



ANNUAL REPORT 2013-2014

For the year ended March 31, 2014

Railway Technical Research Institute



Foreword

Norimichi KUMAGAI
President



The Railway Technical Research Institute (RTRI) is working intensively on developmental subjects associated with maintaining safe and secure transportation, utilizing energy effectively, and high levels of simulation, which are based on three directional axes; research work targeted on the railway systems of the future, development of practically technology requested by a lot of railway business operators including JR companies, and other basic R&D such as solving practical issues currently affecting the field and human factor analysis. We were able to make steady progress on 279 research subjects in the fiscal year of 2013 in accordance with our original annual plan. In addition, while completing the fourth year of the “RESEARCH 2010” (5-year medium and long term master plan), we achieved a series of successful outputs in advanced studies affecting railways in the future, such as how to predict liquefied soil deformation in consideration of the impact of aftershocks, vertical vibration-suppressing system for bolster-less bogies with air suspension and safety assessment of vehicle collision. Furthermore, despite stricken economic circumstances, we were commissioned with over 530 requests in the form of contractual business. In the area of international standards, we hosted ISO/TC 269 Plenary Meeting in Japan, and at the same time, shifted the Railway International Standards Center to the Chiyoda Office. Still in the field of international activities, we promoted a technical seminar by enhancing cooperative research work with overseas research institutions.

The East Japan Earthquake has marked not only everyday life and society in Japan it has also created huge challenges which railways today as businesses must face. While keeping the reality of decreasing birthrates and an aging population at the forefront of our minds our railway transportation

system must maintain high levels of safety and security without accidents, as well as address the ever pressing need to be more robust, energy efficient and capable of withstanding large-scale earthquakes and heavy rainfall disasters. Given this new era, we are thinking of finding new solutions to different problems by clarifying the role to be played by RTRI to meet the expectations of railway operators or society by flying a banner entitled “What do we perform for railways which keeps developing?” The world of R&D is in constant motion, as such it is our duty to ensure that our posture towards tackling R&D issues is rapid, innovative and advanced – which are a prerequisite to being “dynamic”. Furthermore, we pledge to remain “fair and neutral” in our role as agency working in the public interest. Moreover, our goal is to “lead railway technology in the world” and enhance this endeavor by making full use of cooperative opportunities with overseas research organizations.

In order to push these plans forward, we will set still higher targets to bolster our “reliability”, providing you with “high quality” research and development results, fully showing the comprehensive force of RTRI.

Our actions will be guided by the desire to provide our clients, using our outputs or consulting services, with high-quality solutions in response to their needs. Everyone at RTRI including administrative staff, will do their utmost to draw the maximum from the pool of ability and expertise within RTRI (human resources, test facilities, cumulative data, and knowhow) with a view to fulfilling our commitment to ensure that our R&D output benefits railway business. Finally, we would like to say that we are always open to your guidance and suggestions about our work, which form part and parcel of our path forwards.

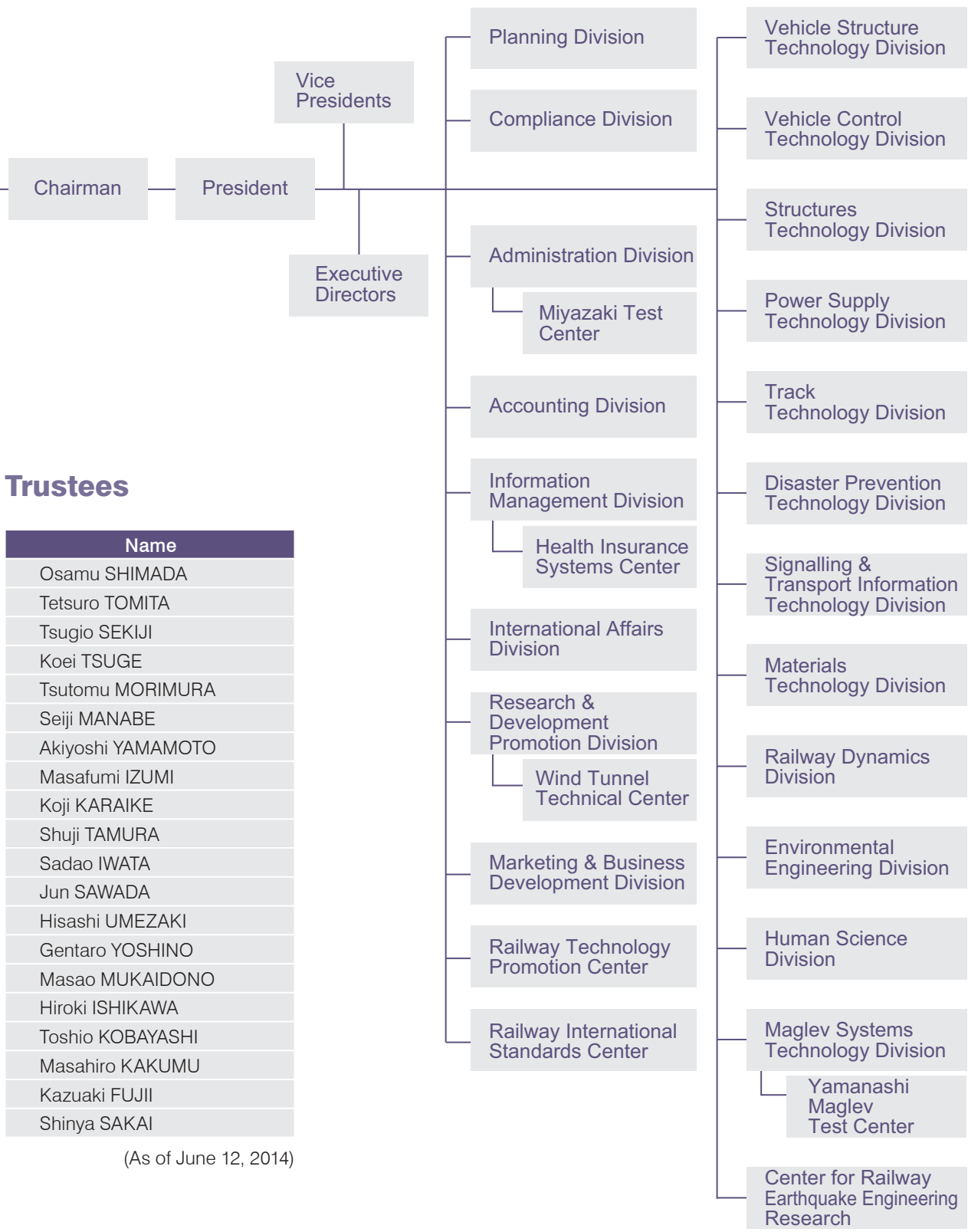
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Board Members

Position	Name
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Executive Director	Kazuaki KANASUGI
Auditor	Mitsutoshi INAMI
Auditor	Hidenori FUJII
Auditor	Yataro KIGUCHI

(As of June 12, 2014)



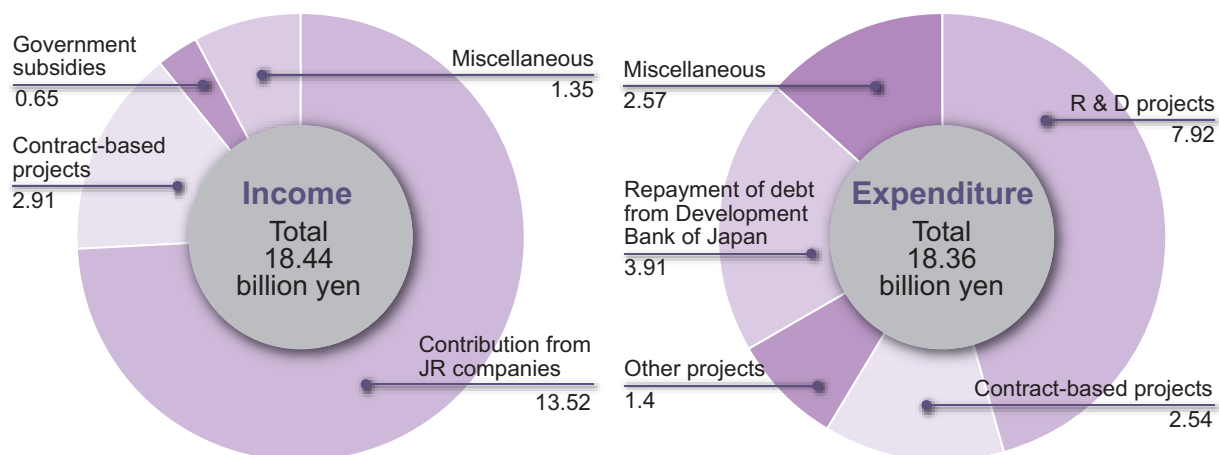
Trustees

Name
Osamu SHIMADA
Tetsuro TOMITA
Tsugio SEKIJ
Koei TSUGE
Tsutomu MORIMURA
Seiji MANABE
Akiyoshi YAMAMOTO
Masafumi IZUMI
Koji KARAIKE
Shuji TAMURA
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Jun SAWADA
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Gentaro YOSHINO
Masao MUKAIDONO
Hiroki ISHIKAWA
Toshio KOBAYASHI
Masahiro KAKUMU
Kazuaki FUJII
Shinya SAKAI

(As of June 12, 2014)

(As of April 1, 2014)

Income and Expenditure



Human Resources

Number of employees	526
Number of PhD Degree holders	168

Objectives and Mainstays of R&D in Activities



Number of On-Going Projects

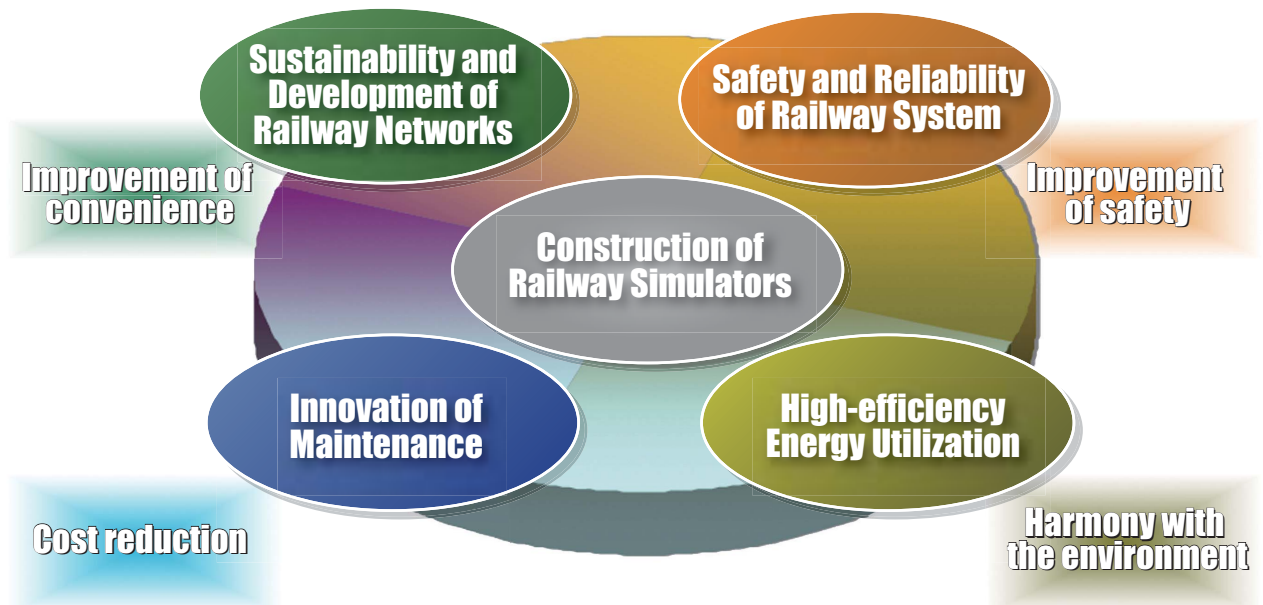
Numbers of Themes

R&D for the future railways	45
R&D for practical technologies	119
Basic research for railways	115
Total	279

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

Evaluation and measures of car inside-comfort

- Techniques to improve vibration ride comfort
- Techniques to reduce noise inside cars
- Techniques to evaluate comfort inside cars

Smoothing movement at traffic nodes

潜在貨物がシフトした場合のCO₂排出削減可能量 (トン-CO₂/年)

- Smoothing the movement at and around stations
- Diversified techniques to evaluate train operation
- Techniques to evaluate freight traffic

➔ Establishment/evaluation of an environment for seamless movement

New technology to monitor and maintain equipment conditions

- Technologies to monitor/maintain equipment conditions
- Basic technologies to monitor equipment conditions

➔ Proposal of equipment condition monitoring systems

Innovation of the structure renewal technologies

Technologies to renew deteriorated bridges on revenue service lines

➔ Renewal technologies for bridges, viaducts as well as underground and ground level stations

– RESEARCH

- Techniques to preventive me
- Noise/ground

Sustainable Development Railway

Innovation Maintenance

ARCH2010 - Future-Oriented Challenges (Fiscal Years 2010 - 2014)

Evaluation/measures to preserve wayside environment for high speed operation

Simulation to predict ground vibrations

Evaluate aerodynamic noise/ measures
vibration preventive materials

Safety and reliability with intelligent trains

Slope disaster

Crossing

On board car sensing

Safety of workers on the track

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

Hazard map

Real-time hazard mapping

Stability and
management of
networks

Safety and Reliability of Railway System

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

Position of fault

Optimization of
finance

High-efficiency Energy Utilization

Design/development of a railway simulator core system

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

Virtual railway test track

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

Pantograph

Car model

Truck

Track model

Analysis of three-dimensional dynamic interaction

New power supply system

Superconducting cable

- 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

and the 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

The basic research for railways leads to practical technologies, which are essential to solve various railway-related problems, and leads to further work which we might define as “analytical research projects” and “those to explore further research.”

(5) Others

(a) Dissemination of information

We collect, store and disseminate 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 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 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 assesses 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 integrates 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 dissemination of the information received.

