed for evaluating the danger of rainfall induced landslides or embankment collapse using 3-D topographical data.
- This evaluation can be applied to pinpoint vulnerable slopes according to precipitation levels.



▶ Mountain stream and embankment forming object of the calculation



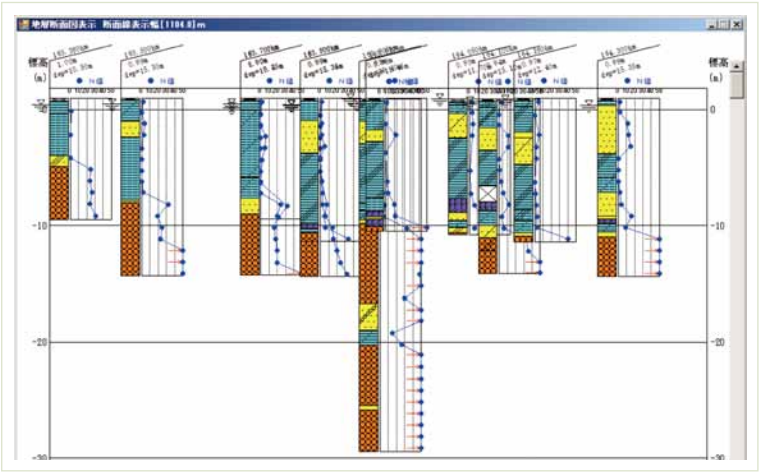
▶ Example of failure risk of the slope adjoining the stream and calculated stream volume of flow



▶ Example of calculated staibility level and runoff volume onto embankment

Archives for ground and structural data and tool for automatic analytical modeling

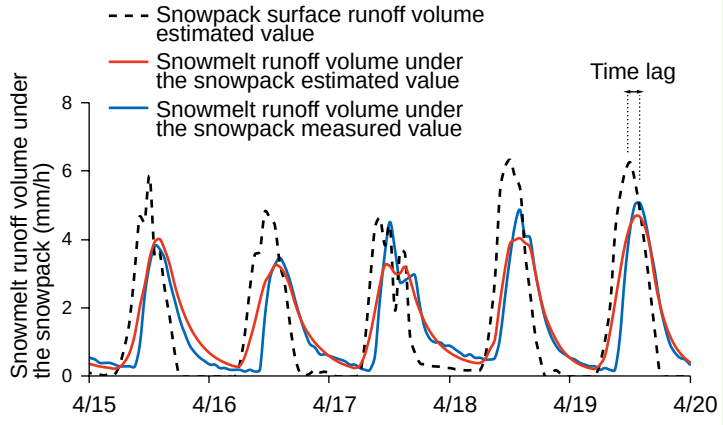
- Archives for subsurface ground and railway structure information were developed, whose data are associated with their latitude/ longitude and railway kilometer points.
- A tool was then developed which can automatically produce analytical models for simple earthquake disaster simulation of a whole line with limited data about ground/ structures.



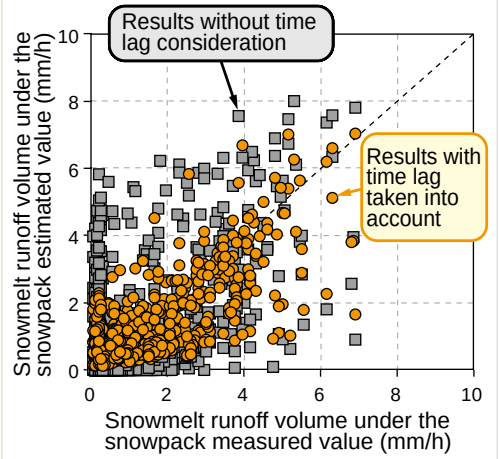
▶ Geological profile of earth quality, through GIS interface

Simple method for estimating snowmelt runoff volume beneath snow pack

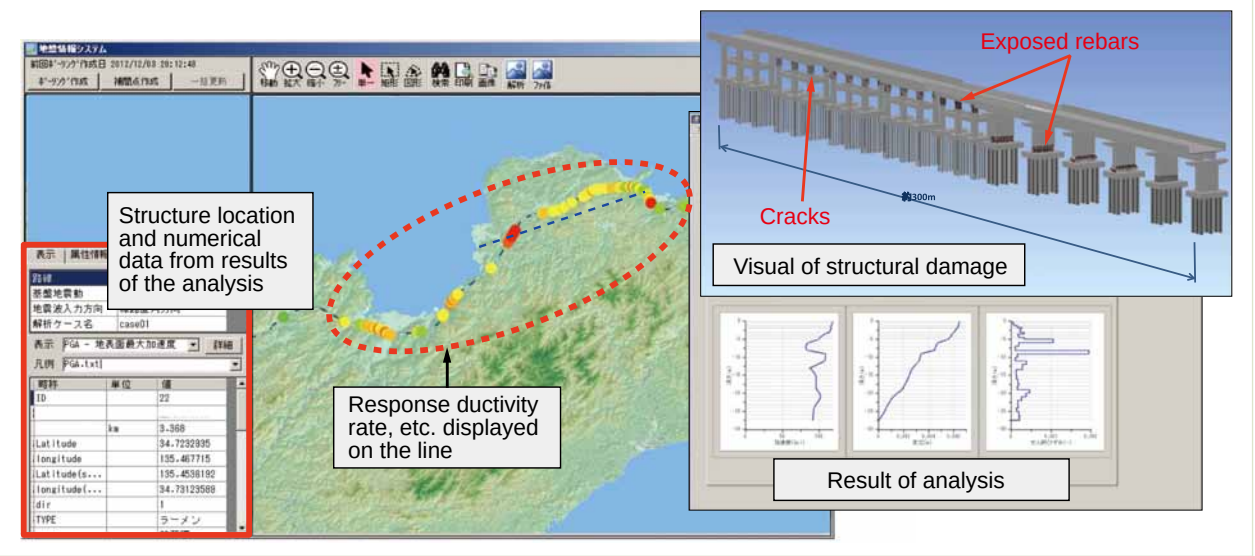
- A simple method has been developed to determine the volume of melting snow on the snowpack surface from commonly available meteorological data. This method is required for assessing risk of total layer avalanches.
- By taking into account the infiltration process of water from melting snow into the snow layers, it was demonstrated that this method can reproduce runoff volume over time flowing beneath the snow pack.



▶ Changes over time in snowpack surface runoff volume, snowmelt runoff volume under the snowpack (period observed: 15 - 19 April (5 days))



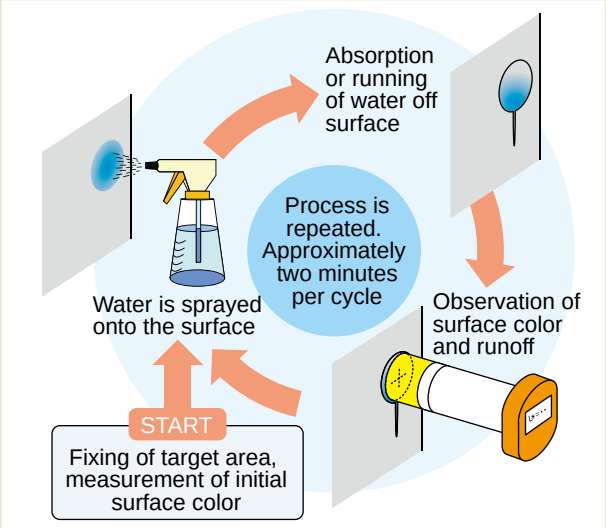
▶ Results to validate the present method (hourly units)



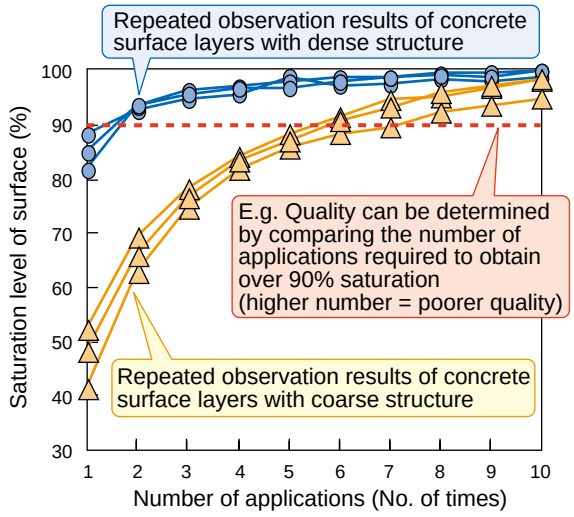
▶ Earthquake and disaster simulation result of entire line, displayed on GIS interface

Simple non-destructive test method for assessing surface layer permeability of concrete structures

- A simple non-destructive method has been developed for on-site assessment of the permeability of concrete surface layers which is a key influencing factor on overall resilience of steel reinforced concrete structures.
- The method is highly efficient and user-friendly and allows a single inspector to complete each assessment in a maximum of 20 minutes.



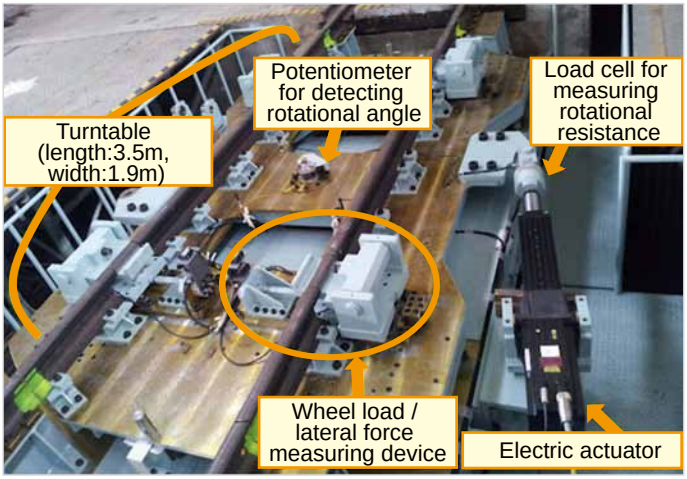
▶ Outline of the developed method



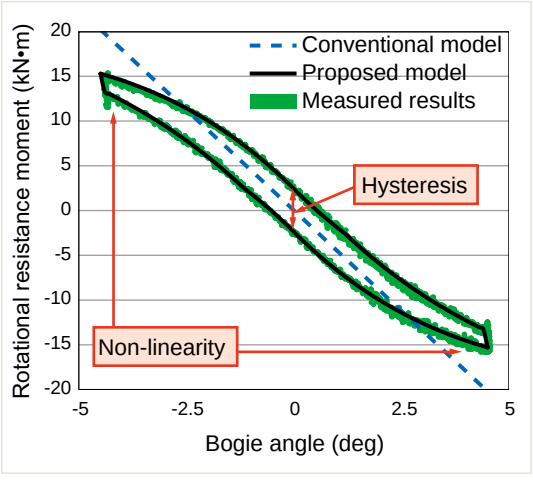
▶ Relationship between surface saturation level and number of spray applications

Method for evaluating bogie rotational characteristics

- A device was developed for testing bogie rotational characteristics.
- By measuring the resistance moment of a bogie, it is possible to obtain a more accurate evaluation of its characteristics when running through a curve.



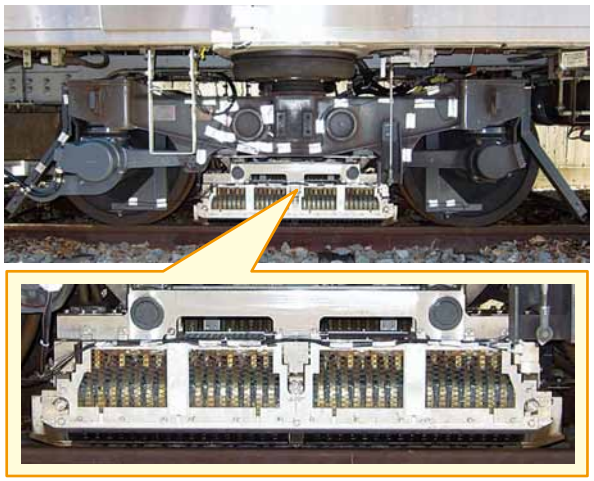
▶ Set up for examining bogie rotational characteristics



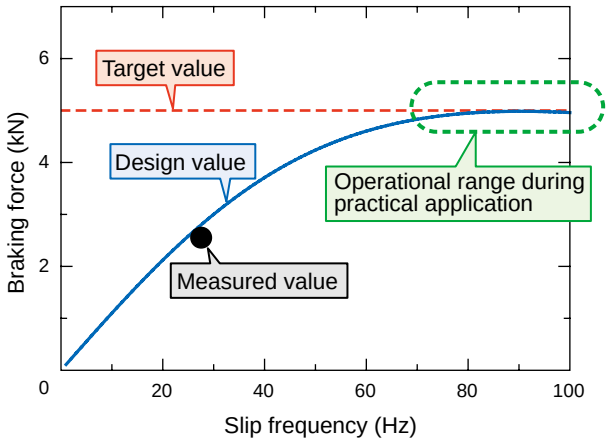
▶ Proposed model for finding rotational resistance moment of bogie

Practical application of a linear-motor-type rail brake

- A contactless rail brake which can also be used during power outages was developed.
- A prototype of the brake was fitted to a commercial line vehicle bogie to verify that the target braking force could be reached without a power supply.



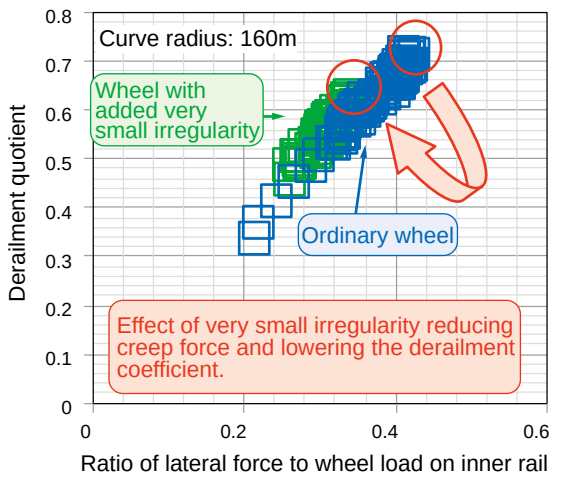
▶ Linear-motor-type rail brake fitted to vehicle bogie



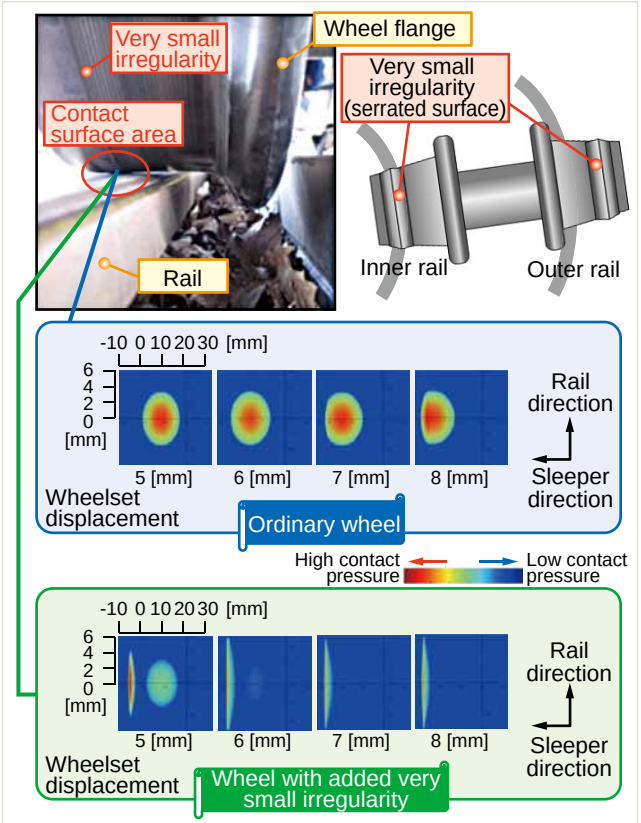
▶ Brake force characteristics (for each side (left/right) of the bogie)

Method for reducing lateral force while running through curves due to very small wheel tread irregularity

- Insight was gathered into the impact of small wheel tread irregularity on creep force characteristics
- After reproducing corrugation on the outer edge of the wheel tread, a method was proposed and verified for efficacy in field tests on RTRI premises.



▶ Tests on real vehicle to show effect on reducing lateral force



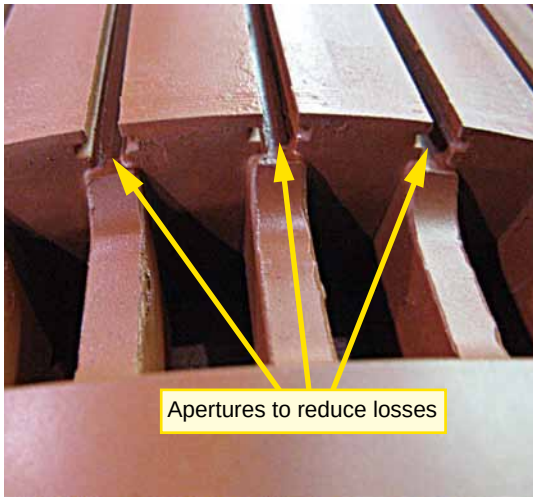
▶ Relationship between numerically calculated wheelset displacement and shape of contact surface on inner rail

HARMONIZATION WITH THE ENVIRONMENT

High efficiency induction traction motor

- A high efficiency induction traction motor was developed, with a view to improving the energy saving performance of railway vehicles.
- 96% efficiency was achieved employing low loss material and a new rotor design.
- The new induction traction motor managed to cut electrical energy consumption by approximately 10%.

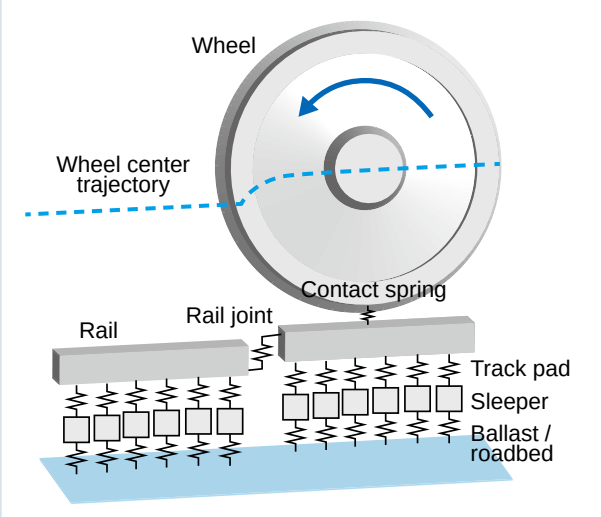
▶ The prototype traction motor



▶ The new rotor design

Model for predicting impact noise of vehicles running over rail joints

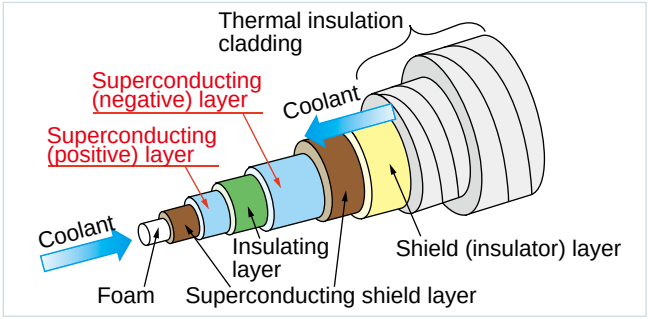
- A model for predicting the impact noise of vehicles running over rail joints was proposed; the suitability of the developed model was then verified.
- The prediction model was subsequently applied to gain insight into the contribution of each sound source to total impact noise.



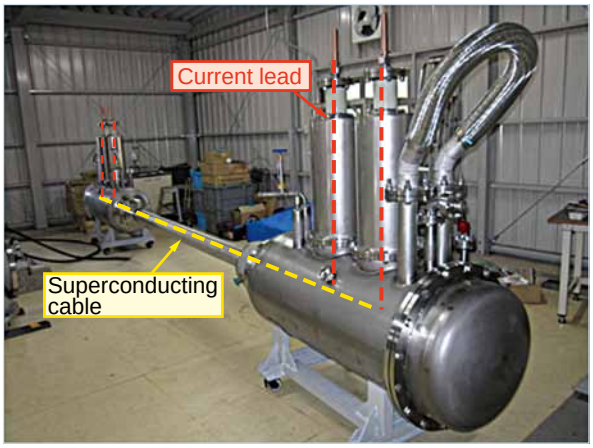
▶ Impact noise prediction model

Production of superconducting cable for railways

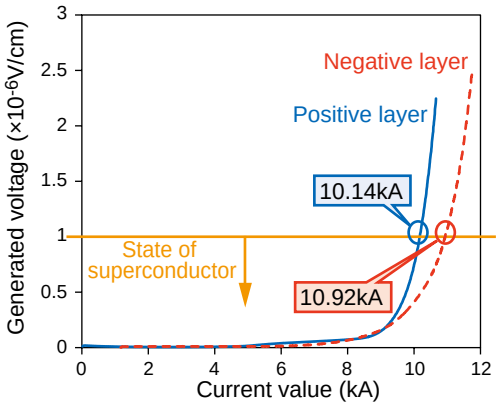
- A five meter long superconducting DC 1.5kV, 8kA cable was made to meet practical specifications for use on railway lines.
- The results from electric conductivity tests verified that there were no transmission losses and that electricity could flow at over 10 kA.



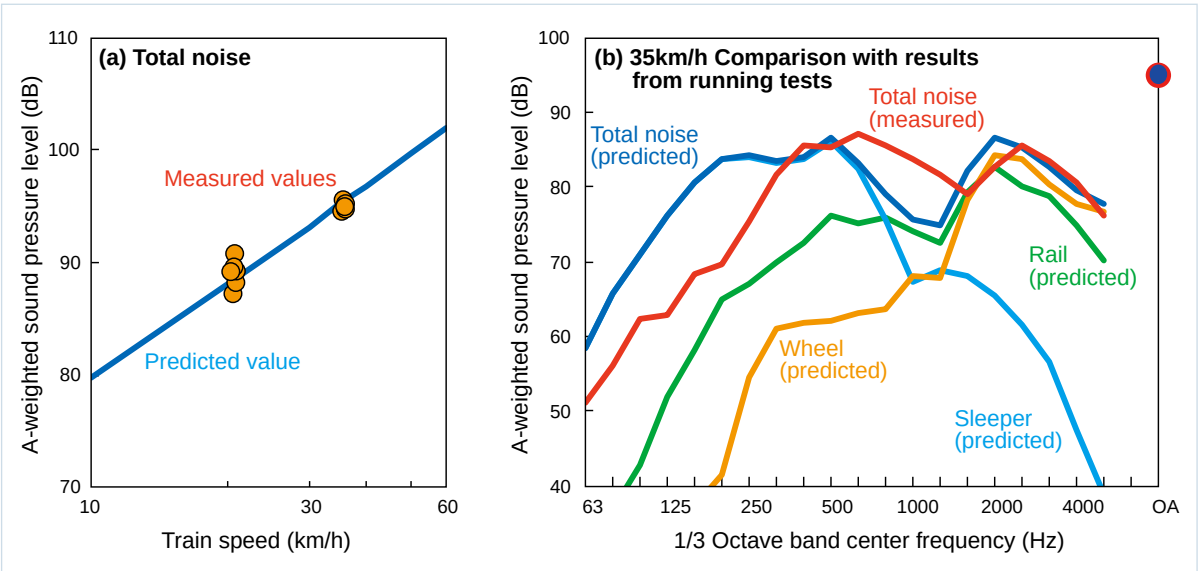
▶ Structure of Superconducting Cable



▶ The new superconducting cable



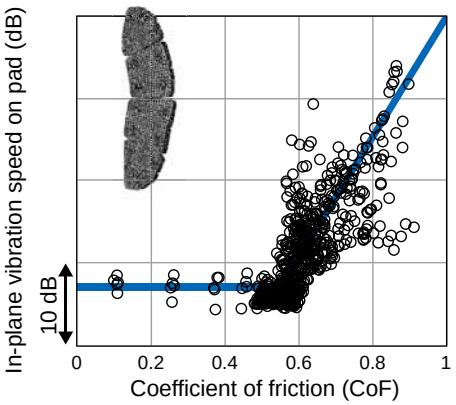
▶ Results of electrical current tests



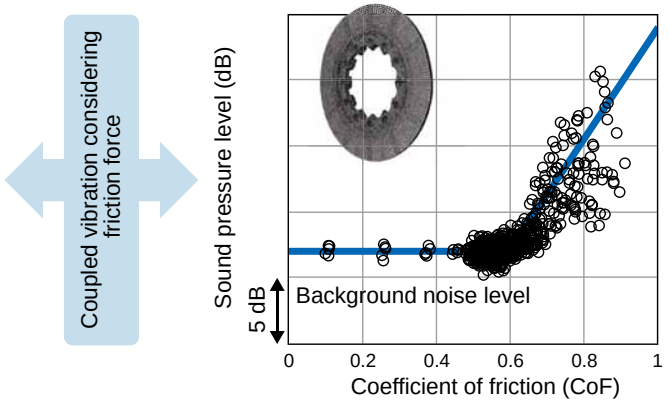
▶ Results of impact noise prediction method (joint step-down height: 1.3 mm joint gap; play: 5.5 mm)

Reducing noise of Shinkansen train disc brake application

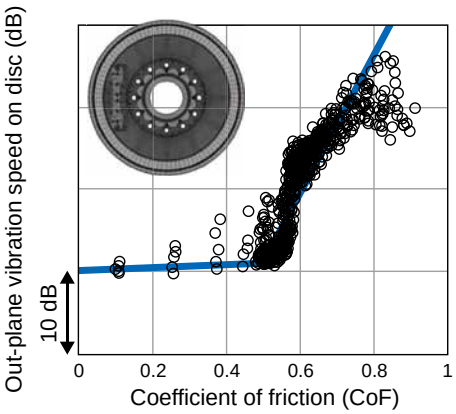
- Insight was gained into the squeal noise emitted by Shinkansen trains when applying their disc brakes.
- The source of squealing was determined using an evaluation method developed on a test bench.
- A number of possible means were identified to reduce braking noise.



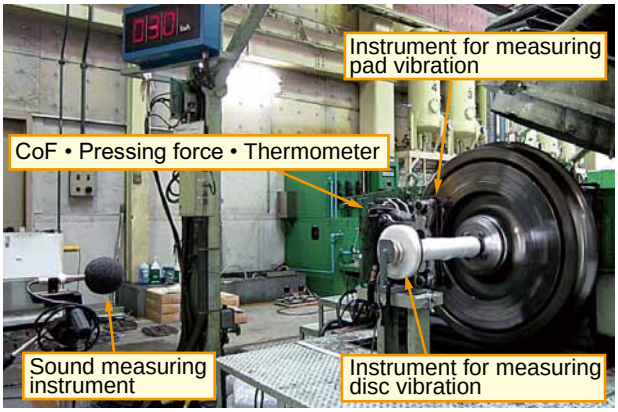
(a) Relationship between pad vibration and CoF



(b) Relationship between disc vibration and CoF



(c) Relationship between sound pressure and CoF



(d) System for evaluation of brake noise

▶ Evaluation of brake noise on bench test

Cementless geopolymer sleepers

- A cementless, chemically stable geopolymer concrete sleeper was developed, cutting CO_2 emissions by 80% compared with traditional fly ash intensive manufacturing processes.
- The newly developed geopolymer concrete sleeper satisfied all traditional sleeper requirements.

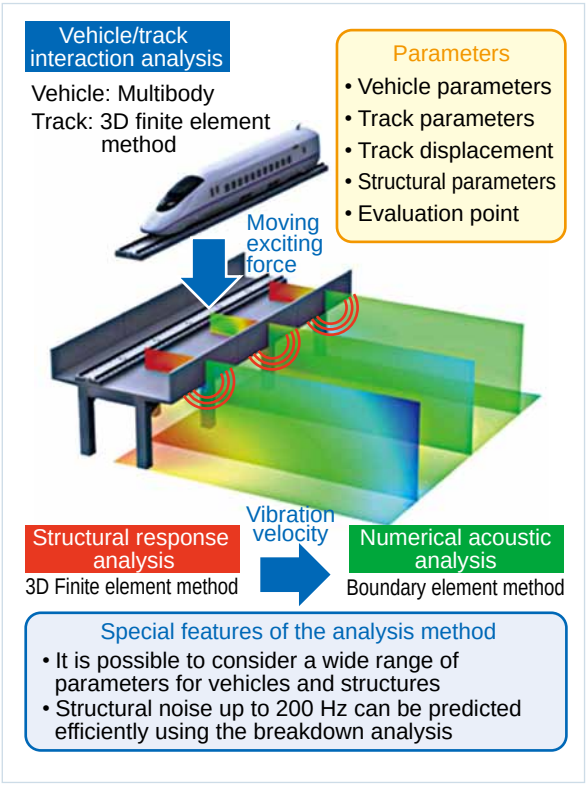
Type of sleeper	Item	Rail side section		Sleeper middle section		Pull - off test	
		Proof load	Fracture load	Proof load	Fracture load	Proof load	Fracture load
PC sleeper	Standard value	50.5	97.6	53.0	115.9	30.0	50.0
	Tested value	○	140.0	○	159.0	○	149.0
Sleeper block	Standard value	29.4	---	---	---	29.4	---
	Tested value	○	45.0*	---	---	○	79.0*

○ : No cracking during proof load tests
* : Load when cracks appeared
--- : Standard value or no test value

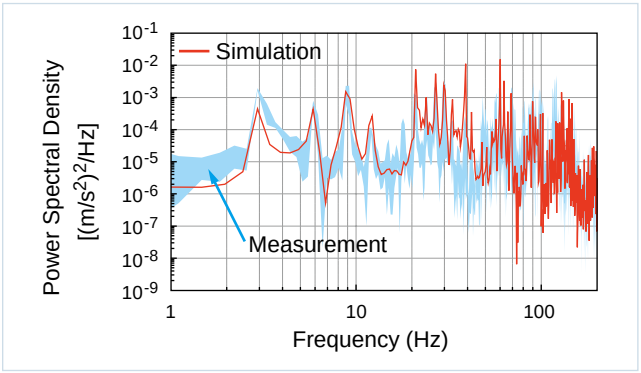
▶ Results of functional test on geopolymer sleeper (Units: kN)

Simulation of pressure variation caused by structural vibration

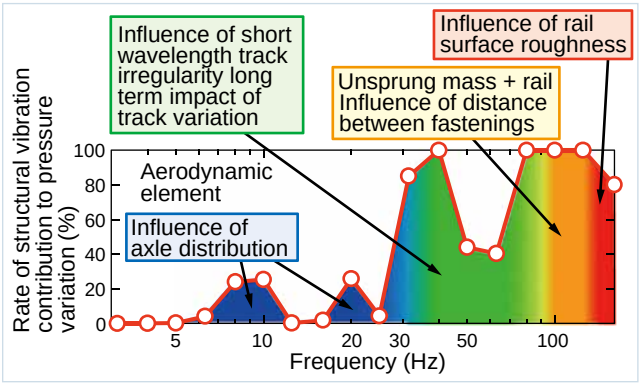
- A method was developed to estimate pressure variation due to structural vibration.
- By comparing estimated and measured results, insight was gained into the rate of structural vibration contribution to total pressure variation.



▶ Simulation of pressure variation resulting from structural vibrations



▶ Results of comparison between simulation output of floor slab vibration and actual measured results (train speed of 270 km/h)



▶ Rate of structural vibration contribution to pressure variation

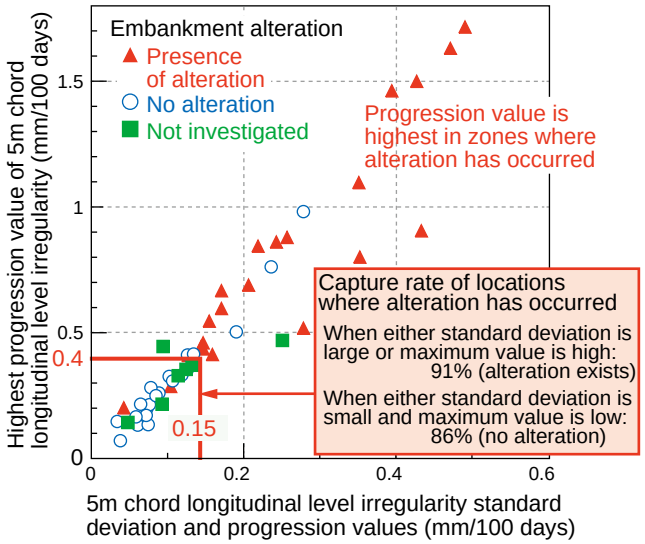
▶ Geopolymer PC sleeper

▶ Steel fiber reinforced geopolymer sleeper block (no rebars)

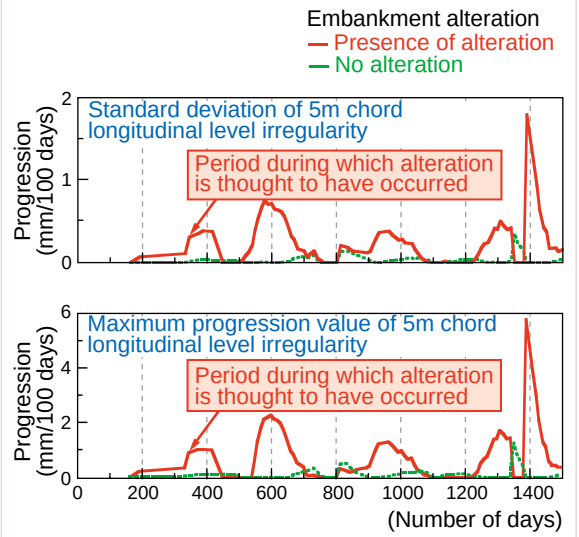
COST REDUCTION

Method employing track inspection data to evaluate the internal condition of embankments

- Using 5m chord longitudinal level irregularity progression was found to be an effective indicator for assessing the internal condition of embankments on structure boundary sections.
- This indicator should make it possible to locate weaknesses in embankments and provide insight into when these weaknesses appeared.