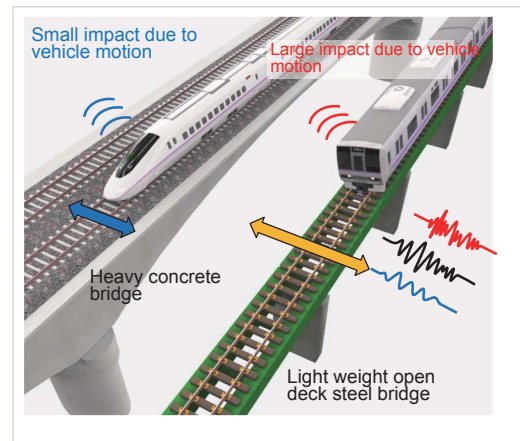
Major Results of Research and Development

In the year 2013 and 2014, we pushed ahead with research and development projects on 279 themes and completed 93 projects. Major results of the research and development are shown below.

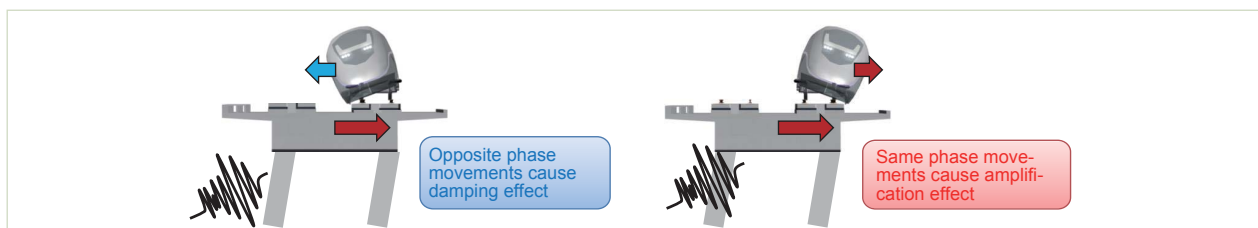
IMPROVEMENT OF SAFETY

■ Simplified method for evaluating vehicle motion effect on seismic response of railway structure

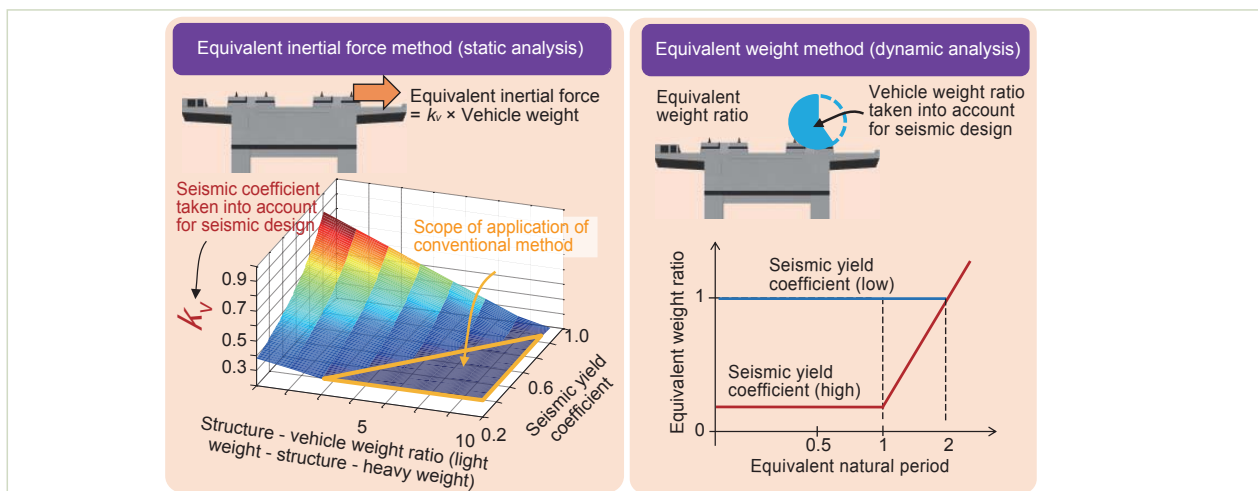
- Numerical analyses evaluated amplification effects and damping effects induced by vehicle motion on the seismic response of structures.
- A simplified method for estimating the seismic response of structures in consideration of the effect of vehicle motion was proposed.



► Dynamic interaction between structures and railway vehicles during earthquake



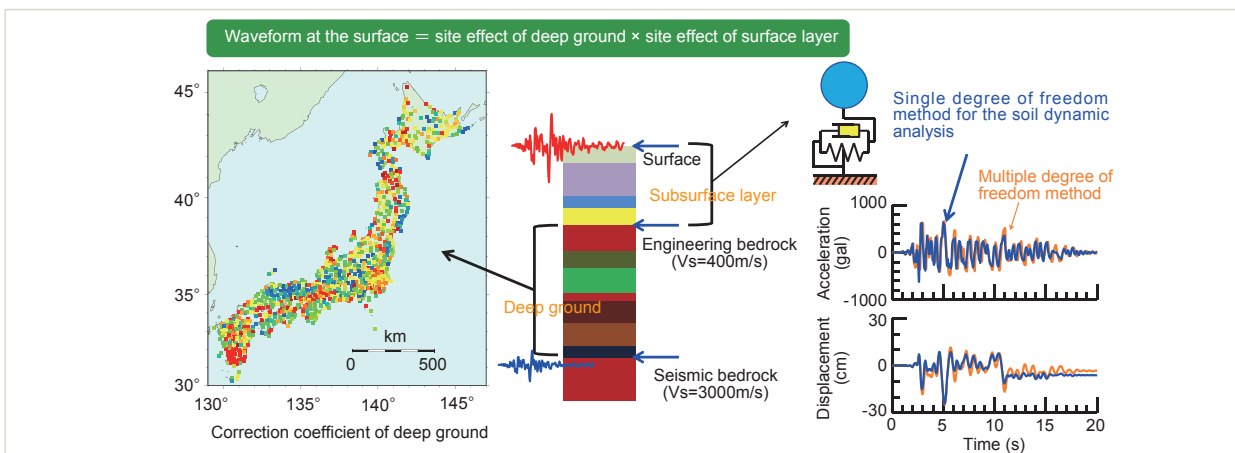
► Mechanism by which vehicle motion influence structures



► Seismic design method taking into account vehicle motion

Simple evaluation method of the waveform at the surface using micro-tremor

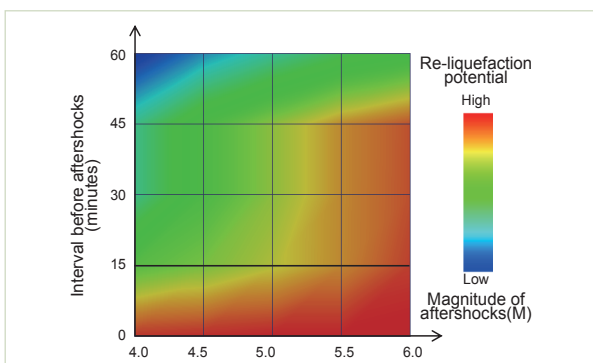
- A simple evaluation method of the waveform at the surface was proposed by using the micro-tremor data and database of site effect of the deep ground in Japan.
- It is possible to estimate ground motion along railway lines, simply by using micro-tremor data.



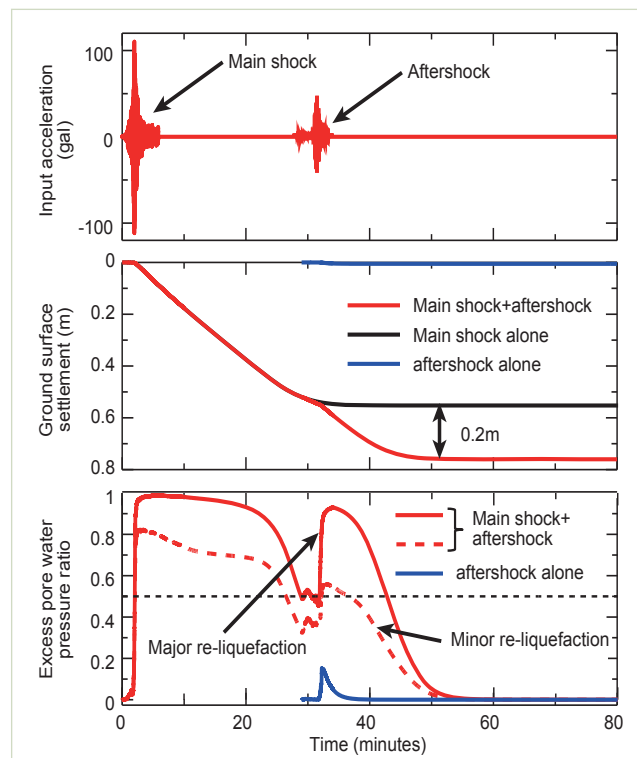
► Simple evaluation method of the waveform at the surface

Method for predicting the deformation of liquefiable ground considering the influence of aftershocks

- A method was developed to predict the deformation of liquefiable ground taking into account the influence of aftershocks.
- In case of a massive earthquake and aftershock clusters, this method makes it possible to evaluate the potential of re-liquefaction depending on the degree of liquefaction during the main shock, intervals between the main shock and aftershocks and the magnitude of aftershocks.



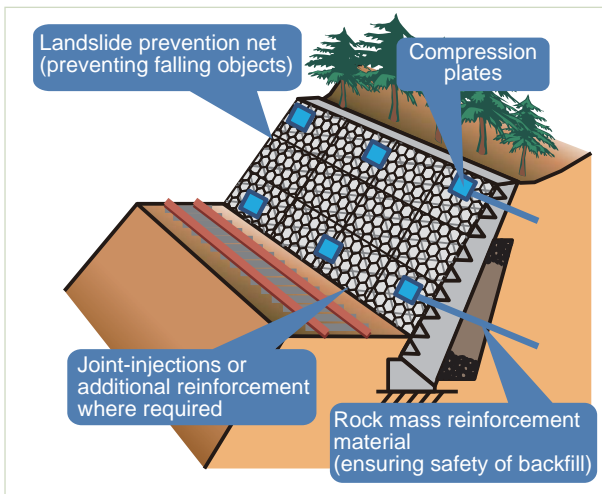
► Re-liquefaction potential under aftershocks (with a main shock magnitude of 7)



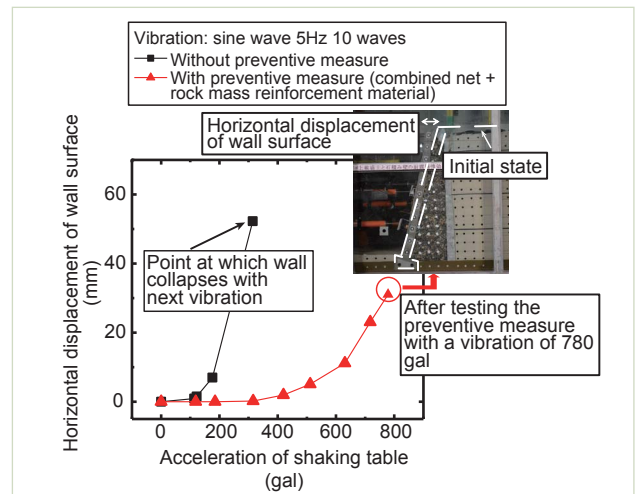
► Analysis taking into account aftershocks

■ Work method to increase seismic resistance of masonry walls combining landslide prevention netting and rock mass reinforcement materials

- A new method was developed to improve the seismic resistance of masonry walls based on a combination of landslide prevention nets and rock mass reinforcement material.
- Trials on a shaking test bench with doubled landslide acceleration demonstrated that the developed method is an effective means to increase seismic resistance.
- A design manual was produced to accompany this work method.



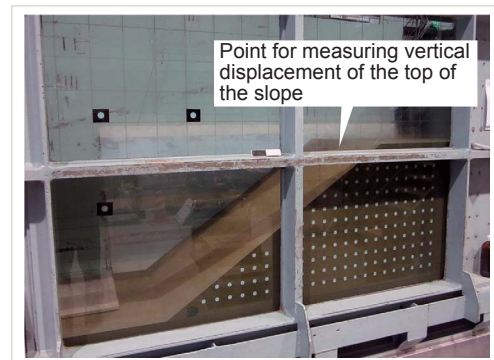
► Work method to increase seismic resistance of masonry walls combining landslide prevention netting and rock mass reinforcement materials



► Relationship between horizontal displacement of wall and acceleration of shaking table

■ Clarification of mechanisms underlying seismic activity induced weakening of embankment resistance to rainfall

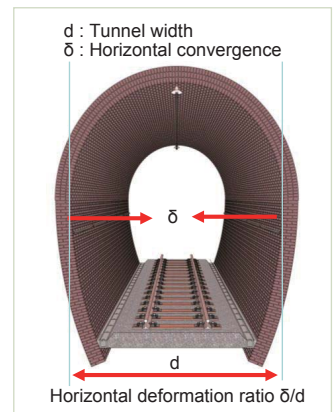
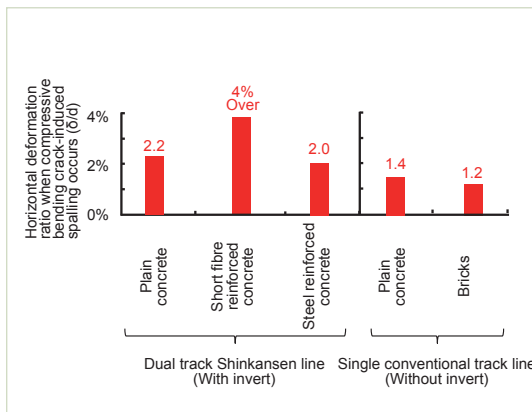
- The relationship was clarified between the scale of alteration in the state of embankments due to seismic activity and their resistance to rain fall.
- It is now possible to quantitatively assess the rain resistance of a real embankment using analytical modeling.