▶ Standard deviation and highest progression value of 5m chord longitudinal level irregularity and embankment condition



▶ Shift over time of 5m chord longitudinal level irregularity standard deviation and maximum progression value

Combination of reinforced soil structure with jointless bridge to form integrated bridges with reinforced embankments

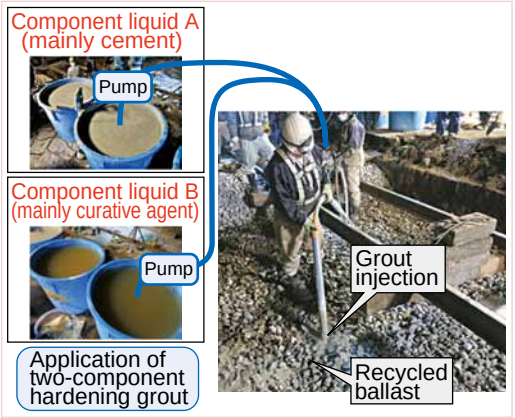
- An integral reinforced embankment bridge was developed by combining reinforced soil structures with a jointless bridge.
- Using a full size test bridge, girders were subjected to repeated horizontal loading tests, taking temperature induced contraction and expansion into consideration, and positive and negative alternating loading tests for level two earthquake conditions, validated improved continuous stability.

▶ Full scale mock up of reinforced embankment jointless bridge

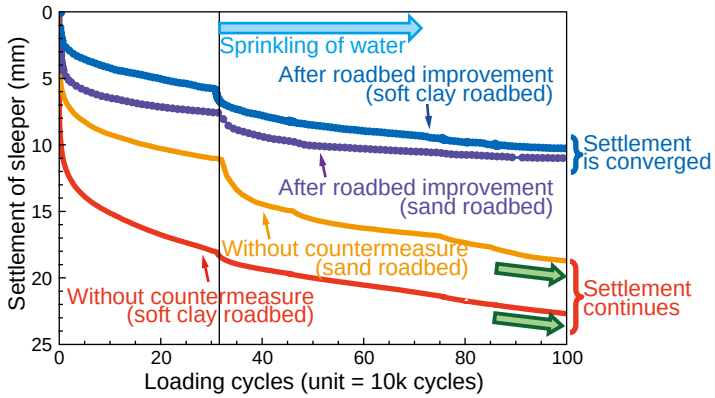
Using recycled ballast in work method for roadbed improvement

- A roadbed improvement method was developed using grout injected recycled ballast.
- This work method reduces the impact on the environment and is more time and cost effective.

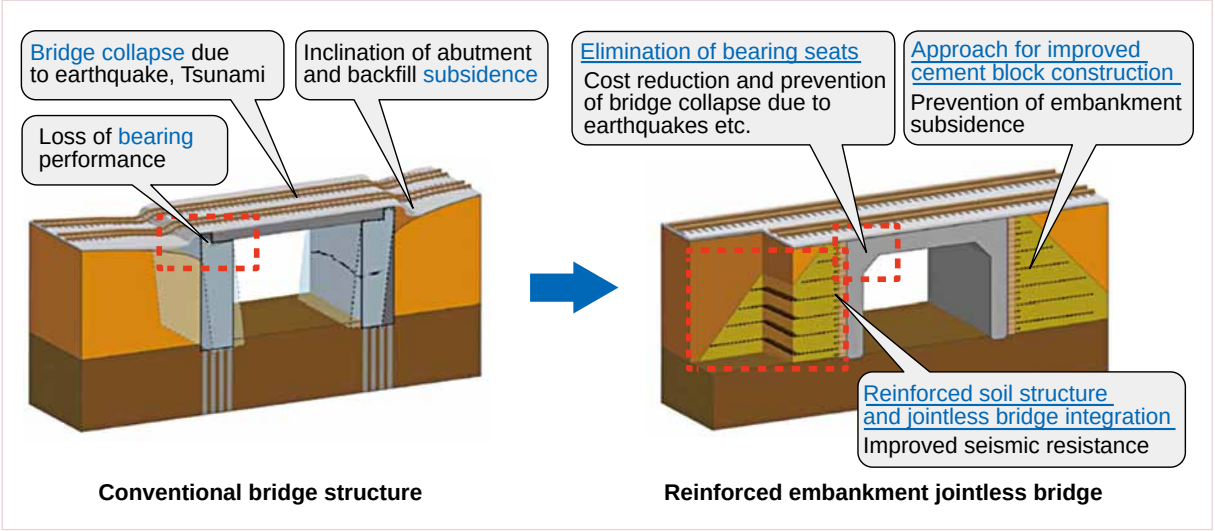
▶ Outline of the roadbed improvement method using discarded ballast



▶ Roadbed improvement work



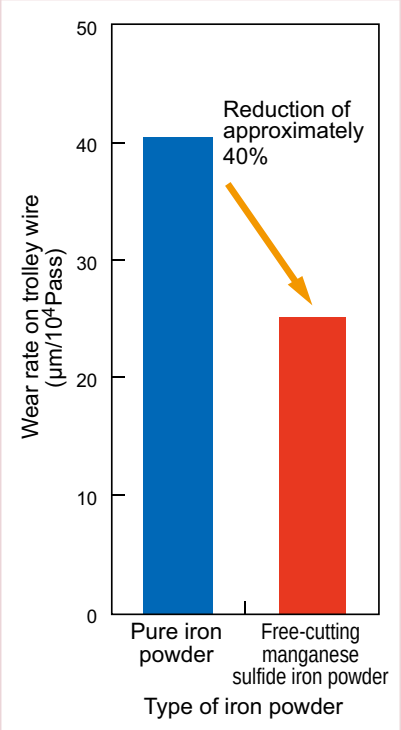
▶ Verification of results from repeated loading tests



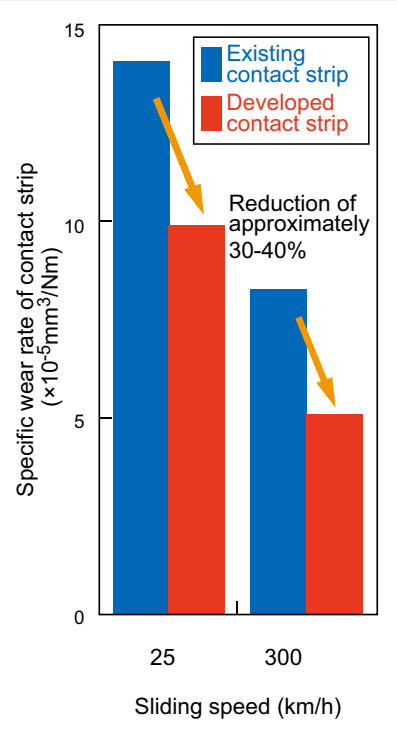
▶ Conventional bridge issues and features of the reinforced embankment jointless bridge.

Development of iron-based sintered metal contact strip with extended service life, for use on Shinkansen trains

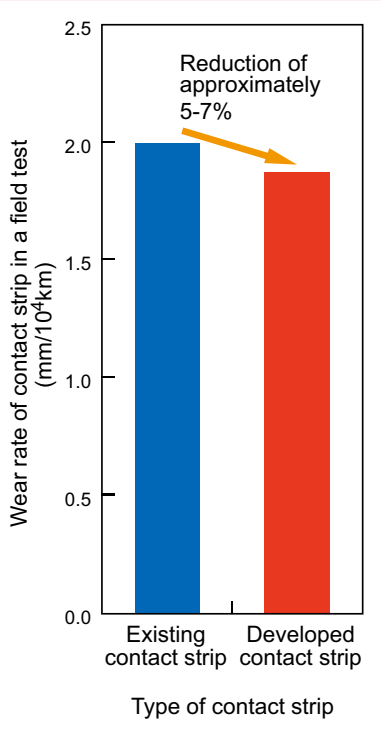
- In order to extend the service life of iron-based sintered metal contact strips used on Shinkansen, a new contact strip material was developed which can reduce the wear of trolley wire while maintaining its lubricating property and wear resistance.
- Compared with existing material in use, the newly developed contact strip has approximately 5-7% more resistance to wear.



▶ Comparison of wear rate on trolley wire according to type of iron powder



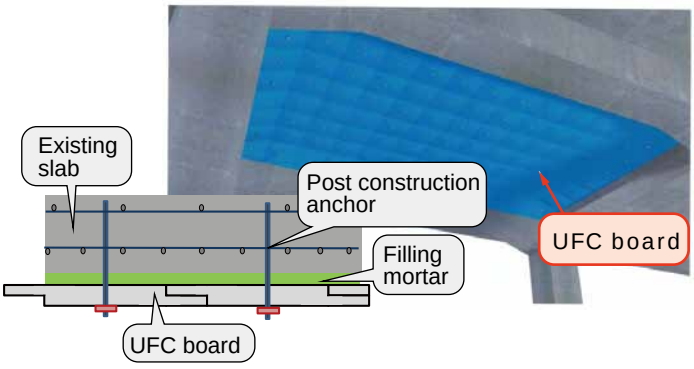
▶ Comparison of specific wear rate of contact strip in a wear test



▶ Comparison of wear rate of contact strip in a field test

Method for reinforcing or repairing deteriorated slabs on viaducts

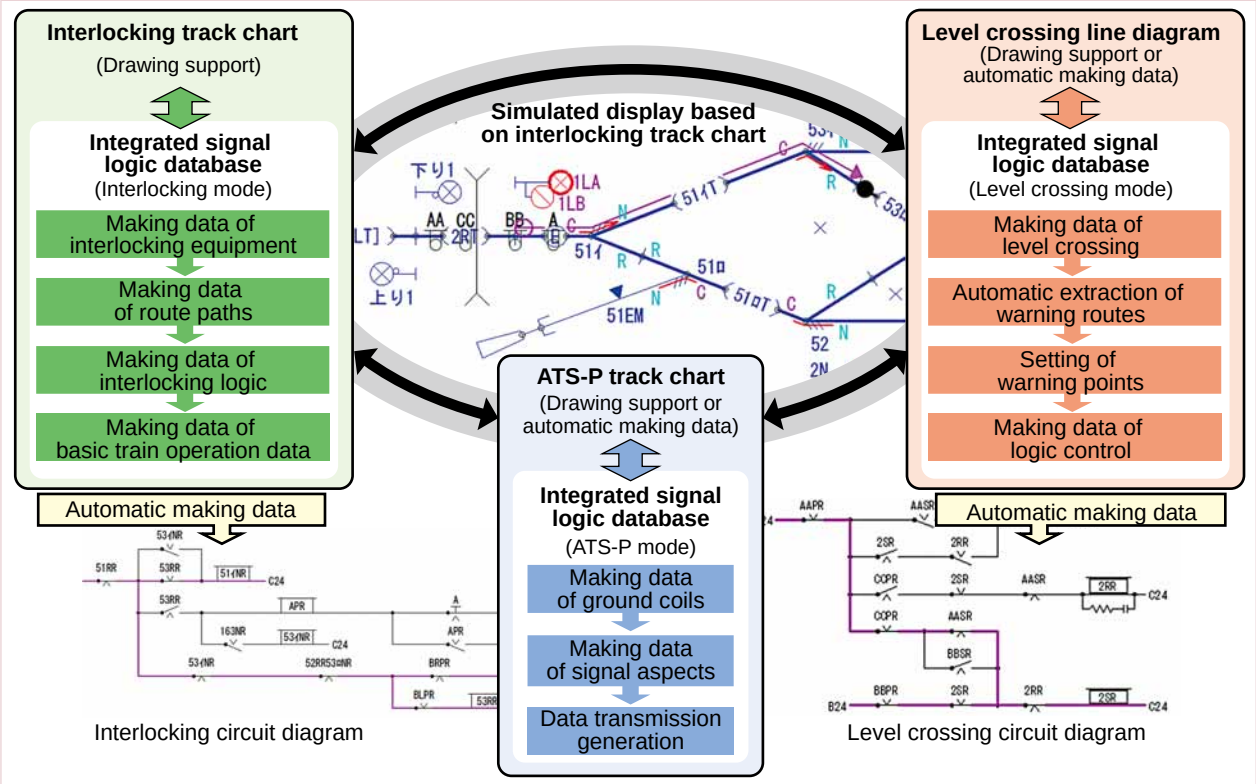
- A bonding method using UFC (ultra high strength fiber reinforced concrete) was developed for improving the endurance of deteriorated slabs on viaducts.
- A deck slab bonding method which reduces noise as well as increasing endurance was developed.
- Full scale tests demonstrated that both methods were practical and effective for reinforcement and repairs.



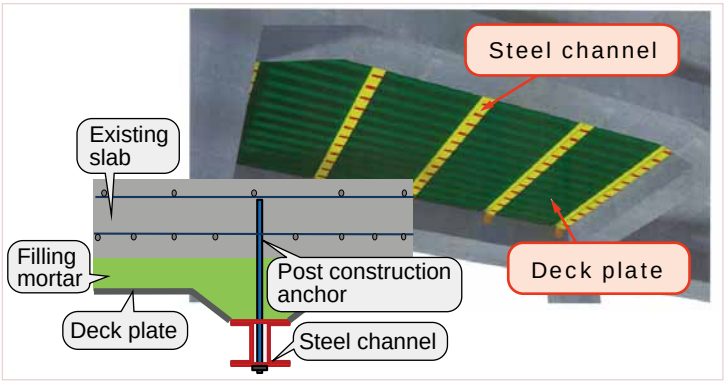
▶ Outline of method for UFC Board bonding

Method for improving the efficiency of integrated logic design of safety signalling equipment

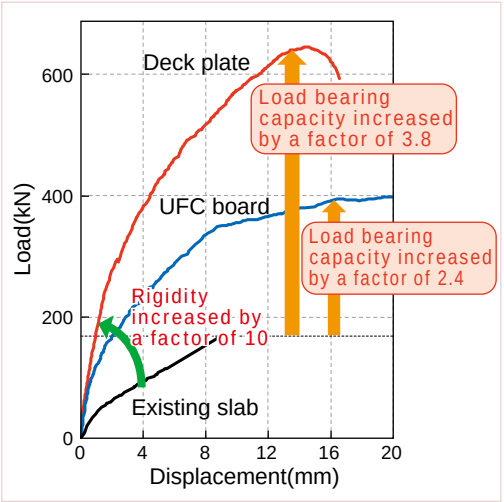
- A database was proposed for the integrated logic design of safety signalling equipment.
- Based on the proposed database, a method was put forward to make integrated logic design of level crossings and ATS systems more efficient.
- Insight was gained into how to create automatic schemas of level crossing circuit diagrams and a connectivity simulation tool.