► Picture of model embankment

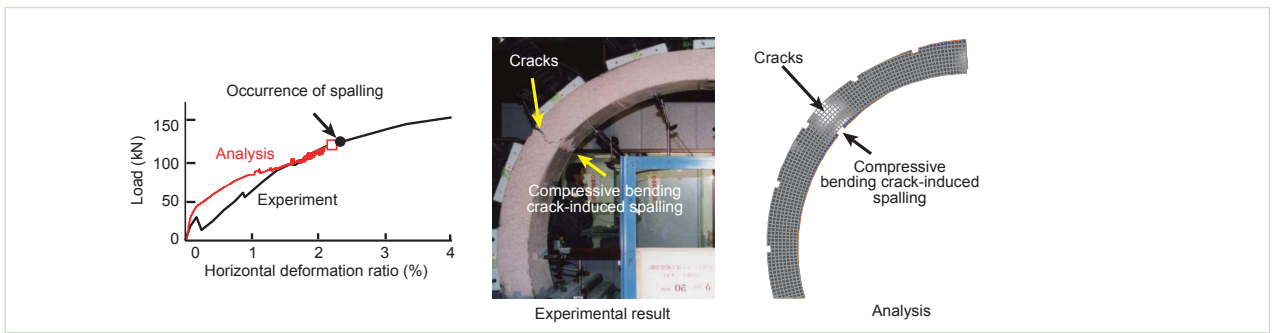
Method for evaluating the safety of mountain tunnel linings

- A method has been proposed for assessing the safety against compressive bending crack-induced spalling of different types of mountain tunnel lining materials.
- A safety assessment handbook was compiled for mountain tunnel linings.



▶ Example of evaluation using numerical analysis

▶ Horizontal deformation ratio

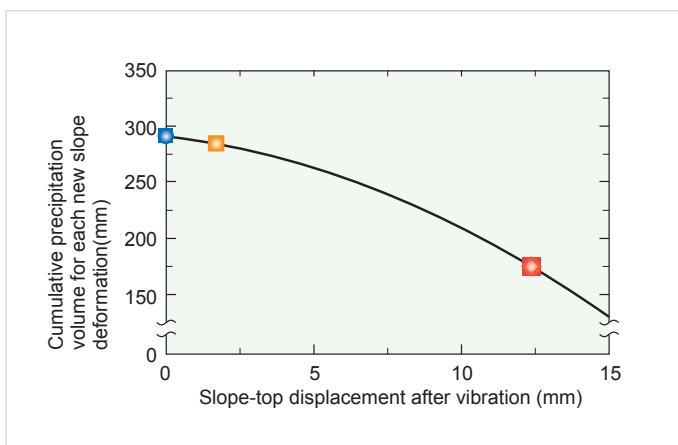


▶ Reproduction through numerical analysis

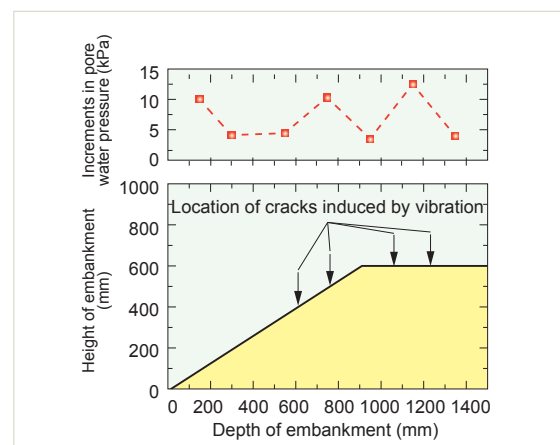
State of soundness in relation to compressive bending crack-induced spalling	Horizontal deformation ratio δ/d (%)	
	Without invert	With invert
State of soundness A	1% Over	0.5% Over
State of soundness B	0.5 ~ 1%	0.25 ~ 0.5%
State of soundness C,S	0.5% Under	0.25% Under

※ In case of tunnels deformed by plastic earth pressure in soft rock mass
 ※ In case of tunnels made by conventional construction method with void above the lining

▶ Example of safety evaluation



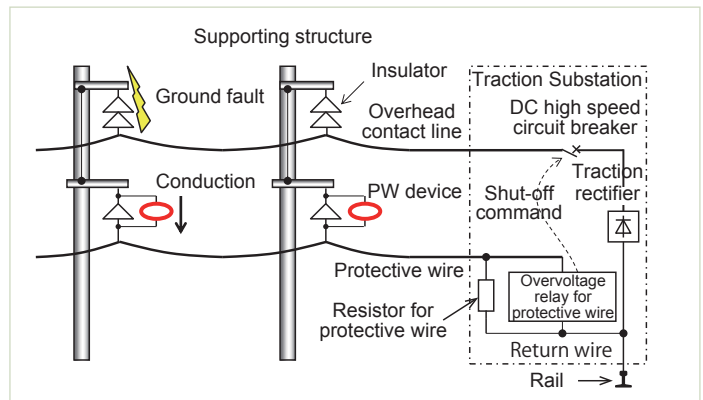
▶ Slope top displacement after vibration and cumulative precipitation volume when slope-top deformation occurs during rain fall



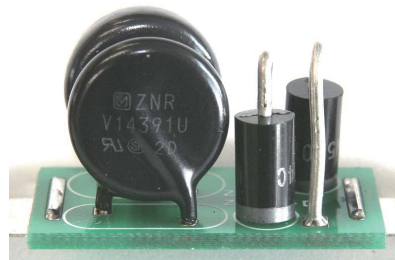
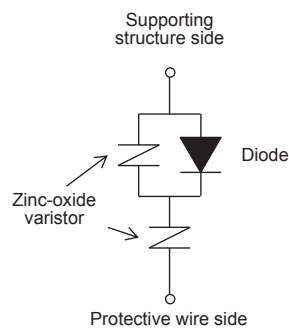
▶ Increment distribution of pore water pressure inside the model embankment

High-resistance ground fault detection system for DC feeding circuit using protective wire and PW devices

- In the case of DC feeder circuits faults sometimes occur in high-resistance ground circuits through the insulators and other support components. A system was thus developed to immediately detect such faults using a protective wire (PW) and PW devices.
- The effectiveness of the system was validated on a revenue line with tests where faults were manually induced.

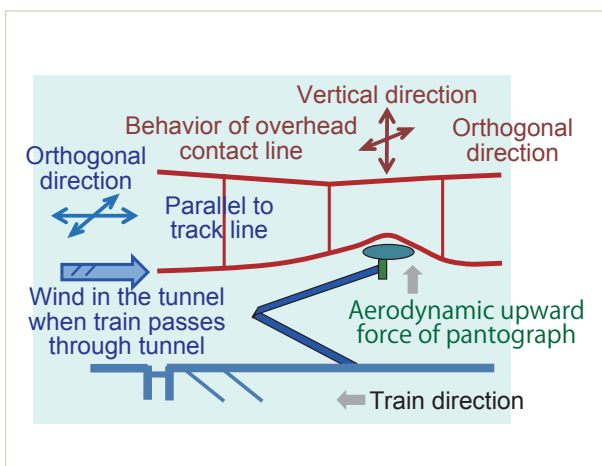


► Schematic diagram of the developed high-resistance ground fault detection system

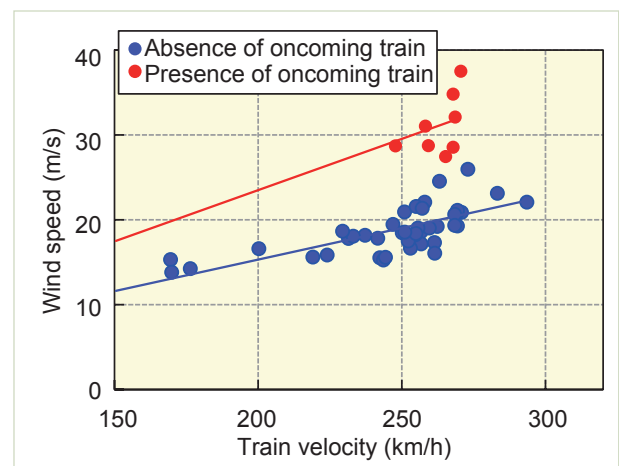


► Structure of PW device

Proposal for wind speed in tunnel to be used in the design and evaluation of overhead contact line facilities



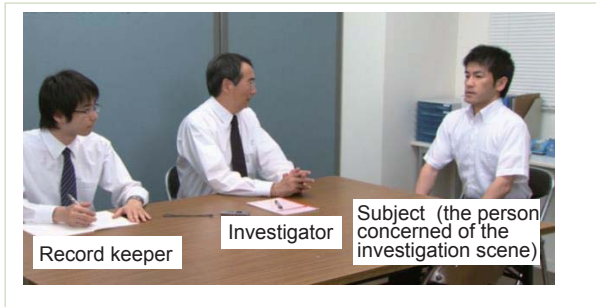
► Wind flow and contact wire behavior in the tunnel



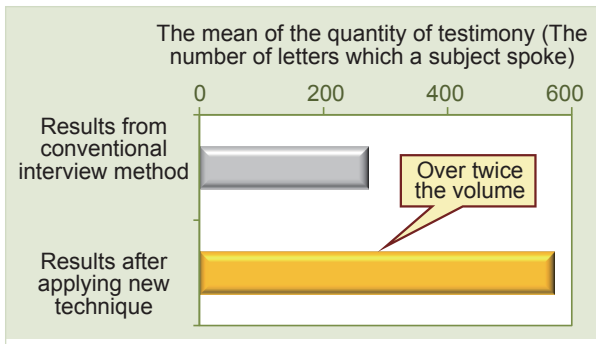
► Wind speed parallel to track line

Hearing investigation technique to analyze the background factors of an accident

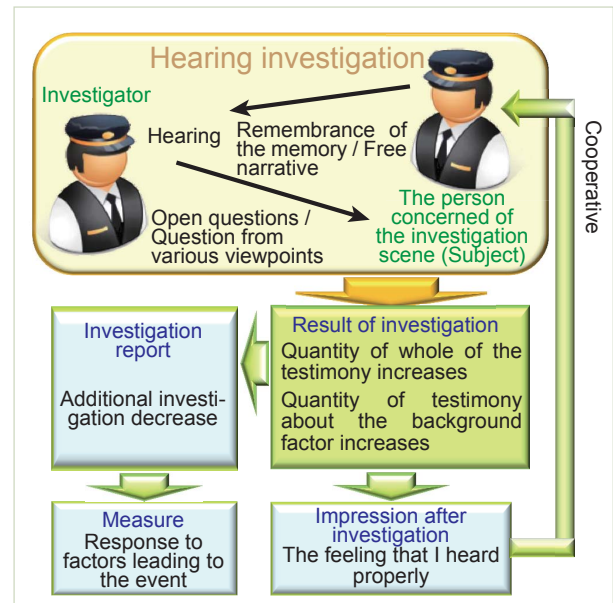
- We developed hearing investigation technique to collect data about the background factors of an accident.
- As a result of having tried this technique, we confirmed that we could collect more the data about the background factors.



► A scene of the hearing investigation



► Quantity of testimony about the background factor



► Characteristic of new technique

- The wind speed which should be taken into account for the design of overhead contact lines and for forecasting current collection performance was clarified by using measured contact line behavior, wind speed and wind direction when trains pass through tunnels.
- Estimation of the pantograph upward force using the proposed wind speed, allows accurate forecast of current collection performance.

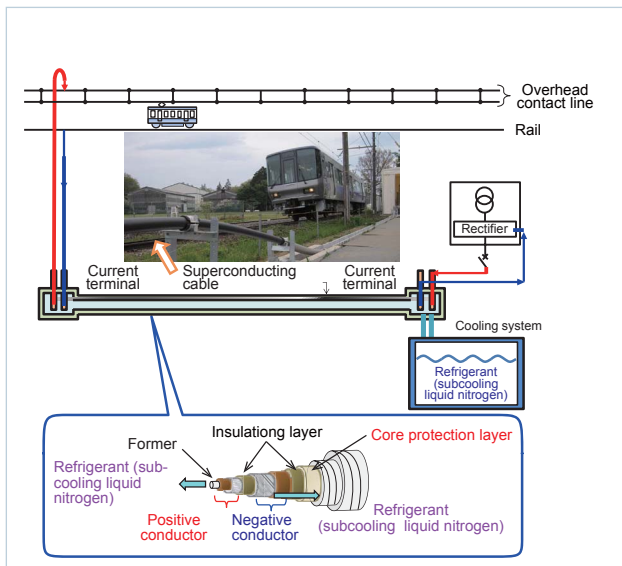
Wind direction	Oncoming train	Ratio of wind speed to train velocity	Train velocity : 300 km/h	Wind direction	Oncoming train	Ratio of wind speed to train velocity	Train velocity : 300 km/h
Parallel to track line	Absence	0.3	25m/s	Orthogonal direction	Absence	0.08	7m/s
	Presence	0.5	42m/s		Presence	0.12	10m/s

► Wind speed to be considered for overhead contact line facilities

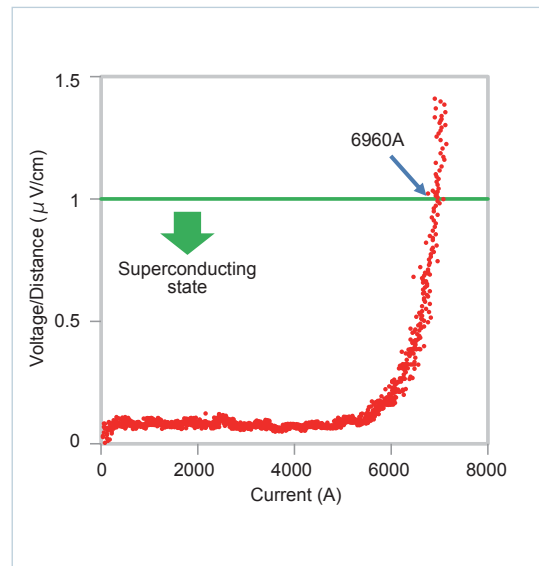
HARMONY WITH THE ENVIRONMENT

■ Operating trains using superconducting cable

- A prototype DC superconducting cable for railway system was built and tested on the RTRI test line.
- Current, voltage resistance, and cooling tests were performed, demonstrating that the superconducting cable system was applicable to train operations.



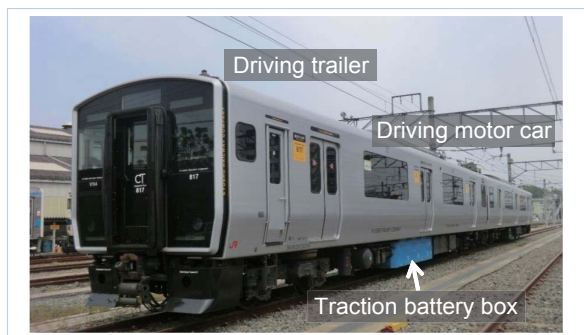
▶ Superconducting cable system for railway



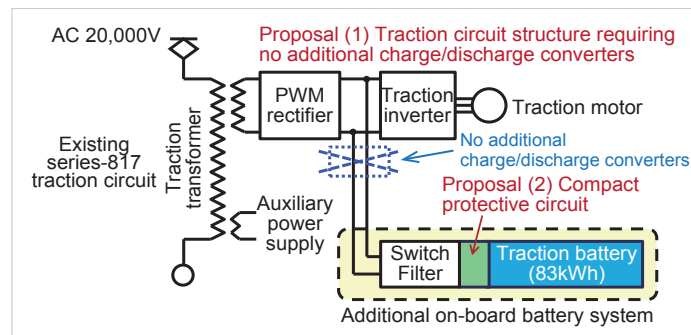
▶ Results from current tests

■ Development of a hybridized battery and AC dual source conventional line train

- We have developed a high capacity/high voltage battery system requiring no additional charge/discharge converters.
- Various properties were verified such as ability to suppress battery temperature to around 50°C, prevent contact wire over-heating during quick charge, and one charge running distance was approximately 30 km fed by a 83-kWh battery when no A/C operates.



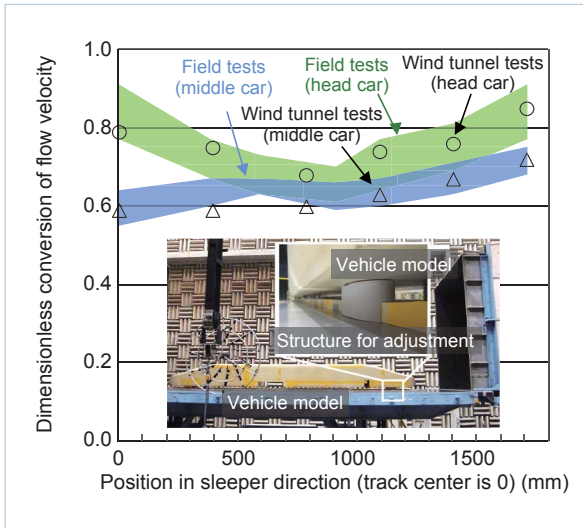
▶ Outside view of battery-powered dual source EMU (test train)



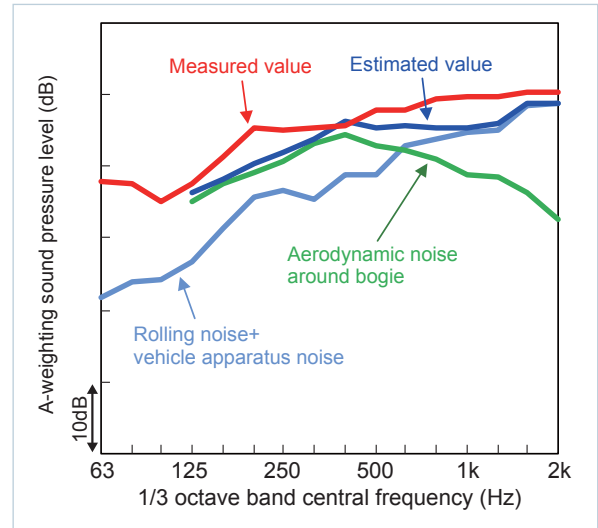
▶ Configuration of the traction circuit

Development of an experimental method using a wind tunnel to evaluate underbody aerodynamic noise

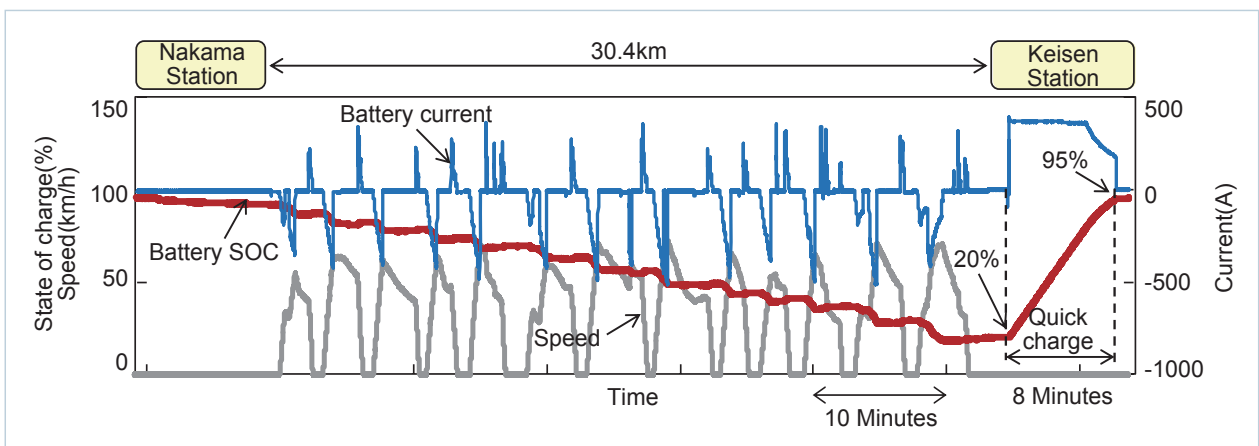
- A method was developed to reproduce in a wind tunnel the flow velocity profile of the underbody of a real Shinkansen train.
- The developed method makes it possible to quantifiably evaluate aerodynamic noise from the bogie area.



► Shinkansen underbody flow velocity profile (flow velocity elements in the rail direction looking from the train)



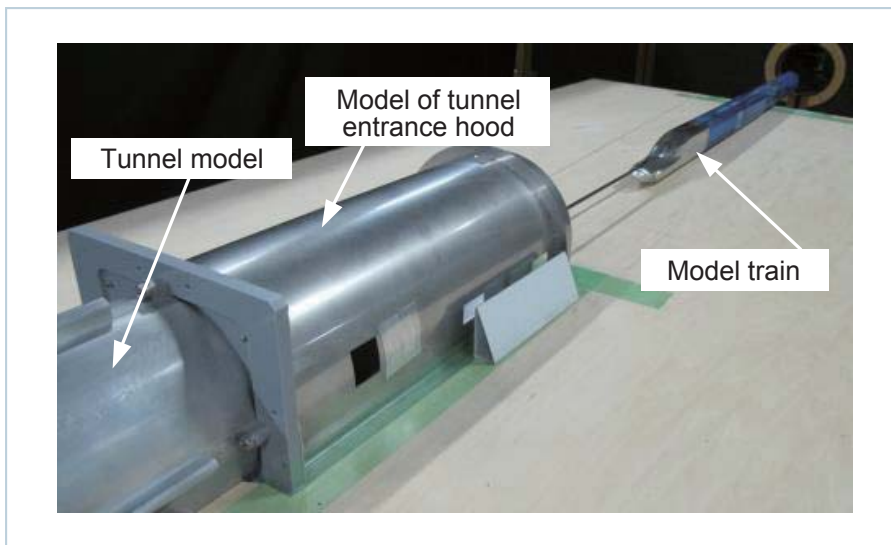
► Comparison of measured and estimated underbody aerodynamic noise (point close to rail at 320 km/h)



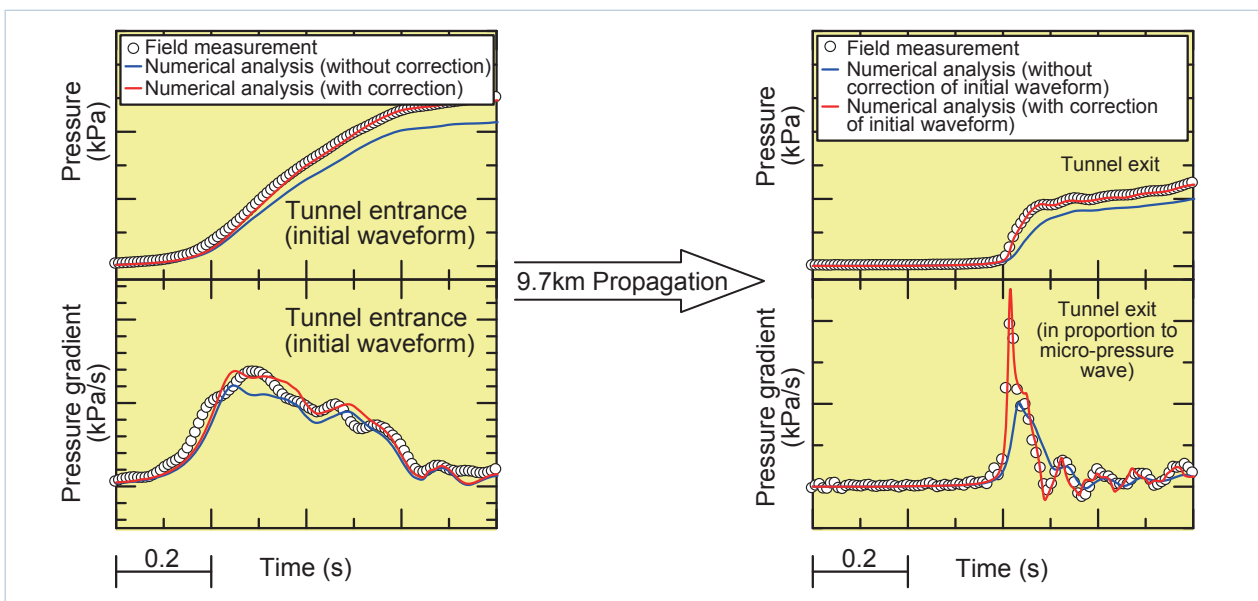
► An example of running test results fed by the on-board battery

■ Increasing the accuracy of micro-pressure wave estimation in tunnels with tunnel entrance hood

- By identifying the factors which lead to errors in numerical analysis of a compression wave generated when a high-speed train enters a tunnel, it is possible to increase the accuracy of tunnel micro-pressure wave estimations.
- This method makes it possible to predict more accurately the effect of a tunnel entrance hood to mitigate the micro-pressure wave.



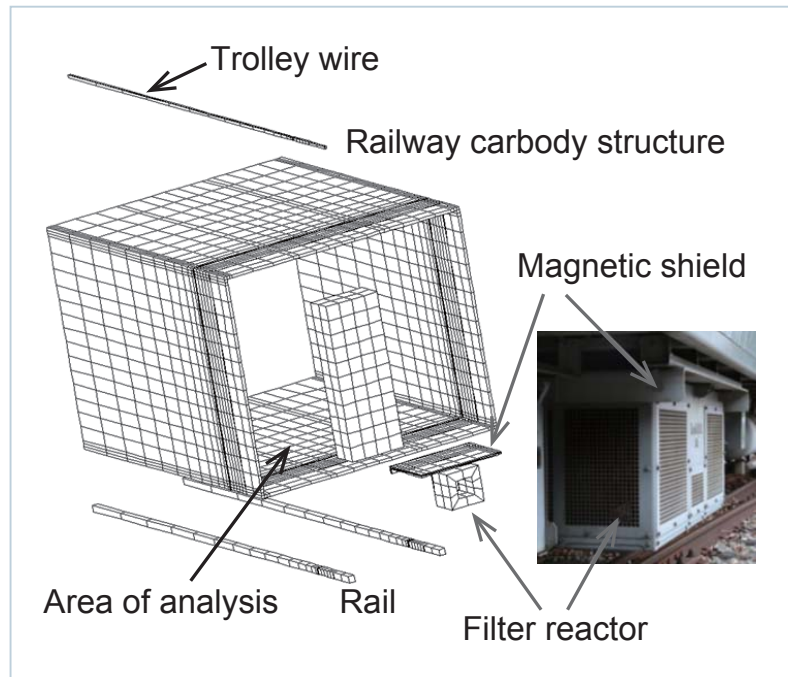
▶ Experiment using actual shape models



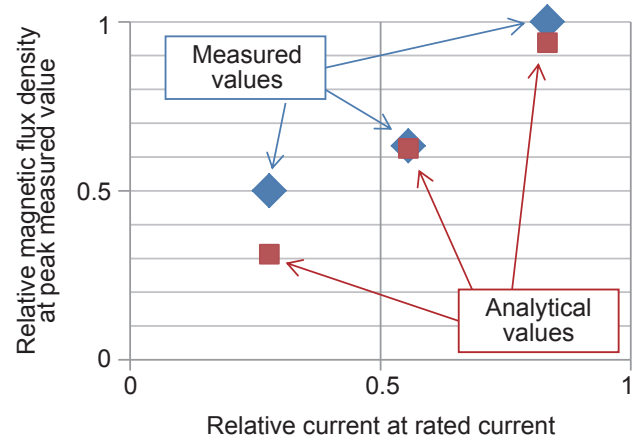
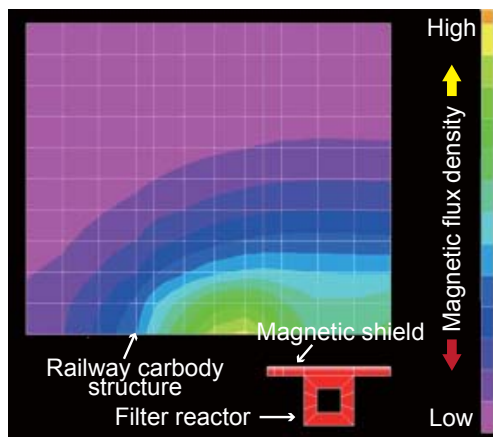
▶ Pressure and pressure gradient of compression waveform inside tunnel

Method for estimating magnetic fields on railway vehicles

- A method was proposed to calculate magnetic field distribution on railway vehicles in operation.
- This method makes it possible to calculate the magnetic fields in the vicinity of ferromagnetic material, and verify the efficacy of magnetic shields.