▶ Structure of proposed system and flow chart showing process



▶ Outline of method for affixing deck plates

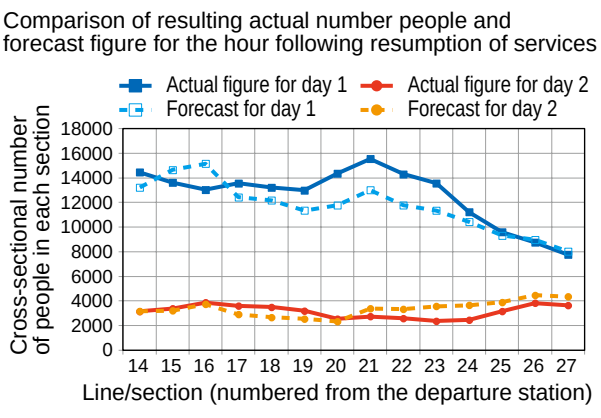


▶ Investigation into the effectiveness of the reinforcement work

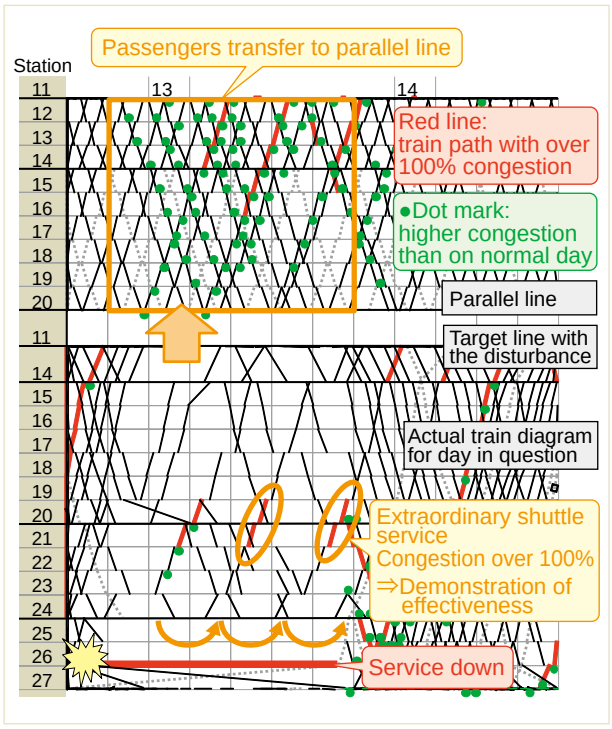
IMPROVEMENT OF CONVENIENCE

Using recorded data to analyse passenger flow when traffic is disrupted

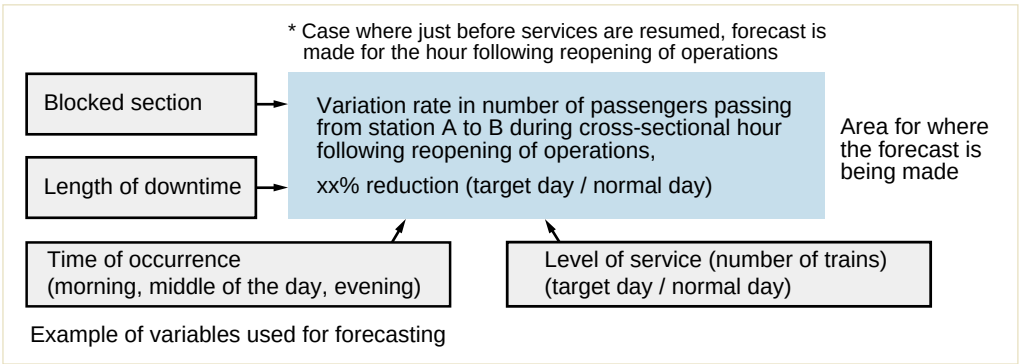
- We have made a method to visualise passenger flow when traffic is disrupted, based on recorded transport data
- We have built a method to quantitatively predict passenger flow before and after resumption of operations



▶ Results of prediction model verification tests



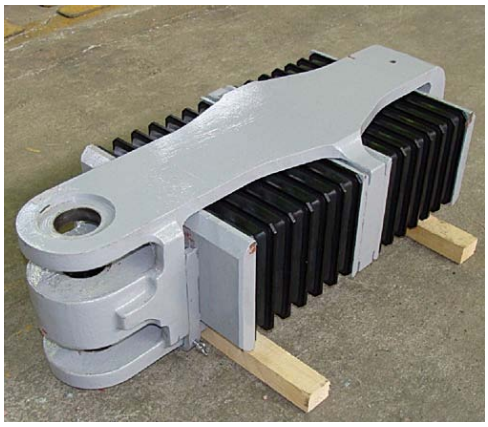
▶ Visualisation of actual traffic management and passenger flow figures (example of metropolitan line section with parallel running lines)



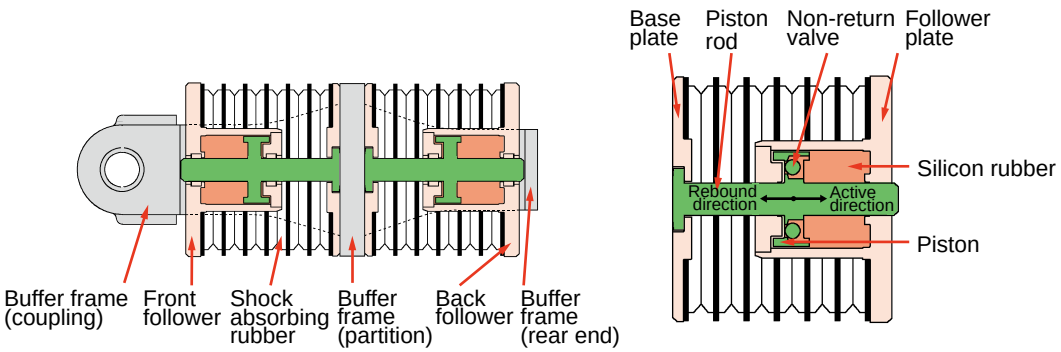
▶ Model for predicting cross-sectional number of people around time when services are to resume

Silicon buffer for freight vehicles

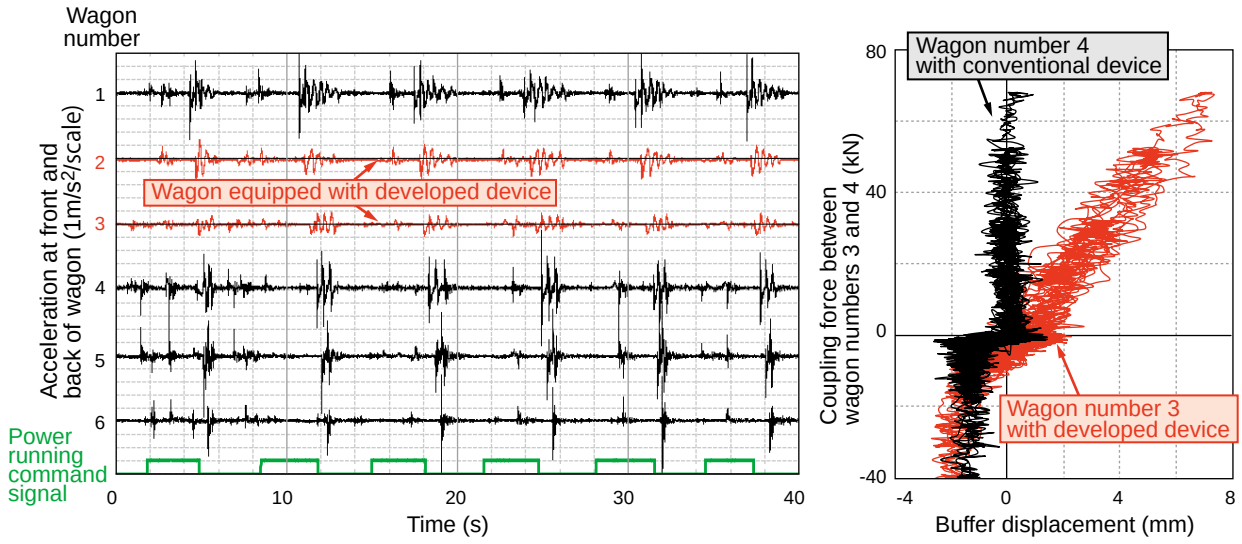
- A silicon buffer was developed to improve the quality of freight transport by reducing movement at the front and back of wagons.
- Yard tests demonstrated the effectiveness of the device in reducing acceleration at the front and back of wagons and that its basic functions were working properly.
- Applicability and effectiveness of the device on long freight trains was verified through simulation.



▶ The outside of the newly developed device



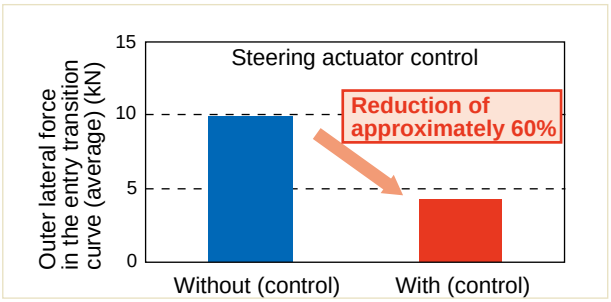
▶ Structure of device (left: assembly; right: shock absorber unit)



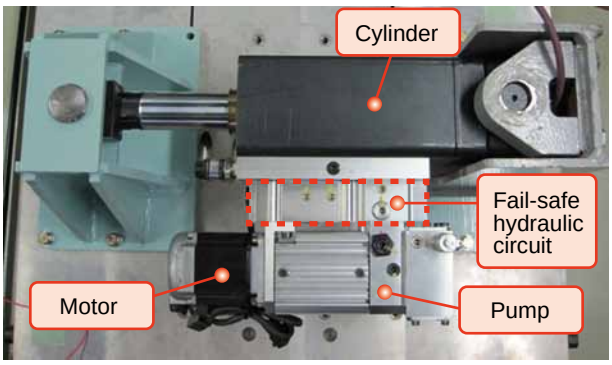
▶ Effect on lowering acceleration at front and back of wagon (power running 4 notches ON⇔OFF approximately every 3 seconds)

Electro-hydraulic actuator with fail-safe function for steering system

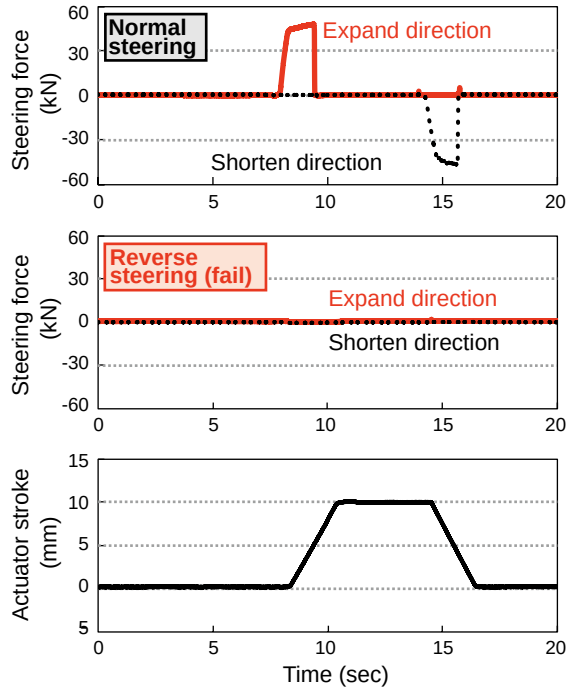
- In order to decrease the lateral force in the transition curve, we developed an electro-hydraulic actuator with a fail-safe hydraulic circuit which can prevent the reverse steering.
- From the result of the running test on a test line, we confirmed that the new steering system was able to reduce the lateral force approximately by 60% compared with an existing steering truck.
- From the result of a bench test, we verified the fail-safe function in case of a reverse steering command.



▶ Results of running tests



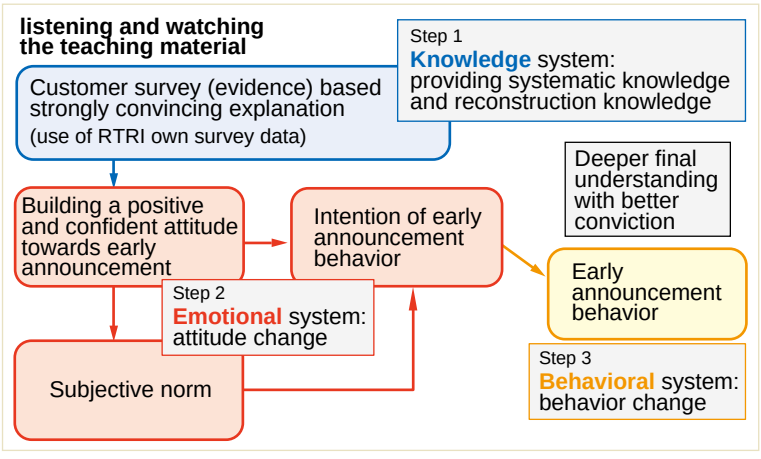
▶ Electro-hydraulic actuator with fail-safe function



▶ Failsafe function test results

Pedagogical guidelines on information to be provided to travellers about resumption of train services, based on the passenger point of view

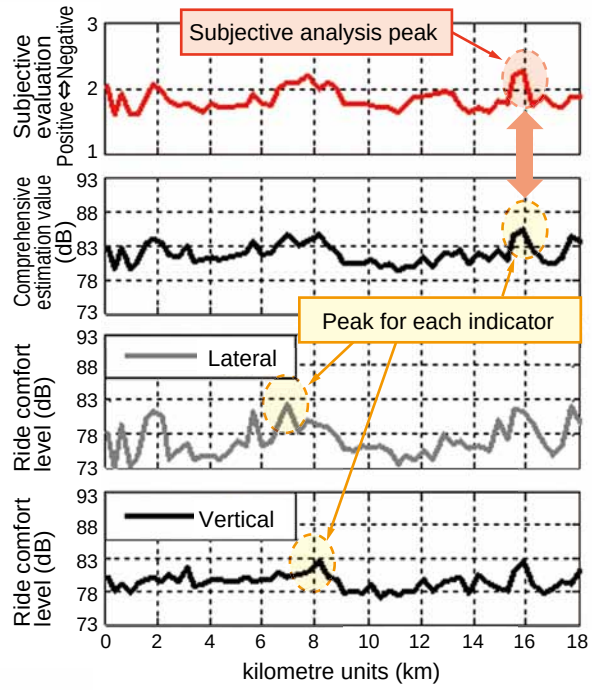
- To help staff overcome the difficult of understanding and realising how to formulate passenger announcements from the "user point of view," pedagogical material was produced to encourage responsible dissemination of information.
- Announcements improved with the teaching material; checks carried out showed that the progress achieved was still effective after 12 months



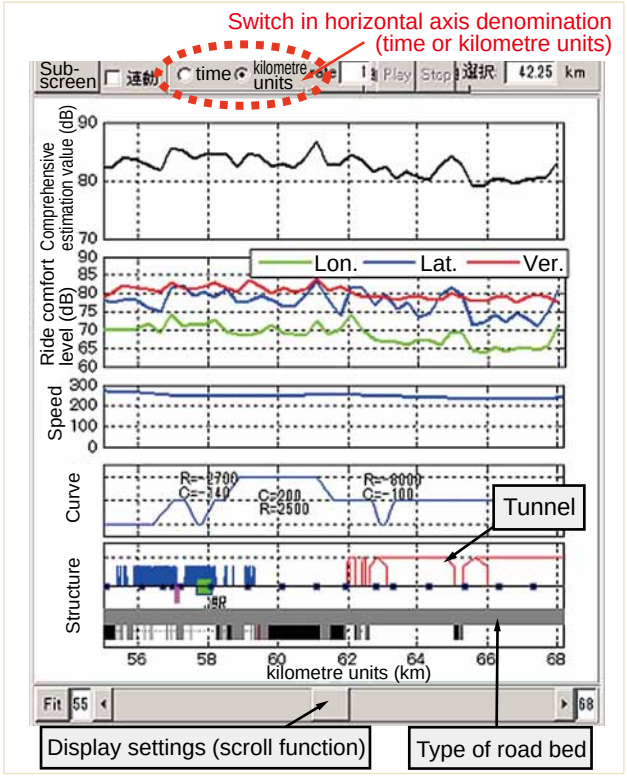
▶ Flow diagram of proposed method

Method for estimating location specific ride comfort based on compound vibration data

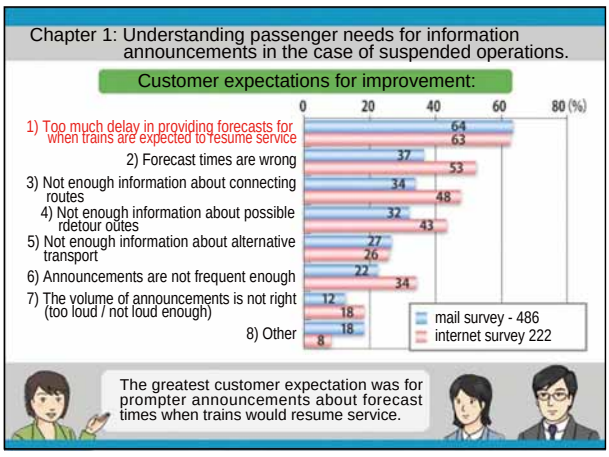
- In order to predict change in ride comfort due to vibrations, a method was proposed for obtaining an integrated estimate value, which is deemed to be a close representation of the physically perceived ride sensation.
- A system was then devised which analyses and gives a holistic view of ride comfort related information.