► Model for analysis of magnetic fields on railway vehicles

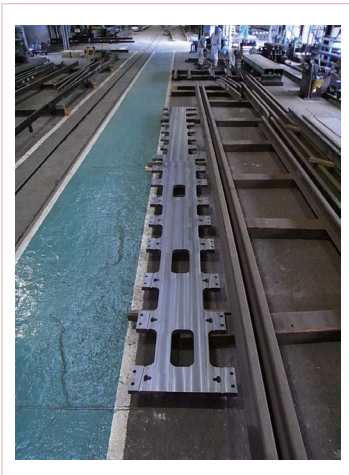


► Example of analysis of magnetic fields on a railway vehicle, and results of a comparison between analytical values and measured values (close to filter reactor)

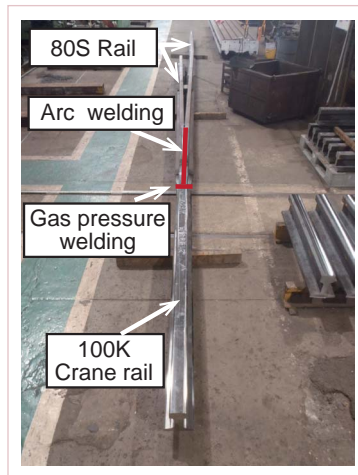
COST REDUCTION

Development of a rail steel moveable nose crossing for Shinkansen lines

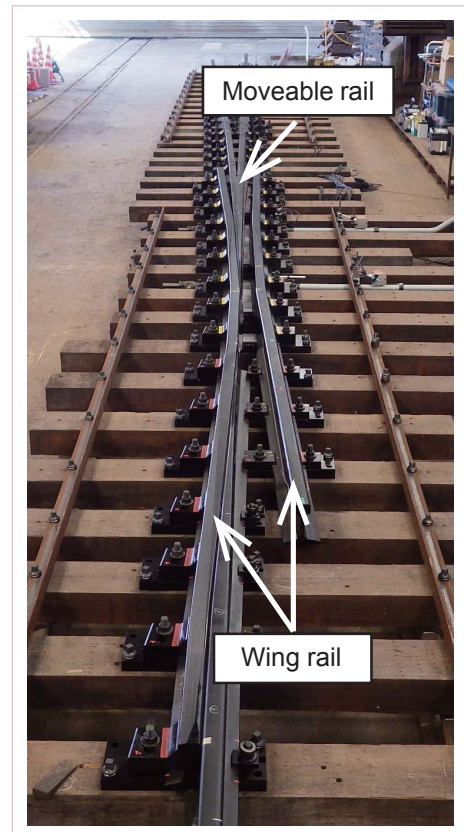
- A thermal processing technique was developed for a rail steel moveable nose crossing on a Shinkansen line.
- Verification was made to confirm that this method makes it possible to perform ultrasonic inspections in the same way as on ordinary sections except for a part.



► One-piece cast base plate

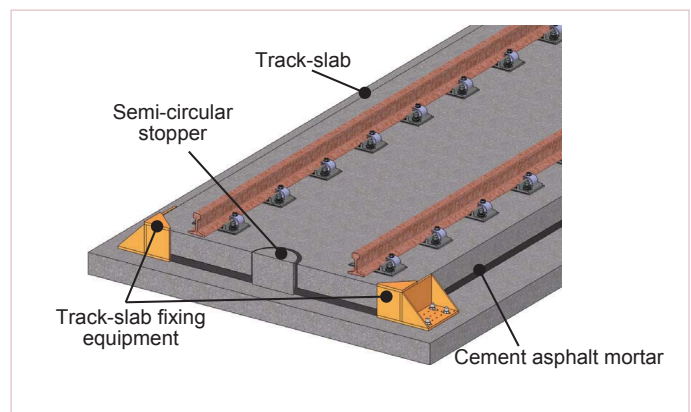


► Moveable rail (before reprofiling of tip)



► View of whole crossing

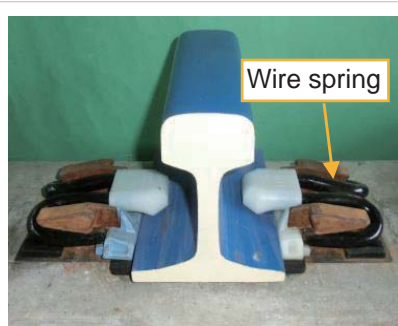
- A track-slab fixing equipment was developed to improve the horizontal resistance force of existing track slab.
- A method was proposed to allow installation of the track slab fixing equipment in a way which is adapted to the layout conditions of the track slab in the field.



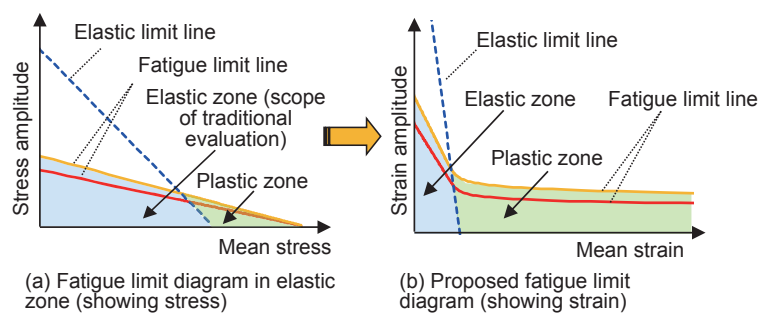
► Example of track-slab fixing equipment

■ Verification of fatigue in wire spring type rail fasteners subject to plastic deformation

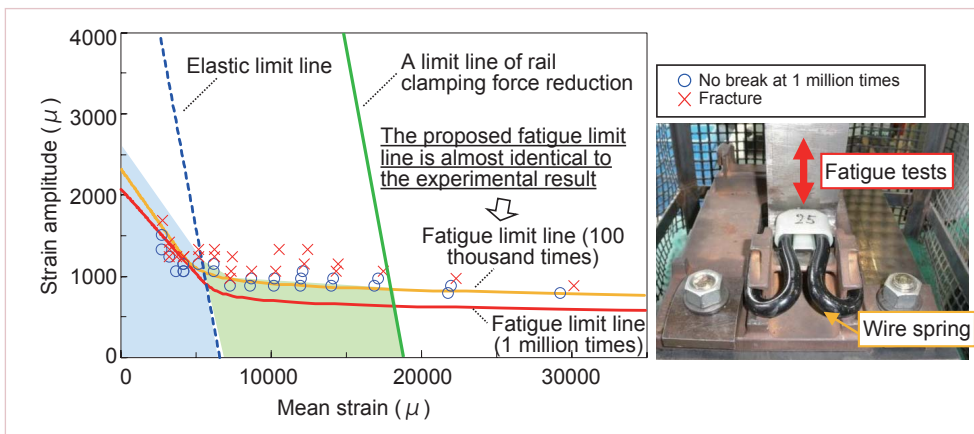
- A proposal was made for a fatigue limit diagram which could be applied to spring rail fasteners subject to plastic deformation.
- By adapting this fatigue limit diagram, it is possible to more appropriately evaluate the performance of wire spring type rail fasteners.



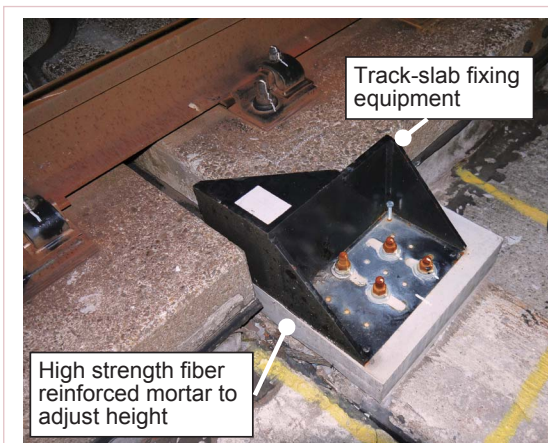
▶ Example of a wire spring type rail fastener



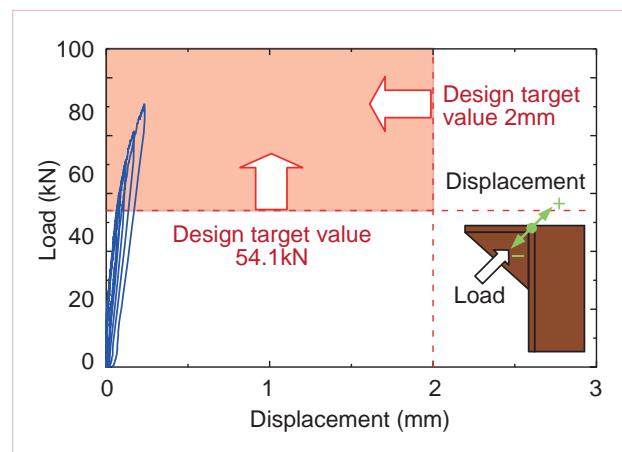
▶ Proposal for fatigue limit diagram based on strain



▶ Comparison of fatigue limit diagram and fatigue test results in the plastic zone



▶ Picture of equipment applied in the field to an actual slab track



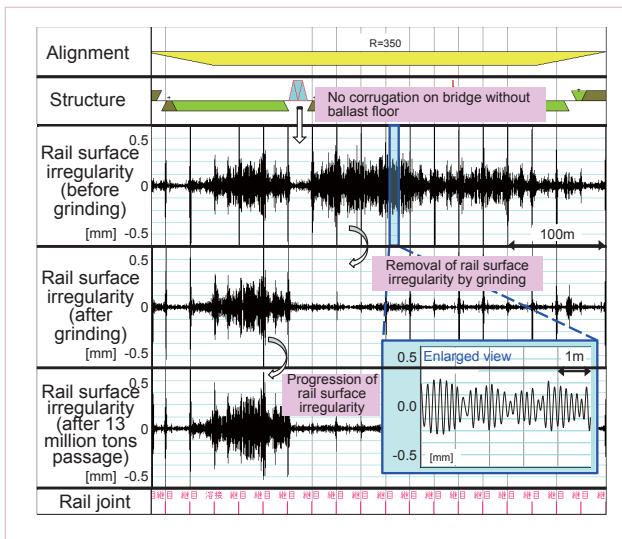
▶ Example of results from horizontal loading tests

Effective management method for rail corrugation

- A device was developed to allow continuous measurement of rail surface irregularity, such as rail corrugation.
- The developed method offers a system for managing rail corrugation efficiently; rail surface irregularity and axle-box acceleration data inter alia are used to identify rail sections needing rail grinding and maintenance priorities can be calculated.



▶ Rail surface irregularity continuous measurement device



▶ Example of continuous rail surface irregularity measurement result

Rail corrugation management system

① Specify work folder Main operation screen

② Specify conditional data Axle-box acceleration data input folder
F:\RCAcVer116\ISO

③ Preparatory calculation Input location

Selection of method to process measured data

Processing with smoothing index YES

Speed of rail surface irregularity conversion [km/h]

④ Processing of collected data Example of displayed result

⑤ Evaluation of state

▶ Rail corrugation management system

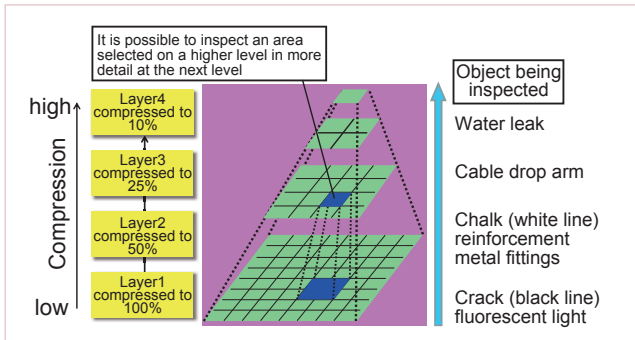
- We developed a seismic retrofitting method with band-shaped steel plates for sections containing terminations of longitudinal bars of reinforced concrete (RC) piers. This method can also be used as repair method for earthquake-damaged sections containing termination of longitudinal bars of RC piers.
- The effects of this retrofitting method and construction performance were confirmed by loading tests with large scale specimens.



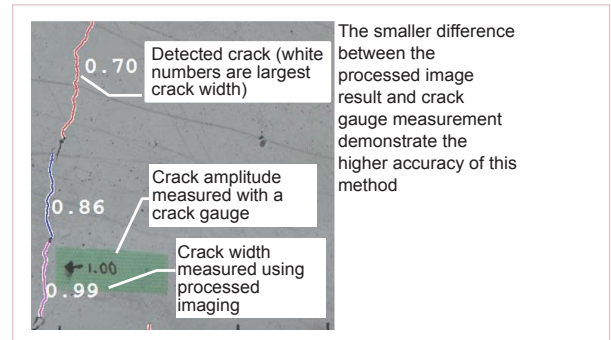
▶ Example of damaged section containing termination of longitudinal bars in bridge pier

Higher precision concrete structure inspection using image processing

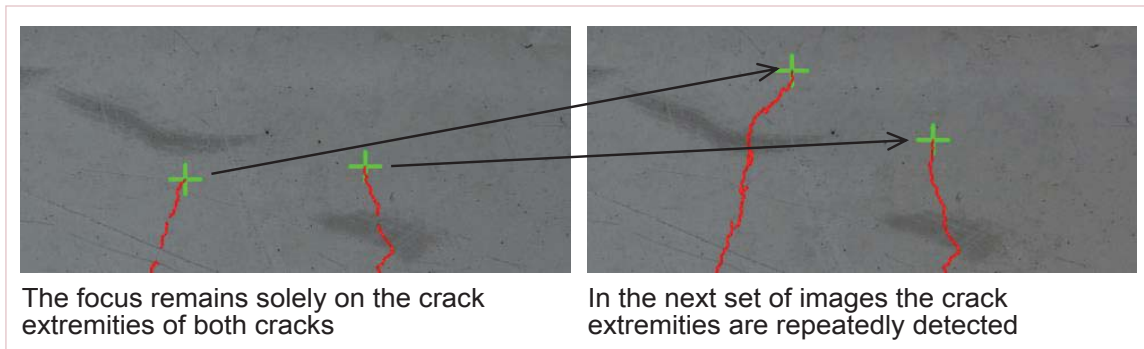
- A crack detection method was developed using different resolution images and controlling noise influence.
- The developed method makes crack detection possible even to the untrained eye.
- By tracing the crack from its origin it is also possible to estimate its progression.



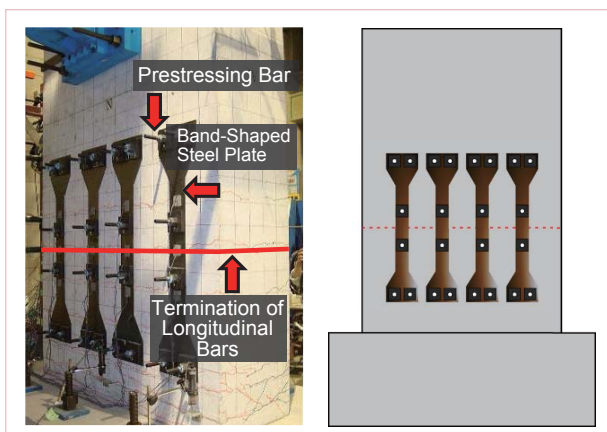
► Layered image produced with multi-resolution images



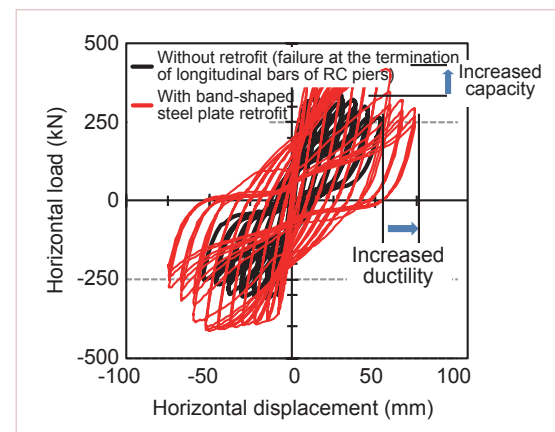
► Result of crack inspection using optimal parameter values



► Crack progression measurement without using the layered imaging



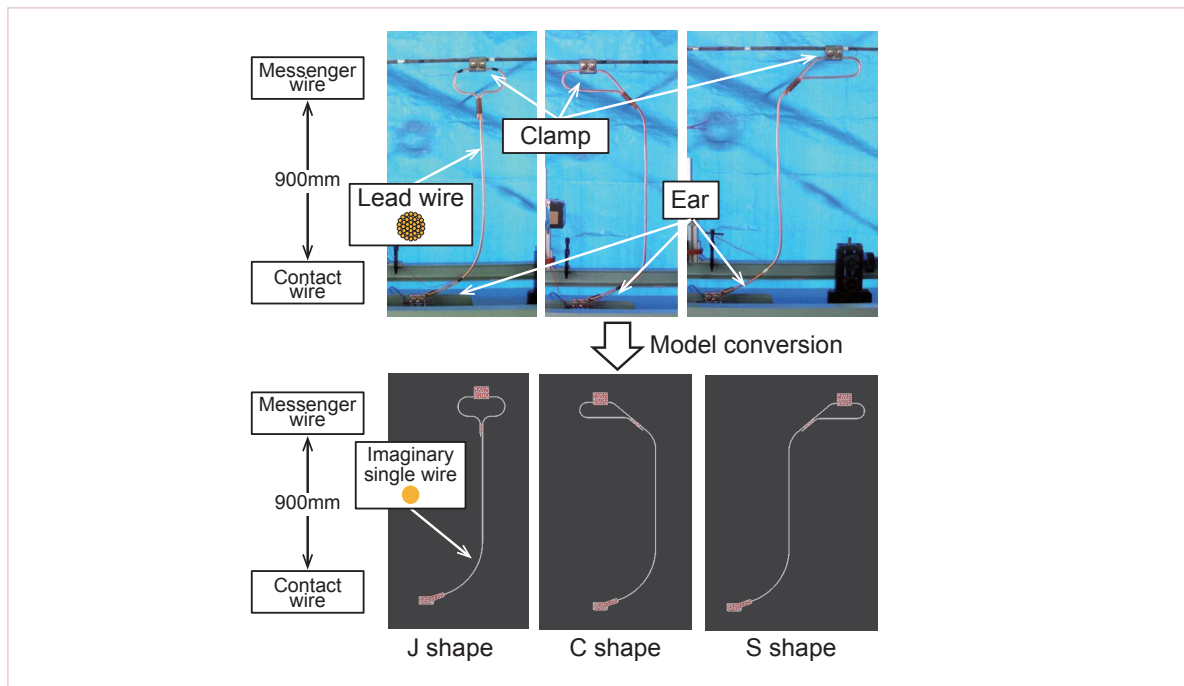
► Outline of retrofitting method with band-shaped plate



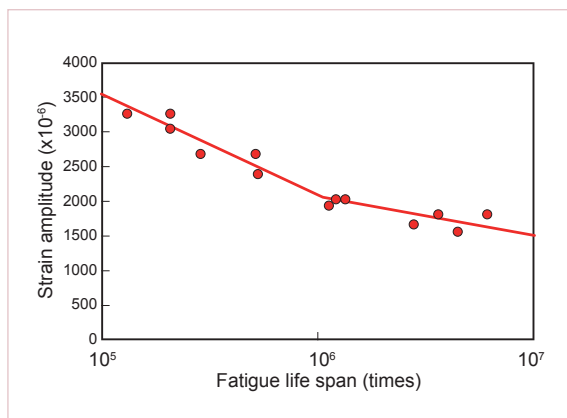
► Investigation of retrofitting effects

Method for estimating the fatigue life of connectors

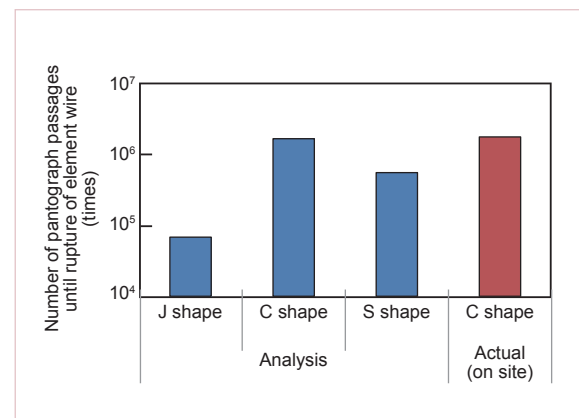
- An analysis method of strain generated on lead wires for arbitrary shape of connector and vibration of overhead lines was developed.
- It is possible to estimate the fatigue life of connectors subject to trolley wire and messenger wire vibrations.



► FEM model of connector using single line instead of wire strand



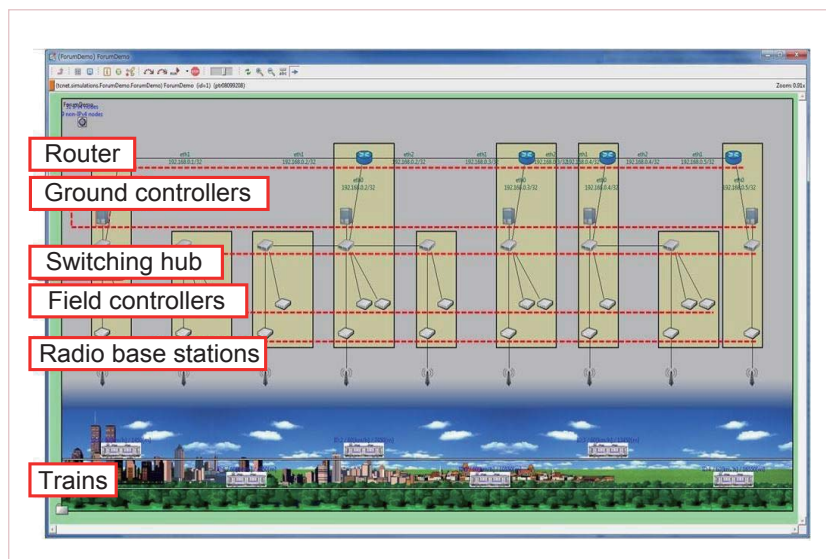
► Fatigue life curve of connector lead wire (at moment of element wire rupture)



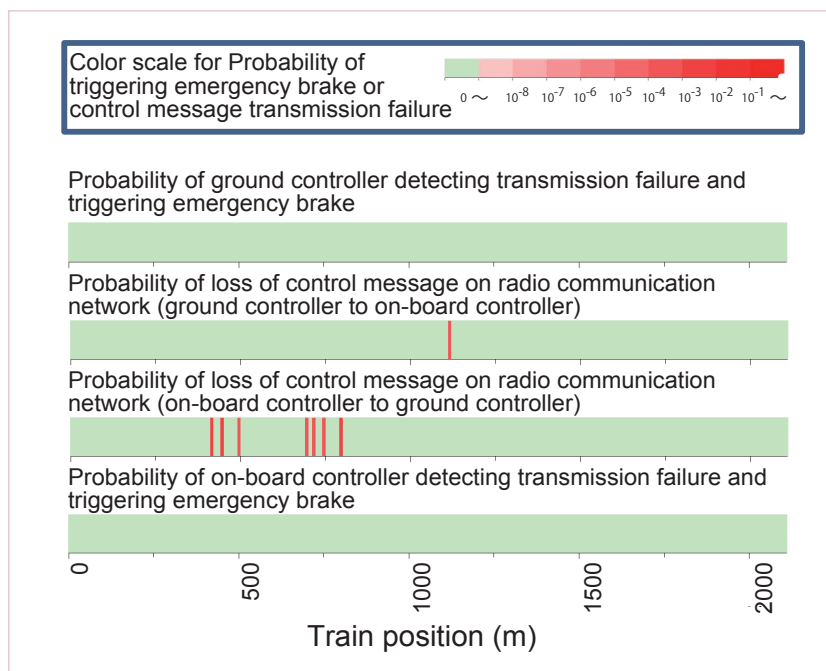
► Fatigue life estimation result of connectors

■ Radio communication network simulator to evaluate the stability of radio based train control systems

- We developed a simulation system to support the design and performance evaluation of the radio communication network systems for radio based train control systems. This simulation system calculates the data transmission quality over a radio communication network taking into account the trackside radio propagation and electromagnetic environment. And we can evaluate stability of train control systems by using the simulation system.
- This simulation system can support the evaluation of radio communication system designs ensure their compliance with international standards and help reduce the cost of trials.



► An example of simulator screenshots

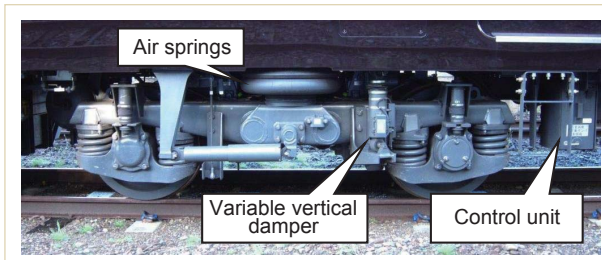


► Examples of simulation results

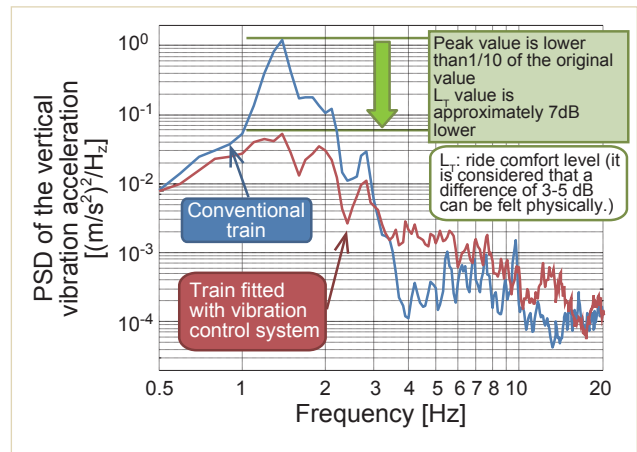
IMPROVEMENT OF CONVENIENCE

Vertical vibration control system for practical use on bolsterless air spring bogies

- A vertical vibration control system was developed for bolsterless air spring bogies.
- It was confirmed that this system can reduce the power of carbody vertical acceleration by up to 90%.
- Applied in practice to a cruise train, ride comfort was demonstrably improved.



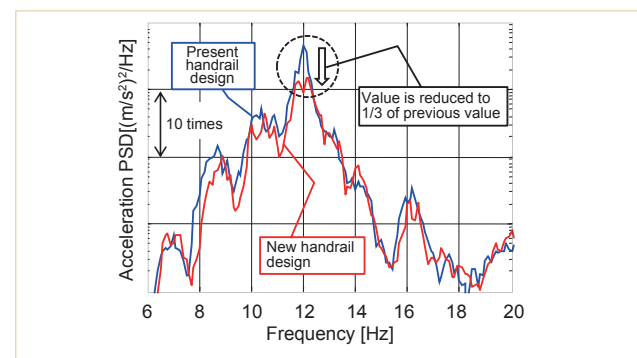
► Appearance of fitted device (on the Seven Stars cruise Train "Nanatsuboshi" in Kyushu)



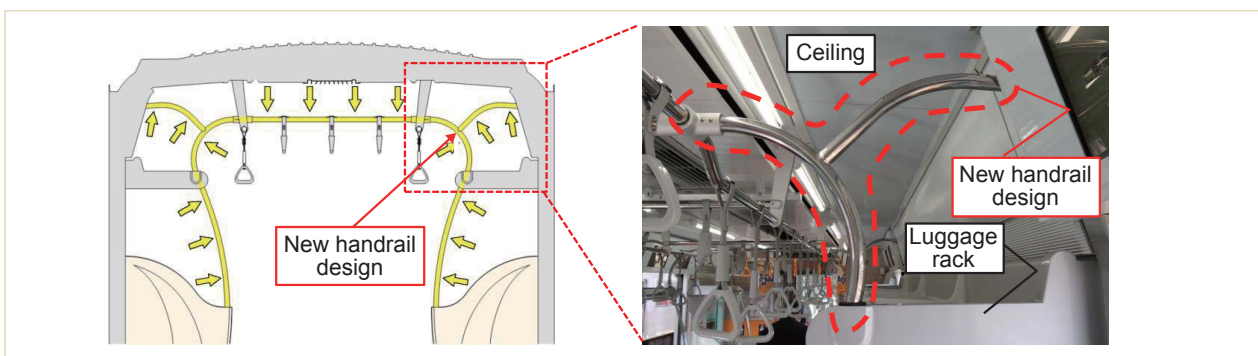
► Comparison of vertical vibration on conventional train and train fitted with the new device (running speed of 60 km/h)

Handrail contributing to better ride comfort and carbody rigidity

- A method was designed to improve carbody rigidity and ride comfort by virtue of interior handrails.
- With this method handrails are put to practical use with part of "interior roll bars."
- Measurements on a train running on a commercial railway line revealed that this method was effective in reducing vertical vibration.