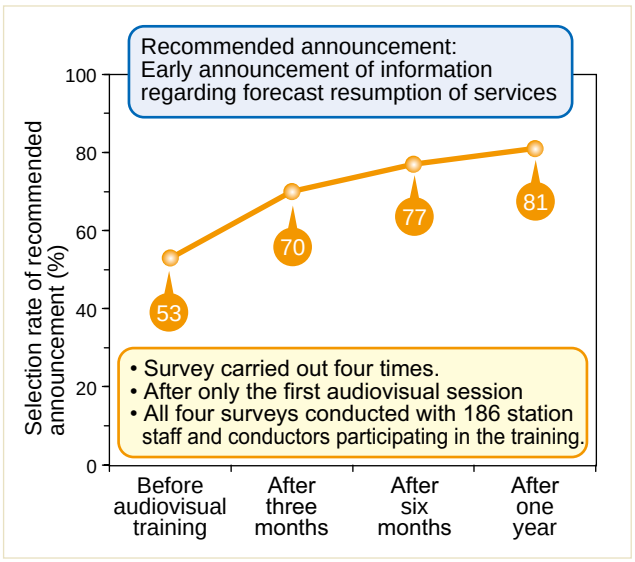
▶ Example of comprehensive estimated value



▶ Screenshot example of unified analytical system



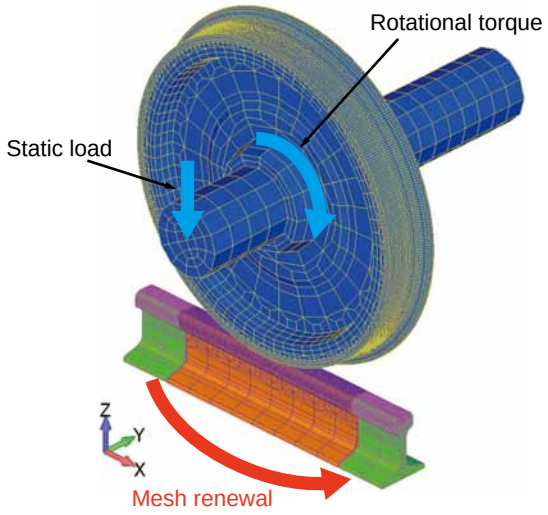
▶ Screen shot of teaching material - customer survey based explanation



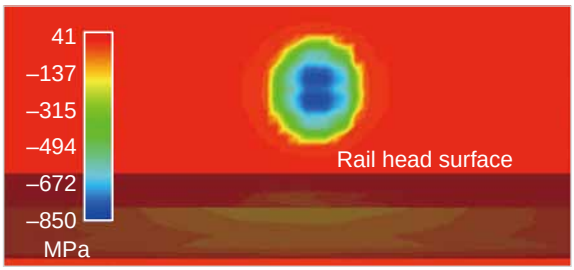
▶ Change recorded over one year of improvement in announcements

Method for dynamic analysis of wheel/rail rolling contact

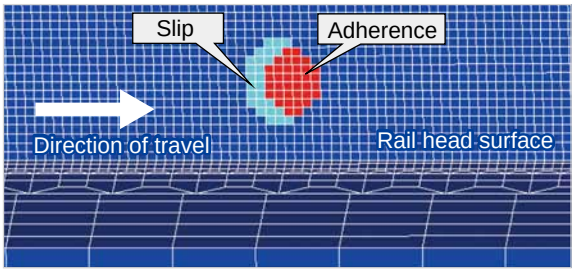
- In order to assess the state of dynamic rolling contact between the rail and the wheel, the finite element analysis program in a large scale parallel computing was developed.
- Dynamic rolling contact behavior for a single axle - single wheel model when running at high speed was calculated with high precision



▶ Caterpillar mesh analysis model



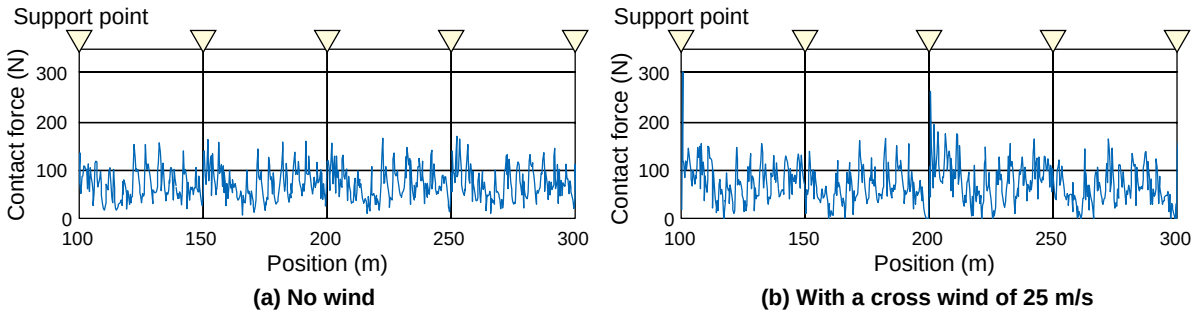
▶ Vertical direction stress distribution of contact surface



▶ Adherence and slip distribution areas

Three-dimensional dynamic simulator of pantograph/catenary system

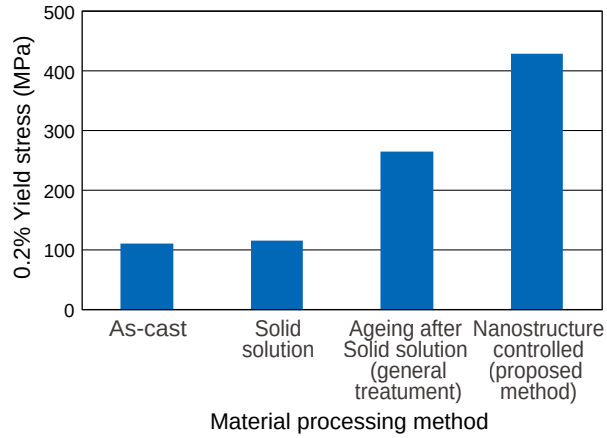
- This simulator can provide accurate three-dimensional static geometry of overhead contact lines.
- Dynamic analysis of the pantograph/catenary system can be performed considering geometric non-linearity of droppers and steady arms.



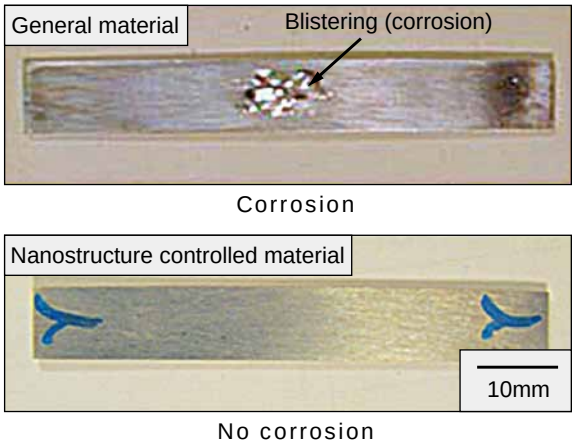
▶ Example of calculation of time history of contact forces at 300km/h

Method for improving aluminium alloy properties through nanostructure control

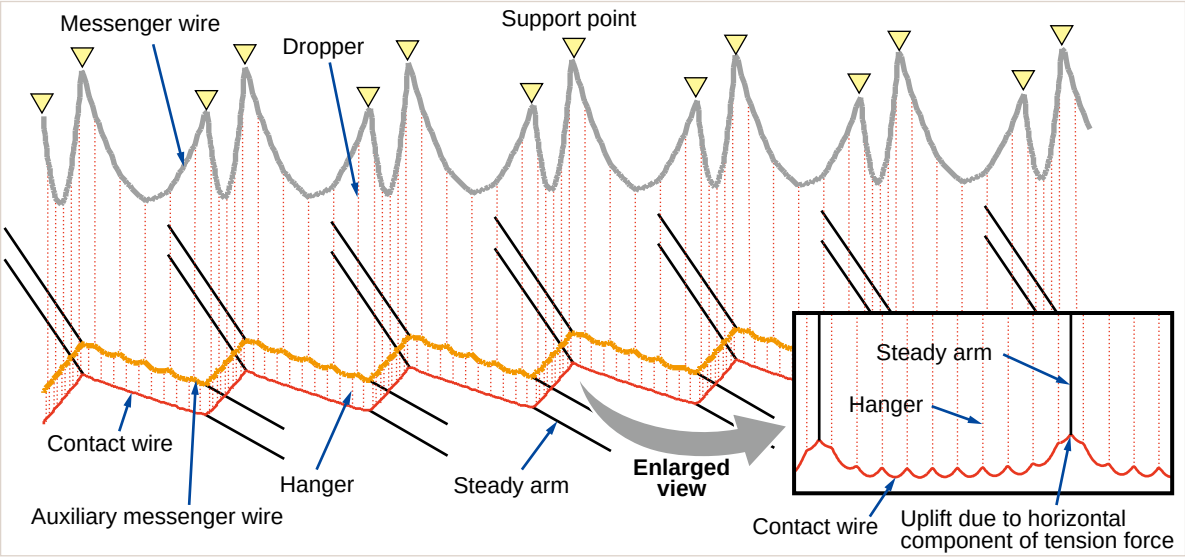
- A thermomechanical processing method was proposed to produce a higher performing aluminium alloy for use on Shinkansen train car bodies with nanostructure control of its metallic microstructure
- Verification was made of improved strength and resistance to corrosion.



▶ Resulting increase of yield resistance to 0.2% after applying the nanocontrol method (Al-Mg-Si: AA 6N01)



▶ Stress corrosion cracking resistance tests showing comparative resistance to corrosion (Al-Zn-Mg AA 7075)



▶ Example of 3D static structural calculation of compound catenary

Outline of Activities FY 2012

Public Interest Activities

1 Research and Development for Public Interest

In FY 2012 we pushed ahead with 282 research and development projects relating to the future of railways, as well as practical technologies and basic railway research. Among them, we finished 115 in 2012. 11 of them were sponsored by publicly-offered outside funding. The funds for research and development amounted to 2.58 billion yen, including 170 million yen of government subsidy and 120 million yen of outside funds. In addition, we implemented one contract-based R&D project, generating income of 120 million yen.

To improve the efficiency of research and development, we also launched 65 joint research projects with universities and other research institutes and 14 contracted research projects, while positively seeking advice and evaluation by 10 experts from outside organizations through the R&D review system.

We have disseminated the major results of our research and development through periodical publications, the RTRI Technology Forum and other seminars, and published booklets of the results of the R&D projects completed in FY 2011.

2 Surveys and Investigation

We conducted surveys on social and economic trends and on technical trends of railway technology at home and abroad in order to reflect the findings from our research and development plan. We also conducted strategic surveys such as awareness studies on railway safety and energy saving, and publicized the results through the RTRI lecture and other activities. We seconded a researcher to the International Union of Railways (UIC) in order to collect information on European railway technology and disseminated it through periodical publications.

3 Activities Involving Technical Standards

We conducted seven research and survey projects relating to technical standards which were commissioned by the national government. The income from this amounted to 100 million yen. We also carried out eight projects including development of design tools relating to technical standards.

4 Information Services

We collected information, publications and materials on railway technologies at home and abroad, and released them through the Internet and document search services. The full texts of RTRI's periodicals are available on our website. We continued digitalizing the materials stored in the library to improve the convenience of the library.

5 Publications and Lectures

We issued periodicals "RTRI Report," "RRR," "QR," "Railway Technology Avalanche" and "Information on World-Wide Railway Technologies (WRT)." We also held an RTRI Lecture entitled "Towards Further Improvement of Energy Efficiency" (452 participants), made 11 Monthly Presentations (1,022 participants), and delivered 27 Railway Technical Lectures (1,553 participants). We published a technical guidebook for Railway Structure Design Standards which was revised and released in 2012 by the Ministry of Land, Infrastructure, Transport and Tourism, and held briefing sessions for the standards in Tokyo and Osaka (484 participants).

6 Diagnosis and Guidance Services

In response to requests from railway operators, we provided consultancy services in 443 cases of rolling stock problems, power supply systems problems, damage to structures caused by natural disasters, as well as technical guidance in various fields.

7 International Standardization Activities

We promoted activities relating to railway international standards in the IEC (International Electrotechnical Commission) and the ISO (International Standardization Organization) based on policies or proposals which were put forward by the Railway Technology Standardization Committee. We made efforts to collect information by exchanging opinions with related organizations in Europe and Asia. We also promoted international standardization work by arranging a meeting of the Divisional Members Meeting Council and the International Standardization Strategies and Planning Committee according to members' needs.

Regarding IEC/TC 9 (Electric Facilities and Systems of Railways), 11 international standards were issued for which we acted as a secretariat to the National Mirror Committee. Also, energy storage system fitted to rolling stock was officially accepted as a new working topic.

Regarding ISO/TC 269 (Railway Applications) which was established in April 2012, we undertook the role of secretariat to the National Mirror Committee and initiated some international standardization work.

8 Qualification of Railway Design Engineers

We conducted the examination for railway design engineers in Tokyo and Osaka on October 28, 2012. 744 applicants took the exam and 129 passed. Moreover, in FY 2012, the exemption period for the successful first-stage test applicants was extended from one year to three years in order to make it easier for applicants to take the exam.

Commercial Projects

The revenue from contract-based, commercial activities in FY 2012 was 2.61 billion yen including income from patents. We organized eight technical seminars in order to disseminate research results and promote contract-based business, and a total of about 1,130 people from 330 companies attended.

1 Commissioned Research and Development Project

1.1 Public-Interest Projects

We implemented seven public-interest survey projects commissioned by the national government on topics that included "Design of Steel-Concrete Composite Structures," "Displacement of a Moving Car Body on Its Suspension" and "Evaluation of Magnetic Field in the Car Interior." We also carried out one research project entitled "Review of Evaluation Standards of Slope Damage" commissioned by the Japan Nuclear Energy Society (JNES). The income from these projects was 220 million yen.

1.2 Commercial Projects

We carried out contract-based, commercial projects related to the construction of new Shinkansen lines, the introduction of vehicle inspection systems, and the introduction of earthquake early warning systems. These were commissioned by public corporations, publicly-operated railways, JR companies, and other private companies.

Total income from commissioned projects for public-interest and commercial purposes was 2.83 billion yen, while the targeted amount was 3.43 billion yen.

▶Table 1Classification of customers

Customer	No. of projects		Amount of income (100 million yen)	
National government	8	(11)	0.15	(0.17)
Local governments	2	(3)	0.06	(0.10)
JR companies	88	(111)	7.74	(9.60)
Public corporations	38	(42)	7.63	(6.13)
Public /private railways	80	(92)	1.27	(2.69)
Private enterprises	312	(306)	9.28	(10.34)
Total	528	(565)	26.15	(29.03)

The figures in brackets refer to the previous year.

Table 1 summarizes the number of customers and the amount of income from commercial projects in FY 2012. The income from JR companies, public and private railway companies and private enterprises dropped in comparison with FY 2011, while the income from public corporations increased.

Major contracted projects were a review of structure design and assessment standards of slope damage commissioned by the government, testing for a new Shinkansen project commissioned by a public corporation, introduction of rolling stock inspection systems commissioned by public railway companies, introduction of earthquake early warning systems commissioned by JR companies and seismic assessment of railway facilities commissioned by private enterprises.

1.3 Total Income

Total income from public-interest and commercial projects was 2.83 billion yen in FY 2012, 82.5% of the targeted amount of 3.43 billion yen.

2 Railway Technology Promotion Center

We sought to properly assess the technical needs common to member organizations and promoted various projects in close co-operation with railway/tramcar operators and local railway associations.

In the sphere of technical support, we dealt with 92 inquiries from members on technical subjects and carried out eight field surveys. We held forums entitled “Human Science Technology Supporting Safe and Steady Railway Transportation” in Sapporo, Tokyo, Osaka and Fukuoka, and also gave lectures at nine technical workshops organized by local railway associations. Furthermore, we compiled a textbook on rolling stock for leading engineers.