► PSD of acceleration above the floor when running

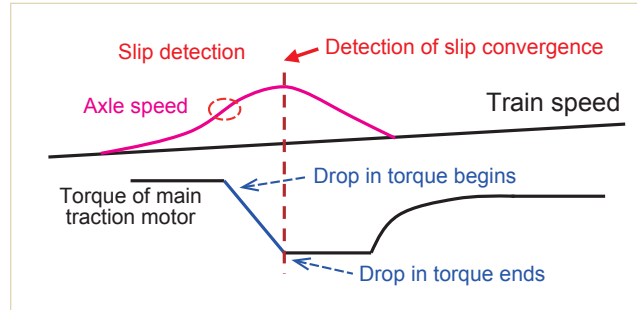


► Interior roll bar (in yellow)

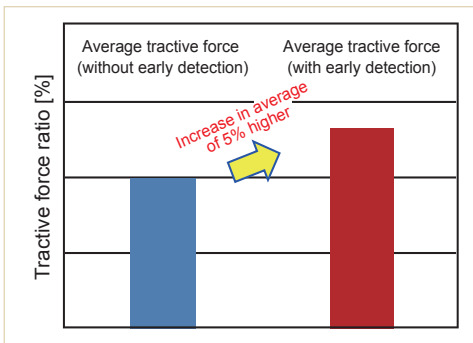
► Appearance of installed handrail

Increasing the tractive force of electric rolling stock through early detection of wheel slip convergence

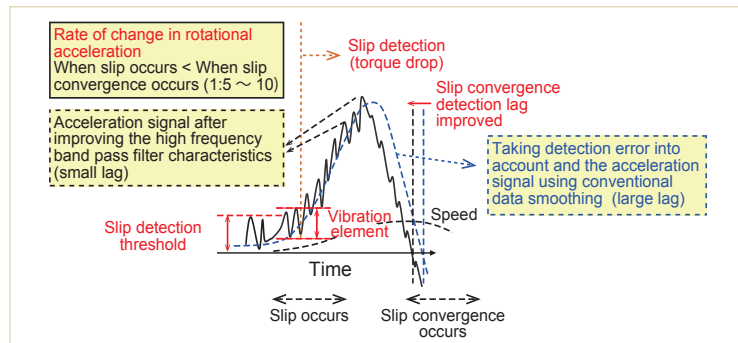
- A method was developed to increase electric rolling stock tractive force through early detection of wheel slip convergence.
- The results from tests carried out with a shunting locomotive confirmed that after wheel slip detection there was a reduction of the drop in traction motor torque and tractive force was on average 5% higher.



► Slip detection and drop in torque



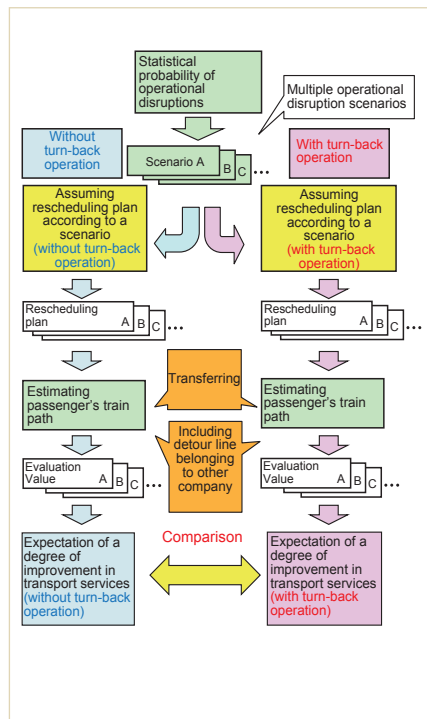
► Results of field tests on real vehicle



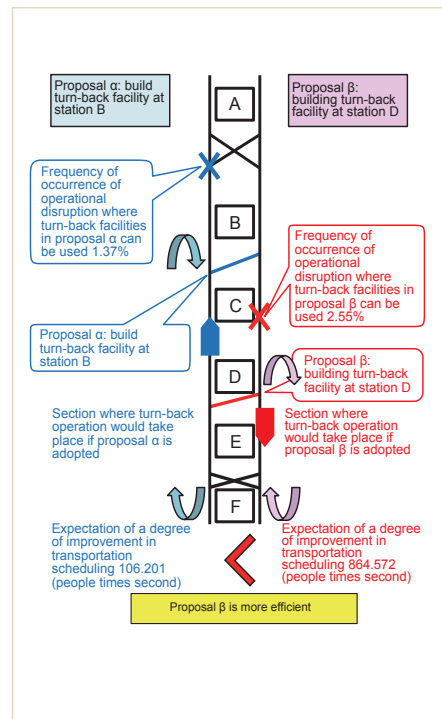
► Slip acceleration data smoothing

Method to quantitatively evaluate turn-back facilities as a means to prevent amplification of operational disruptions

- A method was developed to quantitatively evaluate the efficiency of newly built turn-back operation facilities.
- This method also makes it possible to reflect the frequency of operational disruptions and assess the easiness of turn back operations on the train timetable.
- The method offers comprehensive evaluations which take into account whether passengers managed to reach their destination or not by using alternative transport means.



► Quantitative evaluation method for turn back facilities

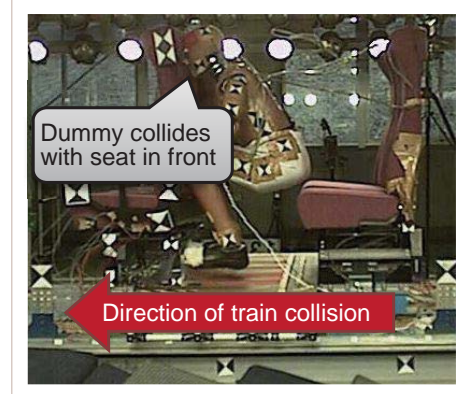


► Example of evaluation of new proposed facilities using the developed method

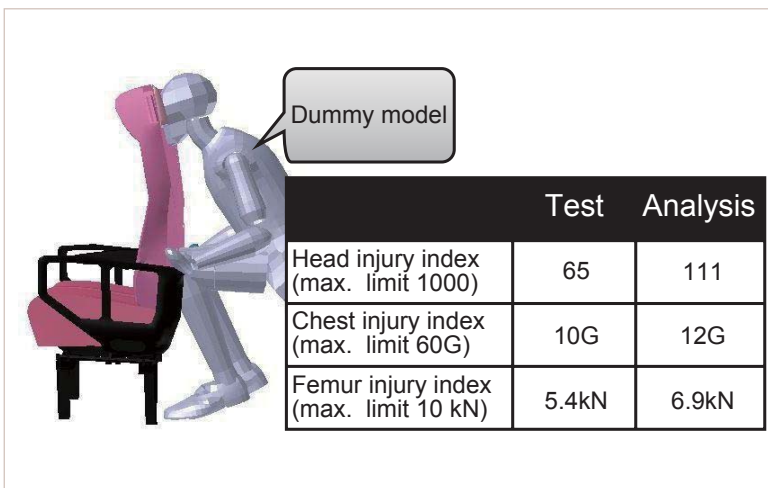
BASIC RESEARCH

■ Analytical method to evaluate injury to passengers in a train collision

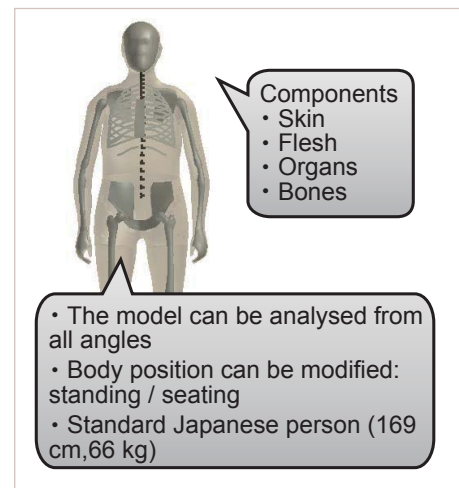
- An analytical method was developed to evaluate injury to passengers occupying transverse seating on a train, in case of a train collision.
- A human body FE model was designed making it possible to evaluate injury for a range of railway vehicle interior characteristics.
- This method makes it possible to propose vehicle structures and interior furnishings which will minimise personal injury to passengers.



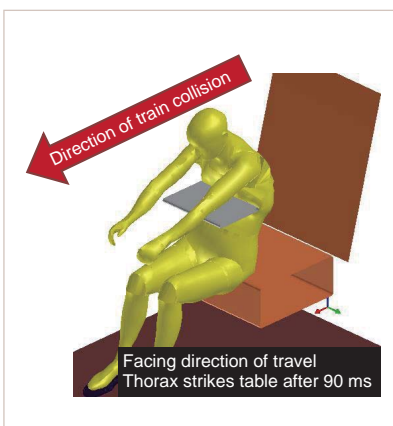
► View of collision test



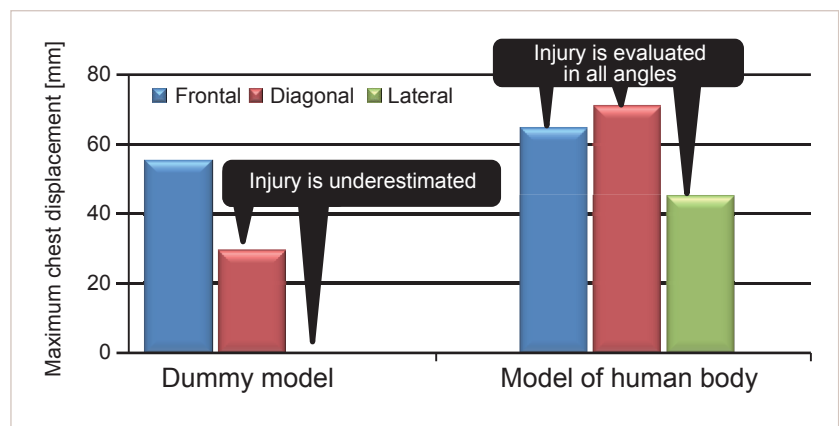
► Comparison of injury indices



► Features of human body model



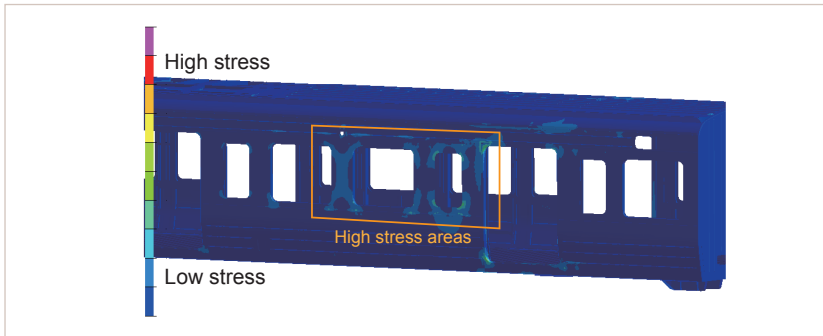
► Collision analysis using human body model



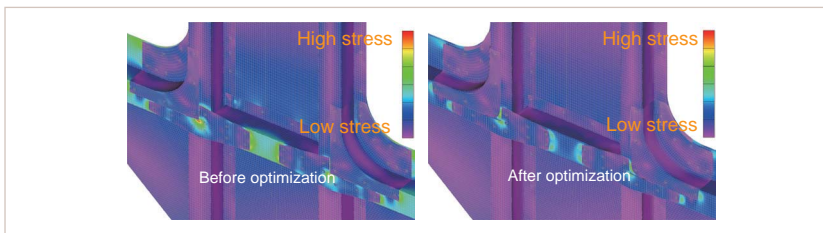
► Comparison of maximum chest displacement

Increasing carbody shell strength through structural optimization method

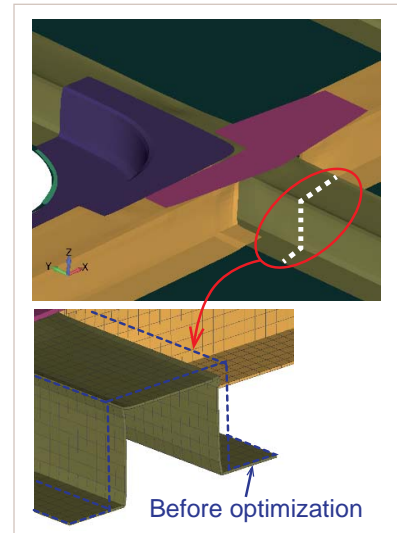
- An optimization method for the shape of carbody shells was developed to reduce stress in high-stress regions and the weight of carbody.
- This method allows of the proposals for enhancement of strength and weight saving to carbody shells.



► Single carbody model stress analysis



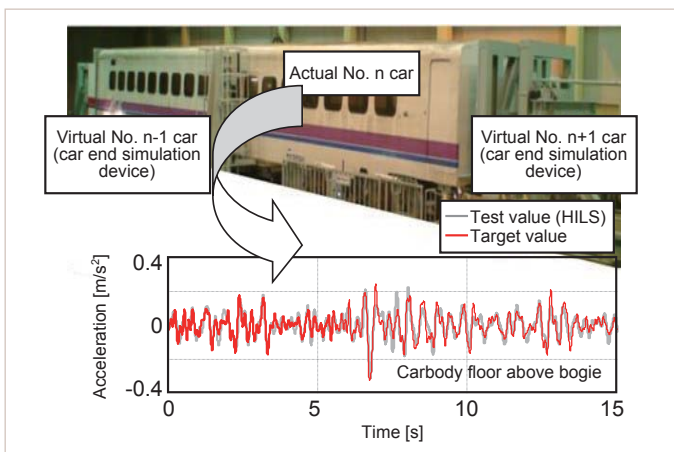
► Optimization of shape in high stress areas



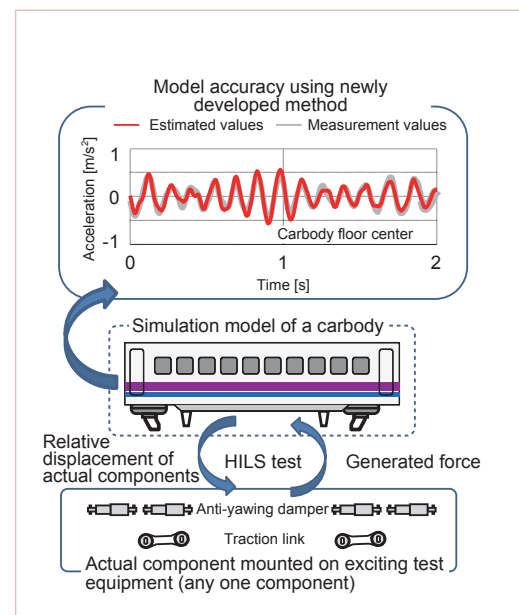
► Cross section of carbody frame after optimization (framing of window corner)

Performance improvement of virtual running test environment for railway vehicles using HILS system

- It is now possible to accurately reproduce the movement of vehicles in a train set on a rolling stock test plant.
- A method was developed to build a model for accurately reproducing the motion of a carbody including elastic vibrations.