We promoted five survey projects in response to members’ requests and completed two of them including “the Survey and Research on Durability of Tunnel Repair Material.” We simplified the registration process so that the members can access the members-only page on the Center’s website more easily. Regarding the database of railway safety, we continued to add information about railway accidents and incidents.

3 Railway International Standards Center

We carried out activities relating to international railway standards of the International Electrotechnical Commission (IEC) and the International Organization for Standardization (ISO).

In July 2012, we undertook the role of secretariat to the National Mirror Committee of ISO/TC 269 and actively participated in the selection of the chairman in co-operation with overseas organizations. As a result, a Japanese chairman was elected. Furthermore, we held two human resource development seminars and made information available at home and abroad via the website and General Members Meetings.

4 Other Activities

4.1 Development of Gauge-Changing EMUs

As a member of the FGT (Free-Gauge Train) Association, we drew up plans for running tests with a new trainset fitted with improved trucks and carried out measurements during the running tests, and further improved the truck.

Apart from the project of the FGT Association, Japan Railway Construction, Transport and Technology Agency (JRTT) has been developing a new type of test train with a further reduction in weight, as a project for FY 2012 subsidized by the Ministry of Land, Infrastructure, Transportation and Tourism. JR Kyushu is in charge of design and manufacture of the vehicle. RTRI took part in the design meeting of the new test train and gave advice.

4.2 Industrial Property Rights

We made 208 patent and utility model applications (215 in FY 2011), and 241 were registered in FY 2012 (215 in FY 2011). As a result, the total number of patents and utility models owned by RTRI reached 2,108 at the end of FY 2012.

Administrative Organization

1 Human Resources Development

We recruited 17 new graduates and two mid-career employees to avoid generation gaps in our technology level and to maintain the R&D potential. We also re-employed 10 retiring researchers as so-called "silver workers," to ensure the smooth transfer of technical knowledge and skills from veterans to young employees. As part of a training program for young employees, groups of four to five researchers who have two years of work experience at RTRI conducted trend surveys of advanced technologies.

In order to promote personnel exchanges, we seconded 63 researchers to other organizations, and accepted 106 in return. Among them, 32 were sent to JR companies and we accepted 59 from JR. In addition, we sent researchers to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan Railway Construction, Transport and Technology Agency (JRTT), the New Energy and Industrial Technology Development Organization (NEDO) and the International Union of Railways (UIC), while accepting researchers from MLIT, private railway companies and railway related manufacturers. Furthermore, as a result of our efforts to strengthen relationships with universities, 11 researchers took office as visiting professors and 42 as part-time instructors. 171 of RTRI's researchers have doctoral degrees and 77 have been qualified as Professional Engineers.

2 Organization

Information and communications technology has been developing at a remarkable pace in recent years. To take account of this, we merged the Signalling & Telecommunications Technology Division and the Transport Information Technology Division into the Signalling and Transportation Information Technology Division in order to establish a more efficient R&D system and to speed up decision making in this field.

We also established the Computational Mechanics Laboratory in the Railway Dynamics Division. This is in charge of acquiring, maintaining and developing advanced simulation technology in order to accelerate research and development in the field of railway simulators which can evaluate the safety, reliability, economy and convenience of railway systems.

3 Promotion of Corporation's Ethical Policy

We made efforts to promote the corporation's ethical policy, including the improvement of research ethics by providing information sessions for employees of RTRI and associated companies. We also offered education for employees through the RTRI version of the web learning system. In addition, we audited compliance with the corporation's ethical policy.

4 Visitors

RTRI's Kunitachi Head Office and the Maibara Wind Tunnel Technical Center received approximately 2,940 and 480 visitors respectively, in FY 2012. About 1,500 participants attended the RTRI Technical Forum held at the Kunitachi Head Office on August 30 and 31, and 360 participants attended the Osaka Forum on November 28 and 29. In addition, approximately 6,310 people visited RTRI's Kunitachi Head Office on the open house day on October 13 and 5,000 people visited Maibara Wind Tunnel Technical Center on its open house days, October 6 and 7.

International Activities

Joint Research with Overseas Research Organizations

We pushed ahead with joint research projects in three framework programs with overseas railway research organizations. Each division also implemented joint research based on its own interests with railways and universities in foreign countries. In FY 2012, we started a new joint research program with Chalmers University of Technology in Sweden and the University of Bristol in the UK.

1 Joint Research with CARS and KRRI

The tripartite joint research by Japan, China and Korea has been conducted by the three parties since the two bilateral research programs (1) between RTRI and the China Academy of Railway Sciences (CARS) and (2) between RTRI and the Korea Railroad Research Institute (KRRI) were combined into a single scheme.

Aiming at sharing research results and exchanging information, joint seminars have been held since 2001 by rotation. In November 2012, we held the 11th Joint Research Seminar in Fukuoka prefecture. The research themes promoted by RTRI were "Investigation of Microorganisms in Railway Systems," "Study of Wheel/Rail Adhesion and a Creep Test Method," "Signal Processing of the Relationship between Track Irregularity and Vehicle Response on High Speed Lines," "Research on the Influence of Railway Vibration on Buildings along Railroad Lines," "Study on Monitoring Technologies for Catenary Systems" and "An Evaluation Method to Determine the Renewal Timescale for Railway Power Supply Facilities.

2 Joint Research with SNCF

RTRI and Société Nationale des Chemins de fer Français (SNCF) have been carrying out joint research since the two parties concluded an agreement on joint research in November 1995. In September 2012, we held a collaborative research seminar at RTRI's Kunitachi Head Office and at the Maison Franco-Japonaise. At the Maison Franco-Japonaise, a Japan-France Railway Technical Symposium was also held with co-sponsorship by RTRI, Japan-France Industrial Technical Committee and the French Embassy in Tokyo on the afternoon of the collaborative research seminar. The 6th joint research program is now in progress in the fields of "Inspection and Preventive Maintenance of Overhead Contact Wires for High-speed Railways," "Ride Comfort for Standing Passengers," "An Application of Wireless Sensor Networks on Railways" and "Management of Research and Development."

3 Joint Research with RSSB

RTRI concluded an agreement on joint research with the Railway Safety and Standards Board (RSSB), in the UK in October 2008, and started joint research in December 2008. In November 2012, we had a meeting regarding the research themes for the next phase, especially for starting collaborative research regarding human sciences.

4 Joint Research with Other Research Organizations

In FY 2012, RTRI started joint research with Chalmers University of Technology in Sweden (Theme: Calculation Method of Air Flow / Fatigue Caused by Wheel-Rail Contact) and with the University of Bristol in the UK (Theme: High Precision Thrust Control by Use of an Actuator). We carried out joint research in the field of transport information technology with the Swiss Federal Railways from May 2011 to March 2013. We have also implemented a joint research program with the University of Cambridge in the UK (Theme: Status Monitoring of Facilities) since September 2006, and with Massachusetts Institute of Technology in the USA (Theme: High-temperature Superconductivity) since April 2004.

Support for WCRR

The World Congress on Railway Research (WCRR) stems from the RTRI-sponsored Tokyo international seminar held in 1992 to which RTRI invited a number of leading members in the field of research and development from major railway operators and other organizations in different countries across the world. WCRR has since developed into an international conference attended by railway engineers from around the world who place particular emphasis on research as part of their technological development. In November 2013, WCRR 2013 will be held in Sydney, Australia. To support its preparation, an RTRI executive and a director attended the Organizing Committee meeting in September 2012 (Venue: Brandenburg, Germany), and the Executive Committee meetings in May 2012 (Venue: Colorado Springs, USA) and October 2012 (Venue: Florence, Italy), as regular members. Moreover, 650 abstracts of papers were submitted for the oral and poster presentations at WCRR2013.

Co-operation with Government and Domestic Organizations

Responding to requests from the Ministry of Land, Infrastructure, Transport and Tourism and domestic organizations which support international activities, RTRI sent its researchers to various countries overseas, and in return accepted visitors and internship students from other countries. In August and September 2012, RTRI's researchers gave lectures on rolling stock and power supply systems in Thailand.

Also, RTRI received visits from foreign students on the internship program of the University of Tokyo in July, from diplomats at the British Embassy in Japan and from representatives of Scottish Development International in November. In February 2013, RTRI received the Minister of State for Transport in the UK by request of the British Embassy in Japan.

Collection of Overseas Technical Information and Participation in International Conferences

We seconded staff to the International Union of Railways (UIC, headquarters: Paris, France) to collect information on technical research and development being undertaken by railways in Europe. We participated in the UIC Asian Regional Assembly held in Moscow, Russia, in November, in the UIC General Assembly and International Railway Research Board (IRRB) meeting held in Philadelphia in the USA in July and in Paris in December. Also, we participated in the US Transportation Research Board (TRB) meeting held in Washington DC in January 2013. As information disseminating activities, RTRI took an exhibition stand at the UIC High Speed Rail event, which was held together with the UIC General Assembly in July and also at InnoTrans 2012, which was held in Berlin, Germany in September.

Dissemination of Information by Publication

In FY 2012, we issued the Newsletter "Railway Technology Avalanche" on a quarterly basis to introduce our latest R&D activities and research staffs. Also, we issued our Annual Report 2011 (English Version) using an edited version of the original Japanese-language report. Furthermore, we started providing information on QR (Quarterly Reports of RTRI) and an English version of some parts of our brochure by using the SPARK (Sharing Portal for Access to Rail Knowledge) system, which has been run by RSSB in the UK since this year.

Overseas Business Trips by RTRI's Researchers and Visitors to RTRI from Overseas

The following Tables show the number of business trips made by RTRI's researchers and the number of visitors to RTRI from overseas.

▶ Number of business trips by RTRI's researchers (by purpose)

	Asia	Europe	North America	Central and South America	Africa	Oceania	Others	Total
WCRR	0	5	1	0	0	0	0	6
Conference/meeting	28	111	13	2	0	0	0	154
Survey/Research	8	5	1	0	0	0	0	14
Joint research	0	8	1	0	0	0	0	9
Technical guidance	0	0	0	0	0	0	0	0
Contract	28	8	4	0	0	0	0	40
Others	33	21	1	0	0	0	0	55
Total	97	158	21	2	0	0	0	278

(As of March 31, 2013)

▶ Number of visitors from overseas by country

Asia	Europe	North America	Central and South America	Africa	Oceania	Others	Total
130	76	14	2	12	2	53	289

(As of March 31, 2013)

Railway International Standards Center

To facilitate the smooth operation of the Railway International Standards Center, Planning and Administration Council's meetings, which are attended by representatives of member organizations, are held a few times a year. The meetings are held to discuss important matters including business plans, budgets, business and financial reports, admissions and withdrawals of members, and other matters. To maintain close communication with members, a General Member Meeting is held a few times every year, and information and views are constantly shared among members.

1 Operation and Management

1.1 Planning and Administration Council

The business report for FY 2011 and the business plan for FY 2013 were discussed at Planning and Administration Council meetings held in May and November 2012 and in February 2013.

1.2 Settlement of Accounts in FY 2012

The total income for FY 2012 was approximately 222 million yen, including 88 million yen from membership fees, 123 million yen from JR contributions and 10 million yen of the balance carried forward from FY 2011.

The total expenditure was 187 million yen, including 60 million yen for business activities, 22 million yen as travel expenses and 102 million yen as personnel expenses.

1.3 Number of Members

There were 18 corporations and organizations joining as new entrants in FY 2012, and, as of the end of FY 2012, the total number of members is124, taking account of withdrawals and mergers.

1.4 General Member Meeting

General Member Meetings were held in August 2012 and March 2013, and discussions at the Planning and Administration Council were reported and views were exchanged among members.

2 Review of IEC and ISO Standards

Railway International Standards Center, RISC, has fulfilled the role as the National Mirror Committee of IEC/TC 9 (Technical Committee of the International Electrotechnical Commission for Electric Facilities and Systems of Railways), ISO/TC 17 (Technical Committee of the International Standardization Organization for Steel), and ISO/SC 15 (Subcommittee of ISO for Rails and Auxiliaries). Since July 2012, the Railway International Standards Center has also been acting as the ISO/TC 269 (Railway Applications) National Mirror Committee.

2.1 Role as Secretariat of ISO/TC 269 National Mirror Committee

Following the authorization of the establishment of ISO/TC 269 by the Japan Industrial Standards Committee (JISC) in April 2012, RISC started acting as the secretariat of the National Mirror Committee of ISO/TC 269 in July 2012, while a candidate recommended by Japan was accepted as chairman of ISO/TC 269, also in July 2012. RISC has continued back-up activities so that Japan can secure a position to exercise leadership in ISO/TC 269.

2.2 Activities of IEC/TC 9

Meetings of the IEC/TC 9 Mirror Committee were held in August 2012 and in March 2013, and the status of standards development was reviewed and reported. The 52nd General Assembly of IEC/TC 9 was held in Oslo, Norway on October 2 to 5, 2012 and seven persons attended from Japan. Regarding the discussions on standards, the Mirror Working Group met more than 60 times and sent 115 members of RISC and other divisions of RTRI to international conferences. Regarding IEC/TC 9, 11 standards which RISC reviewed as part of its role as secretariat of the National Mirror Committee went into effect. In addition, a standard for onboard energy storage systems proposed by Japan was approved officially.

2.3 Activities of ISO/TC 269

In September 2012, a meeting of the 1st ISO/TC 269 Mirror Committee was held, at which there were discussions about its program of activities, its organization, and the stance to be adopted for participation in the General Assembly of ISO/TC 269. The 1st General Assembly of ISO/TC 269 was held in Berlin, Germany, on October 30 and 31, 2012 and 11 persons attended from Japan. At the General Assembly, the conference language and administrative matters including the scope of work were discussed. The establishment of two ad-hoc groups, AHG02 and AHG03, was also approved there. AHG02 will prepare Japan's proposal for Generic Standards, which are comprehensive standards covering entire railway systems, and AHG03 will prepare the proposal covering HVAC (heating, ventilation, and air-conditioning equipment). RISC organized the 2nd ISO/TC 269 Mirror Committee meeting in December 2012, and the results of the General Assembly meeting were reported there, while future strategy was also discussed.

2.4 Activities of ISO/TC 17/SC 15

The General Assembly of ISO/TC 17/SC 15 was held on June 15, 2012 and that of ISO/TC 17/SC 15/WG1 was held on June 14 and 15, 2012, both in Paris; four Japanese experts attended. RISC organized meetings of the ISO/TC 17/SC 15 Mirror Committee in June 2012, and the results of the General Assembly meeting were reported and the future stance required to deal with specific standards was discussed. Furthermore, we sent six experts of the RISC and RTRI's other divisions to international conferences.

2.5 Activities for Other ISO Railway Standards

Regarding the review activities for other ISO railway standards which are not included in the scope of ISO/TC 269 and ISO/TC 17/SC 15, such as noise measurement, ground vibration, synthetic sleepers and fare-control systems, RISC participated in the mirror committees and sent experts to international conferences.

3 International Standardization Strategy for the Field of Railways

RISC has reviewed international standardization strategies in order to address international standardization in the field of railways.

3.1 Gathering Opinions on Strategies

(a) Divisional Members' Meeting Council

RISC's divisional members' meeting council covers 10 sectors such as rolling stock, on-board electrical equipment, parts, power supply, overhead wires, signalling, station facilities, track, non-manufacturing suppliers and JR, and opinions were exchanged on the meetings about the developments in Europe and about divisional needs to introduce international standards.

(b) International Standardization Strategies and Planning Meetings

RISC held International Standardization Strategies and Planning meetings in August 2012 and January 2013, and the activities of ISO/TC 269 and RISC's medium- to long-term activity plan were reviewed.

3.2 Review of the Proposals by Japan

Based on the discussions at the Divisional Members' Meeting Council and International Standardization Strategies and Planning meetings, RISC proposed draft standards for wayside energy storage systems at IEC/TC 9. RISC also proposed at ISO/TC 269 that standardization work for Generic and HVAC equipment should be started.

4 Proposals for Domestic Standardization

RISC reviewed the need to set domestic standards corresponding to existing and prospective international standards, and supported the work required to incorporate them in Japanese Industrial Standards (JIS).

5 Collection, Analysis and Proposals for Information

To collect information on standards developments in Europe and other countries, we implemented the following measures:

- A survey relating to features of each management system standard and its application to railways
- A survey of the analysis methods for the effects of standardization in various railway fields
- Translation of important overseas standards

6 Overseas Dissemination of Japanese Railway Technical Information

In order to make information on Japanese railway technology available overseas in terms of international standardization, RISC introduced Japan's commitment to international standardization on its website in English. We also compiled an English brochure to explain the activities of RISC to overseas organizations.

7 Awareness Enhancement for International Standardization and Human Resource Development

7.1 Seminars

We introduced recent developments in international standardization at RTRI's Monthly Lecture held in July 2012. Furthermore, we held a seminar in January 2013 to disseminate basic knowledge and the latest developments concerning international standardization.

► RTRI's Monthly Lecture in July 2012

7.2 Secretariat Activities to Honour Contributors to the Standardization of Railway Technology

Japan's Railway Technology Standardization Committee organized by the Ministry of Land, Infrastructure, Transport and Tourism honours those who have contributed to domestic and international standardization in the railway field. In 2012, RISC was commissioned by the Ministry to serve as the secretariat for the prize giving work. In FY 2012, four persons won official commendations and three were awarded encouragement prizes.

8 Promotion of Co-operation with Overseas Railway Experts

8.1 Co-operation with Railway Standards Experts Personnel in Europe

An information exchange meeting of the JISC-Comité Européen de Normalisation (CEN) was held in October 2012 in London, UK, and eight persons including the chairman of CEN/TC 256 (Railway Expert Committee) and four Japanese people attended. Furthermore, the information exchange meeting of the JISC-CENELEC' (European Committee for Electro Technical Standardization) was held in Brussels, Belgium, in November 2012. Along with this meeting, a meeting of the JISC-CENELEC Railway Working Group meeting was held, and 11 European people including an organizer of CENELEC/TC 9X (Electrical and Electronic Applications for Railways) and eight Japanese attended, actively participating in the discussions.

8.2 Co-operation with Railway Standards Experts in Asia

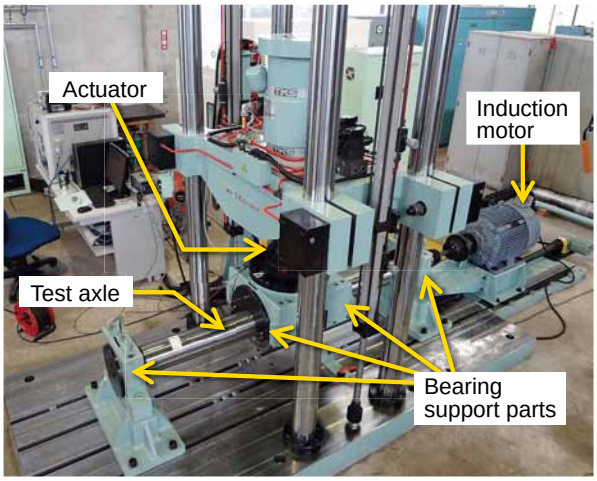
In August 2012 RISC's experts visited the Ministry of Transport and the Land Transport Agency of Singapore to exchange opinions. Also in August 2012, we held an information exchange meeting about Japan-Korea Railway Technology Standardization with KRRI (Korea Railroad Research Institute) in Japan. To co-operate with South East Asian countries, we exchanged opinions with Malaysian Railways Limited (KTMB) and State Railway of Thailand concerning co-operation procedures for international standardization activities by visiting them in December 2012. Based on the results of these activities, we will promote co-operation with Asian countries.

Newly Introduced and Remodeled Machines/Facilities

We renewed three items of equipment including the high-voltage electricity facility, and replaced five aging sets of apparatus including the telephone switchboard; we also implemented four safety measures. Regarding test equipment, we introduced an axle fatigue test machine using full-size axles to evaluate the propagation of cracking and the fracture process. In total, we introduced, improved, or renewed 18 test machines. Major items are summarized below.

Full-size Axle Fatigue Test Machine

We introduced a new rotating and bending test machine which is available for full-size axle fatigue tests. This machine consists of bearing stands and holders to support the axles, an electric hydraulic actuator to apply loads and a rotational force to the axles, and an induction motor. The actuator applies loads onto the two bearing holders at the center, and the bearing stands at both ends support the loads. Bending moments can then be applied to the axle due to the force through these four stress points, as is the case on the axles of actual vehicles. The actuator is capable of exerting a maximum static load of 400 kN and a maximum dynamic load of 320 kN; the maximum speed of rotation is 1200rpm. We can obtain highly reliable fatigue strength data and damage evaluation of full-size axles.

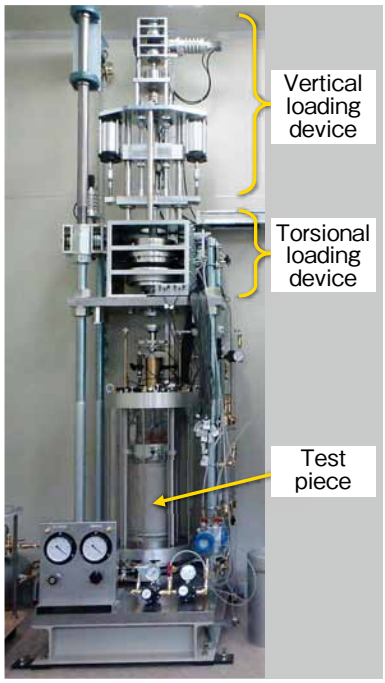


▶Full-size axle fatigue test machine

Torsional Shearing Test Machine for Hollow Materials

We introduced a torsional shearing test machine for hollow cylindrical track bed materials. With this machine, single or repeated twisting motions are applied to the hollow cylindrical test material while it is under vertical load. Compared with conventional triaxial tests, this machine can accurately reproduce the stress and deformation conditions of soil components in actual ground. Its loading mechanism consists of a vertical loading and a torsional loading device which are capable of low-speed and high-stress/torque loading. The test piece has an inside diameter of 120 mm, an external diameter of 200 mm, and a height of 300 mm. Larger-grain materials can also be tested.

In addition, we manufactured a PS logging device which can evaluate the hardness of the material as it changes with the loading. This device measures the velocity of the earthquake's P wave and S wave as they propagate through the ground. We developed the test machine, focusing on precisely evaluating the strength of the ground and its deformation characteristics. The machine can handle low strain conditions such as those occurring during the construction of railway facilities or when trains are running over the ground and higher strain conditions such as those experienced during earthquakes.



▶Torsional shearing test machine for hollow cylindrical track bed materials

Appendix

Publications

RTRI Report

Vol. No.	Titles
Vol. 26 No. 4 (Apr. 2012)	***Special Features: Structural Technology*** REVIEW:Recent Research and Development on Maintenance Technology of Railway Structures PAPERS:Deterioration Prediction of RC Handrails Considering the Variety of Damage Factor PAPERS: Improvement of Deformation Performance of Reinforced Concrete Columns with Small Shear-span Ratio by Using the Steel Jacketing PAPERS:Development of Structural Improvement Composing with Concrete Slabs for Renewal of Existing Railway Steel Bridges PAPERS:Stability Inspection of Existing Retaining Walls PAPERS:Reinforcement of Old-type Bridges against Earthquake by Integrating Railway Steel Girder, Abutments and Embankment PAPERS:Estimation Method of Falling of Concrete Piece from Tunnel Lining PAPERS:An Effect and a Design Method of Rock Bolts as Countermeasures for Roadbed Heaving of Mountain Tunnels PAPERS:Health Monitoring System for Finishing Materials of Station Facilities
Vol. 26 No. 5 (May 2012)	***Special Features:Maglev Technology and Applicable Attempts on Conventional Railway System*** REVIEW:R&D of Superconducting Maglev and Applications of its Technology to Conventional Railway System PAPERS:Development of Models for Co-simulation of Mechanics and Electromagnetics for Dynamic Analysis of Superconducting Maglev Vehicles Moving with Large Displacements PAPERS:A Novel Superconducting Coil Fabrication Method with YBCO Coated Conductor PAPERS:Development of Multiple Cryocooler with Pulse-tubes for High-temperature Superconducting Magnets PAPERS:Development of Temperature Measurement Technique inside Cryogenic Equipment Using Optical Fiber PAPERS:Construction-related Inspection of Cable Wiring of Ground Coil Type of PLG PAPERS:Development of Ground Coils with Low Eddy Current Loss by Applying the Compression Molding Method after the Coil Winding PAPERS:Configuration of Non-contact Power Supply Coil for Railway PAPERS:Performance of Room-temperature Magnetic Refrigerator Applying Ring Halbach-array Magnetic Circuit RESEARCH REPORT:The Results of a Survey on the Regulation of a Electromagnetic Field in Railway System
Vol. 26 No. 6 (Jun. 2012)	***Special Features:Power Supply Technology*** REVIEW:Recent Topics on Power Supply Technology PAPERS:Development of Deterioration Monitor for Surge Arresters of Shinkansen Feeding Circuit PAPERS:Development of Surge Detection Type Fault Locating System for AC Feeding Circuits PAPERS:Undulating Wear of Rigid Conductor Lines and Its Restraint Methods PAPERS:Mechanism of Formation of Undulating Wear on Overhead Rigid Conductor Line due to Dynamic Characteristics of a Pantograph PAPERS:Measures against Middle-level Earthquake for Overhead Contact Line PAPERS:Influence of Arc Discharge on Mass and Surface Condition of Current-Collecting Materials PAPERS:Improvement of Anti-fatigue Property of Contact Wire by Modifying Cross-section Shape PAPERS:Development of Anti-corrosive Supporting Equipment of Overhead Contact Line for Narrow Section Tunnels
Vol. 26 No. 7 (Jul. 2012)	***Special Features:Signalling and Telecommunications Technology*** REVIEW:Recent Research and Development of Railway Signalling and Telecommunications Technologies PAPERS:A Method to Verify Conceptual Design Specifications on Safety Requirements for Train Control Systems PAPERS:The Lightning Risk Evaluation for Railway Signalling Systems based on Observation of Lightning Overvoltage PAPERS:Development of DS-ATC for Hokuriku-Shinkansen, Applicable to 50/60Hz Feeding PAPERS:A Visibility Check Method for Obstruction Warning Signals by Cab-mounted Camera PAPERS:Obstacle Detection on Railway Track by Image Sensor PAPERS:Development of Communication Network Simulator for Train Control System Using Radio Communication PAPERS:A Method to Evaluate the Appropriateness of Introduction of High Speed Data Transmission System Using Metallic Telecommunication Lines into Railways PAPERS:Evaluation Method of Transmission Quality of Public High Speed Wireless Telecommunication Service for Use in Railway Systems
Vol. 26 No. 8 (Aug. 2012)	***Special Features:Railway Dynamics*** REVIEW:Recent Research and Development on Railway Dynamics PAPERS:Reduction of Aerodynamic Noise Generated by a Pantograph Head By using Speaker-driven Synthetic Jet Actuators PAPERS:Three Dimensional Dynamic Simulation of Pantograph-Catenary System Based on Finite Element Method PAPERS:Numerical Dynamics Simulation of Train Set Running on Ballasted Track after Derailment PAPERS:Running Safety Assessment for Flange Climbing at Low Speeds Related to Rail Grinding Profile PAPERS:Assessment of Application of Lubricant to Wheel/Rail Interface in Curves PAPERS:Feasibility Study on a Measuring Method of Rail Axial Stress Based on the Resonant Frequency of Standing Wave Modes PAPERS:Influence of High-speed Train Running on Fatigue Performance of Structure PAPERS:A Study on the Quantitative Evaluation Method of Rockfall Risk by Remote Vibration Measurement
Vol. 26 No. 9 (Sep. 2012)	***Special Features:Disaster Prevention Technology*** REVIEW:Future Research and Development for Natural-hazard and Risk Mitigation PAPERS:An Estimation Method of Epicentral Distance Based on Characteristics of P-wave Initial Envelope PAPERS:Calculation Method of Time History Including Large-scale Earthquake and Its Aftershock PAPERS:A Support System for an Early Resumption of Regular Train Operation by Applying a Public Earthquake Information PAPERS:Assessment of the Incidence of Landslides Using of Numerical Information PAPERS:An Evaluation of Vibration Properties of Scoured Bridge Piers by Using the Analytical Model of Vibration Characteristics Considering the River-flow PAPERS:Seepage Analysis Model for the Drainage Pipe Applied to Embankment PAPERS:Experimental Studies on the Applicability of Sprinkler Snow-melting Method to Shinkansen Lines in Cold and Heavy-snow Regions PAPERS:An Estimation Method of the Probability that Gust Exceeding the Critical Wind Velocity of Overturning Occurs in an Operating Section

Vol. No.	Titles
Vol. 26 No. 10 (Oct. 2012)	***Special Features:Vehicle Technology*** REVIEW:Recent Topics on Vehicle Technologies PAPERS:Safety Evaluation of Railway Vehicle Against Crosswind Applying a Full-Vehicle Model PAPERS:Experiments and Simulations of 1 to 10 Scale Model Vehicle Being on Vibrating Track PAPERS:Fault Detection of Vertical Dampers of Railway Vehicles Based on Phase Difference of Vibrations PAPERS:The Noise Reduction System with Use of Piezoelectric Materials Applied to the Railway Vehicles PAPERS:Improvement of Fatigue Strength of Axle by Changing Shape of Fillet Part between Wheelseat and Axle Body PAPERS:An Estimation Method of SOC of Lithium-ion Battery for Contact-wire and Battery Hybrid Electric Railway Vehicle PAPERS:Detectable Method of Damage of Single Link Rubber that Connects Bogie with Carbody by Impact Test RESEARCH REPORT:Trend of Modularity in Railway System
Vol. 26 No. 11 (Nov. 2012)	***Special Features:Structural Technology*** REVIEW:Recent Trends of Design Standards for Railway Structures PAPERS:Effects of High Frequency Ground Motion on Seismic Design of Bridges and Viaducts PAPERS:Soil Liquefaction Due to a Long Duration Earthquake with Low Acceleration and Its Evaluation PAPERS:Evaluation of the Seismic Response by the Model of the Structure and the Power Pole PAPERS:Evaluation of Load-carrying Capacity of Steel Reinforced Concrete under Antisymmetric Moment Distribution PAPERS:The Influence of the Details of Reinforcement Arrangement on Deformation Performance of Reinforcement Concrete Members PAPERS:Repair Method and Restorability Assessment Method of Damaged Concrete Filled Tubular Steel Members OTHER REVIEWS:Seismic Design Procedure of Reinforced-soil Bridge Abutment and an Example of its Performance Verification OTHER REVIEWS:Seismic Design Procedure of Conventional Type Bridge Abutment and an Example of its Performance Verification
Vol. 26 No. 12 (Dec. 2012)	***Special Features:Materials Technology*** REVIEW:Recent Trend of Research and Development on Materials for Railway PAPERS:Effect of Physicochemical Properties of Aggregates on Dry Shrinkage of Concrete PAPERS:Evaluation of Methods Suppressing the Chloride Attack to Reinforced Concrete Structures by Using Chloride Ion Adsorption Material PAPERS:Mechanical Analysis of Soundproof Plate with Function of Wind Load Reduction and Experimental Verification Using Prototype in Practical Scale PAPERS:Development of Detection Technique of Crack of Movable Nose Crossing Using a Conductive Paint PAPERS:In Situ Analytical Method of Interfacial Substances between Wheel and Rail PAPERS:Development of the Track-side Friction Moderating System to Low-rail of Sharp Curves PAPERS:Brake performance of Cast Iron Composite Brake Blocks Containing Alumina Foams PAPERS:Case Study of Superconducting Cables for Railway Systems PAPERS:Improvement of Bonding of Friction Stir Welding of High Strength Aluminum Alloy
Vol. 27 No. 1 (Jan. 2013)	***Special Features:Environmental Technology*** REVIEW:Recent Studies on Wayside Noise, Ground Vibration and Micro-pressure Wave PAPERS:Development of Experimental Technique on the Micro-pressure Wave Phenomenon Using a Train Model of Actual Shape PAPERS:Development of a Deflector on the Top Edge of the Front End of a Bluff-Nose Train for Reducing the Compression Wave Generated by the Train Entering a Tunnel PAPERS:Countermeasure for Reducing Micro-pressure Wave Emitted from Railway Tunnel by Installing Hood at the Exit of Tunnel PAPERS:Contribution of Rolling Noise and Aerodynamic noise to the Total Noise Generated from the Lower Part of Shinkansen Cars Running at High-speed PAPERS:Improvement of Measurement Methods for Aeroacoustic Noise from Bogie Section in the Wind Tunnel Test PAPERS:Vibration Characteristics of a Wheel of a Running Railway Vehicle PAPERS:Estimation of Aerodynamic Drag Reduction and Energy Saving of Meter-gauged Railway Vehicles RESEARCH REPORT:Results of Wind Tunnel Tests for Aerodynamic Coefficients of Railway Vehicles
Vol. 27 No. 2 (Feb. 2013)	***Special Features:Transportation Planning and Information Technology*** REVIEW:Application of Information and Communication Technologies to Railways and the Role of Simulation Technologies PAPERS:A Quantitative Defining Method of Station's Territories in the Competing Area of Multiple Railway Companies PAPERS:An Algorithm for Crew Route Scheduling Focusing on Manpower Efficiency PAPERS:A Study on the Evaluation Method of the Shunting Operation Plan of a Freight Station with Consideration for the Satisfaction of Express Companies PAPERS:An Algorithm for Scheduling of Freight Container Car Considering Equalization of Daily Work PAPERS:A Prediction Method of Passenger Flow upon Resumption of Train Service PAPERS:Application of Verification Methods to Specifications in Concern with Safety of Signalling Equipment REVIEW:An Outline of IEC 62280 - International Standard for Safety Related Transmission Systems RESEARCH REPORT:Utilization Possibility of the Mathematical Optimization Technologies in Railway System
Vol. 27 No. 3 (Mar. 2013)	***Special Features:Human Science*** REVIEW:Recent Topics on Human Scientific Approach to Railway Transport Fields PAPERS:Analysis of a Subjective Evaluation Test by Semantic Differential Method on Impression of Noise Inside Railway Vehicles PAPERS:Measurement of the Right Hand's Operable Area under a Simulated Driving Situation PAPERS:Practical System for Implementing Vocational Training Program for Improving Train Driver Abilities to Cope with Abnormal Situations PAPERS:Impression of Persons Who Caused Accidents Derived from Contents of Accident Articles PAPERS:A Basic Study on the Detection of Electrical Fire in the Substation by Detection of Odor Substances RESEARCH REPORT:Investigation of Eyesight Required for Recognizing High Speed Signals RESEARCH REPORT:The Difference of Passenger's Recognition on the Occurrence of Railway Accidents or Potential Incidents RESEARCH REPORT:Railway User's Acceptable Degree of Service Shutdown Time Associated with the Implementation of Accident Prevention Measure

Quarterly Report (QR)

Vol. No.	Titles
Vol.53 No.2 (May 2012)	Evaluation of Carbody Strength against Side Load Change in Surface Condition of Turned Wheel and Effectiveness of Lubrication against Flange Climb Derailment Development of Estimating Method of Low-frequency Return-current of DC Electric Railcar Track Angular Rotation Assessment Method Using Seismic Wavelength Originationg from Surface Waves Seismic Design of Retaining Wall Considering the Dynamic Response Characteristic Effect of Inertial and Kinematic Interaction on Seismic Behavior of Various Types of Structures New Method for Estimating Earthquake Parameters for Earthquake Early Warning A Method of Determining Priorities for Investment in Disaster Prevention for Rockfalls from Slopes Evaluation of the Influence of Anemometer Position around Railway Structures on Wind Observation Data
Vol.53 No.3 (Aug. 2012)	Development of a Model Share Estimation Method Considering Latent Passanger Preference for Transportation Modes Optimization Algorithm for Energy-efficient Wireless Sensor Network Design Problem Provision of Forecast Train Information and Consequential Impact on Decision Making for Train-choice Proposal for Grease Replacement for Traction Motor Bearings Development of a Compact Magnet System Based on High Tc Superconductors Development of Alkali-silica-reaction Suppressing Material with Li-containing Zeolite Experimental Method for Wind Tunnel Tests to Simulate Turbulent Flow on the Roof of High-speed Trains Noise Reduction Effect of Low Barriers Installed Adjacent to Rails Development of a Wind Load Reduction Soundproof System
Vol.53 No.4 (Nov. 2012)	Reduction of Reactor Weight by Using Electromagnetic Coupling Fundamental Tests on a Rapid Prototype Bogie Pneumatically Operated Floating Brake Caliper for Shinkansen Vehicles A Study of the Effect of Track Irregularity Prevention Methods for the Transition Zone between Different Track Structures Development of the Car Body Mounted Track Measuring Device with the Inertial Mid-chord Offset Method Influential Factors on Adhesion between Wheel and Rail under Wet Conditions Experience-based PC Learning System for Human Error Prevention by Point-and-Call Checks Simulation of Passanger Behavior on Board a Commuter Train in the Event of a Level Crossing Acident Evaluation and Promotion of Railways Employee Awareness about Observing Rules on Making Passanger Announcements
Vol.54 No.1 (Feb. 2013)	Method for Restoring and Reinforcing Deteriorated Steel Railway Bridges - Development of Integral Bridges with Nail-Reinforced Soil - Development of Composite Steel Girder and Concrete Slab Method for Renovation of Existing Steel Railway Bridges Estimation Method of Falling Concrete Piece from Tunnel Lining Formation Mechanism of Undulating Wear on Overhead Conductor Rails due to Dynamic Characteristics of Pantographs Development of a Deterioration Diagnosis Device for Arresters on Shinkansen Feeding Circuits Improvement of Anti-fatigue Property of Contact Wire by Modifying Cross-section Shape Configuration of Contactless Power Supply Coils for Railways An Innovative Superconducting Coil Fabrication Method with YBCO Coated Conductors Verification of Practical Applicability of Cable Wiring for PLG Ground Coils to Maglev Systems

Newsletter, “Railway Technology Avalanche”

No.	Titles
No.39 (Jul. 2012)	• RTRI Celebrates the 25th Anniversary of its Foundation • A Commemorative Symposium The 25th Anniversary of the Foundation of RTRI Preparing to Meet the Challenges of the Next 25 Years • Development of a New Railway Simulator • Development of an Earthquake Disaster Simulator for Railways • A Study on Intelligent Trains to Improve Safety and Reliability of Operation • A Technology to Restore Deteriorated Steel Bridges-Development of Bridges Integrated with Nail-Reinforced Soils-
No.40 (Sep. 2012)	• Viewpoints on the New Railway Age - Promotion of Basic Research - • High-Speed Rail Development for the Next Generation UIC Highspeed 2012 held in Philadelphia, USA in July 2012 • Diagnostic Technology to Improve the Upkeep and Maintenance of Railway Tunnels • Development of a System to Support Energy Saving Train Operation • Evaluating Train Rescheduling Methods to Reflect Passenger Dissatisfaction • Factors that Influence the Adhesion Coefficient between Wheel and Rail
No.41 (Dec. 2012)	• Recent Research and Development by RTRI • RTRI Stand at InnoTrans2012 • SNCF-RTRI Collaborative Research Seminar 2012 • Development of Automatic Irregularity-Correcting Sleepers • A New Vertical Vibration Control System - Development and Commercialization - • Reduction of Car Body Elastic Vibration Using High-Damping Elastic Supports for Under-Floor Equipment • Detection of Pantograph Failures Using Sensors Fixed to the Catenary System
No.42 (Mar. 2013)	• ISO Institutes New Technical Committee ISO/TC 269 Railway Applications • What Can We Do to Develop Railway Technologies in Asia?- Railway Technical Discussion at RTRI on October 25, 2012 • Development of a Fault Point Locator for the Freight Train Command Line • Development of a Switch Rail with Improved Wear Resistance • A Technique to Detect Overheated Switchboards with a Gas Density Detector • Measurement of Wheel Flange/Rail Gauge Corner Contact Conditions

Lectures

RTRI Lecture

Special address	Japan's energy vision and the latest technology
Keynote address	RTRI's efforts for improving energy efficiency
General address	• Railways and energy • Optimization of energy use by modal shift • Optimization of energy use in the rolling stock field • Optimization of energy use in stations • Optimization of energy use in the power supply field

Monthly Presentation

Theme	Date
Recent research and development on rolling stock technologies	April 18, 2012
Recent research and development on disaster prevention technologies	May 11, 2012
Recent research and development on transportation planning and information technology	June 25, 2012
Trends in recent railway international standards	July 18, 2012
Recent research and development on power technologies	August 9, 2012
Recent research and development on track technologies	September 25, 2012
Recent research and development on earthquakes and structural engineering	October 17, 2012
Recent research and development on human sciences	December 18, 2012
Recent research and development on rolling stock technologies	January 11, 2013
Recent research and development on environmental engineering	February 13, 2013
Research and Development situation on railway simulators	March 13, 2013

Statistics

Record of Recognition

Title	Name of awardee	Category of prize	Date of reward
Commendation by Minister of Education, Culture, Sports Science and Technology, Japan	Ken Watanabe	Research into an evaluation method for determining the progress of destruction of concrete components	April 17, 2012
Medal with Yellow Ribbon	Kimiaki Sasaki	Idea of inventing semi-active vibration control system for railway rolling stock	April 29, 2012

Commending organizations	Category of prize
Academic societies	• Japan Society of Refrigerating and Air Conditioning Engineers, Academic Award
	• Japan Society for Safety Engineering, 2011 Encouragement Award
	• Japan Concrete Institute, 2012 Technology Award
	• Japan Ergonomics Society, 2012 Ergonomics Good Practice Award, First Prize
	• The Japanese Geotechnical Society, 2011 Paper Award
	• The Japanese Geotechnical Society, 2011 Paper Award
	• The Japanese Geotechnical Society, 2011 Research Encouragement Award
	• Japan Society of Civil Engineers, 2011 Yoshida Research Encouragement Award
	• Japan Society of Civil Engineers, 2011 Paper Award
	• Japan Society of Civil Engineers, 2011 Technology Award
	• Japan Concrete Institute, the 34th Concrete Engineering Annual Paper Encouragement Award for a Lecture
	• Japan Society of Civil Engineers, Paper Encouragement Award
	• The Institute of Electrical Engineers of Japan, Industry Application Division, Division Paper Award
	• The 2nd Asian Clay Conference Award for The Best Poster
	• The Clay Science Society of Japan, Technology Award
	• STEH'12 Best Paper Award
	• The Society of Materials Science, Japan, the 12th Symposium of Repair, Reinforcement, Upgrade of Concrete Structures, Best Paper Award
	• 2012 IEEE RFID-TA Technology & Applications Best Paper Award
	• Japan Chapter of International Geosynthetics Society, 2012 Paper Encouragement Award
	• International Society for Rock Mechanics, the 13th Rock Mechanics Symposium, Best Paper Award
Associations	• Japan Railway Electrical Engineering Association, Technology Award, Best Paper Award
	• Japan Railway Electrical Engineering Association, Association Journal Best Work Award
	• Congress of Japan Railway Cybernetics, Best Paper Award
	• Japan Railway Engineer's Association, Sakata Memorial Prize, Best Paper Award
	• The Ceramic Society of Japan, Technology Award

Commending organizations	Category of prize
Associations	• Award from the Ministry of Land, Infrastructure, Tourism and Transport, Contribution of Promotion for Computerization
	• An Administration Committee of Railway Freight Promotion Encouragement Award, Encouragement Award
	• The Promotion Foundation for Electrical Science and Engineering, Committee of the Promotion Foundation for Electrical Science and Engineering, Technology Encouragement Award
RTRI	***Reward for Outstanding Research and Development***
	• Implementation of low-cost vibration control equipment which improves ride comfort
	• Evaluation of the stability of a slope during an earthquake by use of a large scale shaking table test and large deformation
	• Development of a flexible structured composite brake block
	Reward for Outstanding Service Achievement
	• Technical guidance relating to the improvement of running safety on freight vehicles
	• Introduction of an earthquake information monitoring system on the Shinkansen
	Prize for Outstanding Research and Development
	• Development of a safety evaluation method for ballasted track in areas adjacent to structures during earthquakes
	• Development of a bridge with reinforced embankment
	• Implementation of MSK track circuit in low frequency situations
	• A method of producing high-quality panoramic pictures which is applicable to long and massive structures
	• Development of small magnets which are made of high-temperature superconductive materials
	Prize for Outstanding Service Achievement
	• Activities of support divisions in dealing with the Great East Japan Earthquake
	• Activities of a committee and conducting a survey on reviewing the standard of vision for drivers/confirmation tests for signals
	• Working out and dissemination of standards for structural foundations and soil retaining structures
	• Revision of a section of Railway Research Review and change of editorial system
	Prize for Encouragement of Research and Development
	• A high-precision forecasting method for tunnel sonic booms based on logical analysis of the compression wave
	• A stochastic earthquake forecasting method considering the seismic center and position characteristics
	Prize for Meritorious Service
	• Support of damage rehabilitation and survey of suffering caused by the Great East Japan Earthquake disaster

Patents in Possession

Regarding the patents applied for, we do not claim examination of those with little operability or for which improvements have been applied for registration.

We also scrutinized the patents in possession with respect to the necessity of holding or possibility of abandonment. We positively disclaimed the patents for which 10 years or over have passed after registration and little operability is expected.

As of FY 2012, the results of the scrutiny are as follows.

Newly registered patents, etc.

Patents, 239; Design patents, 2; Total, 241

Patents of which the rights have expired

Patents, 12

Abandoned patents, etc.

Patents, 151; Design patents, 0; Total, 151

Consequently, we have 2,127 registered industrial property rights (including 19 trademarks).

▶Domestic industrial rights in possession

Category		Independently owned	Jointly owned	Subtotal
Patent	Registered	663	496	1159
	Applied for (Examination applied for)	568 (232)	354 (177)	922 (409)
	Subtotal	1231	850	2081
Utility model	Registered	0	0	0
	Applied for	0	0	0
	Subtotal	0	0	0
Design patent	Registered	12	15	27
	Applied for	0	0	0
	Subtotal	12	15	27
Trademark	Registered	19	0	19
	Applied for	0	0	0
	Subtotal	19	0	19
Total	Registered	694	511	1205
	Applied for	568	354	922
	Subtotal	1262	865	2127

(As of March 31, 2013)

▶Overseas industrial rights in possession

Status		Number of applications	Number of the countries of registration
Registered		26	71
Registered or applied for	Registered	9	29
	Applied for		-
Applied for		12	-
Total		47	100

(As of March 31, 2013)

Press Release 2012-2013

April 2, 2012	Reorganization of Railway Technical Research Institute (RTRI)
April 2, 2012	FY 2012 Initiation Ceremony
April 18, 2012	FY 2012 Commendation by Minister of Education, Culture, Sports Science and Technology
April 29, 2012	Medal with Yellow Ribbon - A research director awarded a decoration by Japanese Government
June 14, 2012	New executive members
July 20, 2012	Opening of “an earthquake and structure engineering exchange meeting - preparing for a local earthquake in a metropolitan area -”
August 2, 2012	Opening of “a signalling and telecommunications technology exchange meeting”
August 7, 2012	Opening of “a human science technology exchange meeting -toward railway safety-
August 7, 2012	Election of chairman and undertaking of a role as secretariat of ISO/TC 269 National Mirror Committee
August 10, 2012	Opening of “a transportation technology exchange meeting”
August 30, 2012	Railway Technical Research Institute technology forum 2012 was held.
October 3, 2012	Opening of “a power supply technology exhange meeting - efforts for improvement of function and performance of power supply facilities-”
October 3, 2012	Award of a prize from the Ministry of Land, Infrastructure, Transport and Tourism for FY 2012 computerization month
October 4, 2012	Opening of “Japan - France railway technology symposium 2012”
October 4, 2012	Opening of “Japan - France collaborative research seminar”
October 12, 2012	Opening of “a rolling stock technology exchange meeting - towards safe and comfortable rolling stock-”
October 18, 2012	Opening of “a training/education programme for railway structure diagnosis experts”
November 2, 2012	Opening of “a track technology exchange meeting - track technologies for supporting safe running of rolling stock”
November 5, 2012	Opening of “a railway technical discussion at RTRI”
November 9, 2012	Opening of “1st General Assembly of ISO/TC 269”
November 9, 2012	Opening of the FY 2012 lecture by Railway Technology Promotion Center
November 29, 2012	Opening of “a disaster prevention technology exchange meeting - technology for prevention and limitation of disaster damage by changing natural external forces-”
December 5, 2012	Opening of “a Railway Technical Research Institute technology forum 2012 (held in Osaka)”
December 17, 2012	The FY 2012 ceremony of the anniversary of the foundation
December 25, 2012	Opening of “a memorial lecture for the 50th anniversary of R&D on superconductive maglev for high speed railways”
March 8, 2013	A visit to RTRI from the Minister of State for Transport from the UK

(FY 2012: April 1, 2012 - March 31, 2013)

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