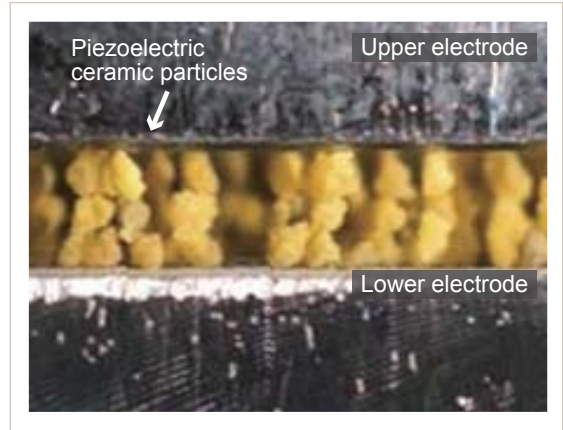
► Exciting test results of a simulated train set running on a rolling stock test plant



► Practical example of HILS system in use for the development of actual component

Improving piezoelectric rubber performance through particle alignment

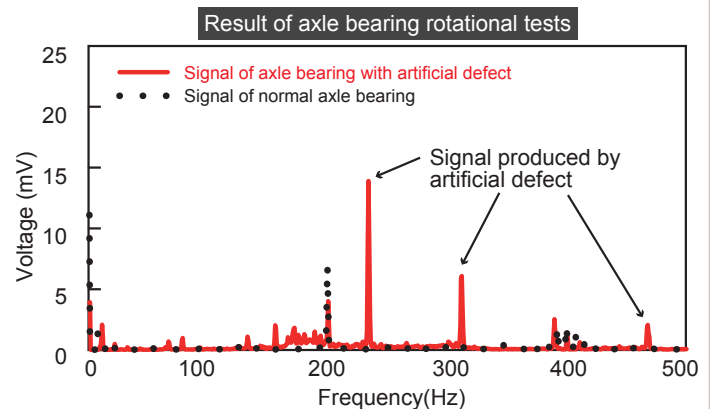
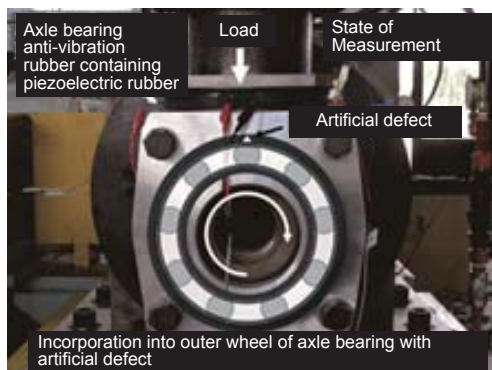
- A ten-fold increase in the performance of piezoelectric rubber was achieved by improving its manufacturing process.
- The enhanced performance piezoelectric rubber can be used in anti-vibration materials possessing sensor functions, and in sensors to detect axle bearing damage, without the need for an amplifier.



► State of particle alignment

Type	D constant (pC/N)	Young's modulus (MPa)
Normal piezoelectric material	80 ~ 600	50000
Common piezoelectric rubber	10	150
Enhanced performance piezoelectric rubber	100	40

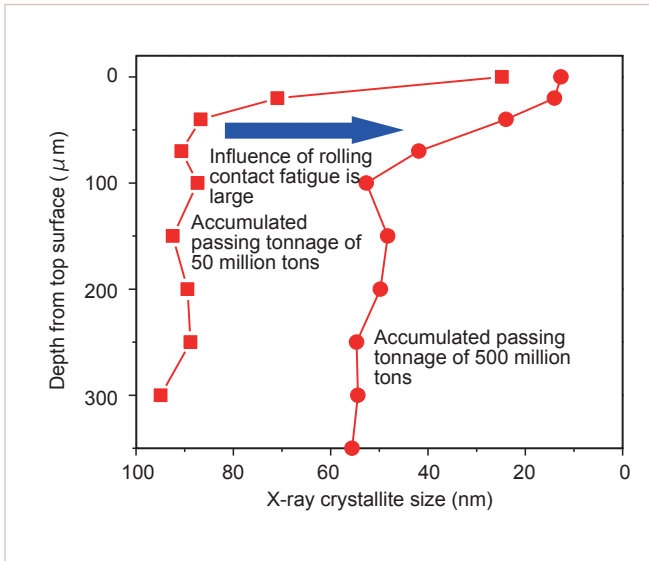
► Comparison of material characteristics



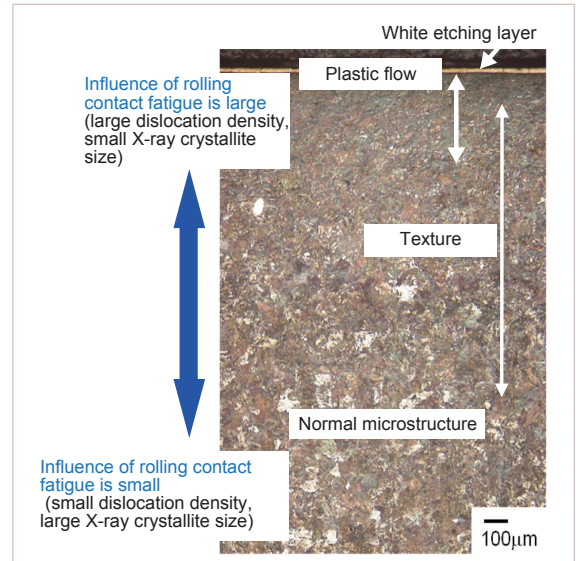
► Example of newly developed piezoelectric rubber in a sensor with anti-vibration properties for detecting axle bearing damage

Evaluation of the rolling contact fatigue layer formed on rails using X-ray Fourier analysis

- It is possible to quantify inside a rail from its surface, changes to its metallurgical microstructure due to rolling contact fatigue with indicators such as X-rayed crystallite size and dislocation density which increase in correlation with plastic strain.
- It is expected that this evaluation method will make it possible to determine more effective rail grinding and rail replacement maintenance work.



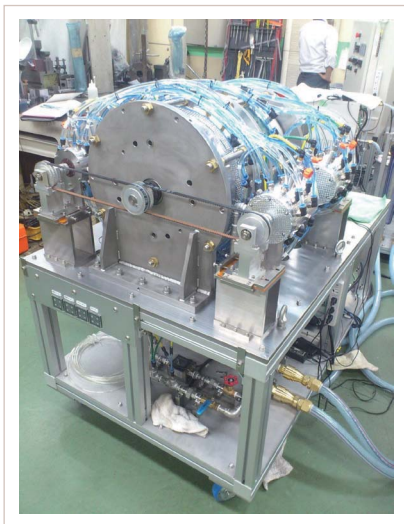
► The state of rolling contact fatigue quantified using X-ray Fourier analysis method



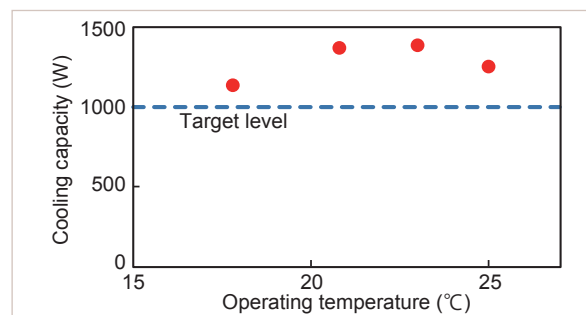
► Optical microstructure of rail with rolling contact fatigue (accumulated passing tonnage of 500 million tons)

Magnetic heat pump system for non-Freon air-conditioners

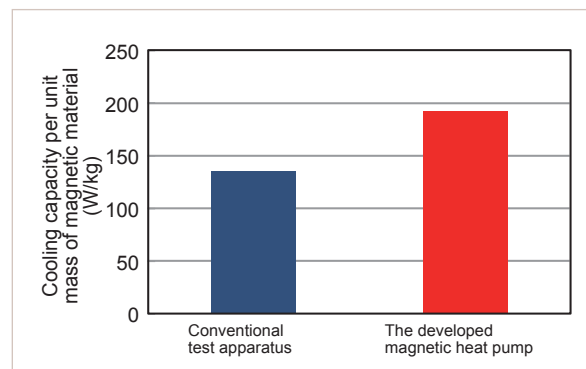
- A magnetic heat pump with a cooling capacity of 1.4 kW was developed using gadolinium alloy as magnetic material.



► The developed magnetic heat pump



► Cooling capacity as a function of operating temperature



► Cooling capacity per unit mass of magnetic material

Outline of Activities

Public Interest Activities

1 Research and Development for the Public Interest

During the fiscal year 2013, ending in March 2014, progress was made in 279 research and development projects, funded by JR companies, relating to the future of railways, as well as practical technologies and basic railway research, of which 93 were completed. 11 projects were implemented with outside public funds from independent administrative institutions. The funds for research and development amounted to 2.74 billion yen, including 190-million-yen in government subsidies and 260-million-yen in external funds. In addition, we undertook two contract-based R&D projects, generating an income of 170 million yen.

To improve the efficiency of R&D, we also launched 67 joint research projects with universities and other research institutes and 13 contracted research projects, while positively seeking advice and evaluation from nine experts from third-party 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 fiscal 2012, ending March 2013.

2 Surveys and Investigation

We conducted strategic surveys on medium- and long-term trends in the fields of safety, environment, transport economics, such as, "A Survey on Railway Risk Management as Social Infrastructure", and "A Survey on Policies and Measures to Maintain and Create Traffic Demand", which will contribute to our R&D. We extracted research themes by conducting surveys of "Upgrading Disaster Prevention Technologies for Railways", in order to seek research themes in the future. We also

collected information about railway technology trends in terms of standardization in Europe by seconding an employee to the International Union of Railways (UIC).

3 Activities Involving Technical Standards

We conducted six research and survey projects relating to technical standards which were commissioned by the national government, generating an income of 110 million yen. We also carried out eight projects including the 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. RTRI's periodicals are available on our website.

5 Publications and Lectures

We issued periodicals "RTRI Report," "Railway Research Review (RRR)," "QUARTERLY REPORT OF RTRI (QR)," "Railway Technology Newsletter" and "Information on World-Wide Railway Technologies (WRT)". We also held the RTRI Annual Symposium entitled "Maintenance Technologies Supporting Railways – Evaluation and Remedy of Deteriorated Structures" (632 participants), 11 Monthly Seminars (938 participants in total), and 29 Railway Technical Lectures (1,620 participants in total).

6 Technology Consulting

In response to requests from railway operators, we provided consultancy services for 482 projects. Among these projects, 46 projects in total related to accidents, disasters, and breakdown of facilities, more specifically four projects related to accidents, 11 to natural disasters, 12 projects on rolling stock breakdown, and 10 power system breakdowns.

7 International Standardization Activities

We promoted activities relating to international railway standards in the IEC (International Electrotechnical Commission) and the ISO (International Standardization Organization) based on policies and proposals provided by the Railway Technology Standardization Committee.

As activities of IEC, we continued the review

of standards as a National Mirror Committee of TC 9 (Technical Committee of the International Electrotechnical Commission for Electric Facilities and Systems of Railways). We also tabled a new proposal for a standard on trackside power storage systems. In addition, we proceeded with draft standards of on-board power storage systems.

As activities of ISO, we hosted the 2nd Plenary Meeting of ISO/TC 269 (Railway Applications) in Tokyo in November. Furthermore, we promoted the drafting of comprehensive standards regulating design and planning processes for railway projects.

8 Qualification of Railway Design Engineers

We conducted the examination for railway design engineers in Tokyo and Osaka on October 27, 2013. 739 applicants took the exam and 124 passed.

Contract - Based Activities

The revenue from contract-based activities was 2.91 billion yen including income from patents. We organized eight technical seminars in order to disseminate research results and promote contract-based business, and approximately 1,200 people from 360 companies attended in total.

1 Commissioned Research and Development Project

1.1 Public-Interest Projects

We implemented six public-interest survey projects commissioned by the national government. We also carried out a research project "A Study of Damage Evaluation Standards for Slopes" commissioned by the Japan Nuclear Energy Society (JNES). The income from these projects was 280 million yen. The income from commissioned research projects combining public interest activities and commercial activities were 3.19 billion yen for a target figure of 3.43 billion yen.

1.2 Commercial Projects

We carried out contract-based, commercial projects including tests and surveys related to new Shinkansen lines, review of structure maintenance, tests for earthquake monitoring systems, and performance evaluation of rail fastening systems.

Total income from the commissioned projects for public-interest and commercial purposes was 3.19 billion yen, while the targeted amount was 3.43 billion yen.

Table 1 summarizes the number of clients and income from commercial projects for the fiscal year 2013. Income from public corporations and private enterprises dropped from the previous fiscal year 2012, while the income from JR companies and other public /private railways increased.

▶ Table 1. Classification of clients

Customer	No. of projects		Income (100 million yen)	
National government	6	(8)	0.15	(0.15)
Local governments	4	(2)	0.06	(0.06)
JR companies	102	(88)	9.66	(7.74)
Public corporations	31	(38)	7.28	(7.63)
Public /private railways	87	(80)	3.42	(1.27)
Private enterprises	301	(312)	7.92	(9.28)
Total	531	(528)	29.13	(26.15)

The figures in brackets refer to the previous year.

1.3 Total Income

Total income from public-interest and commercial projects was 3.19 billion yen in fiscal 2013, and it was 93% 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.

We promoted six survey projects in response to member requests of which three were completed, including “the Survey and Research on a Diagnosis Manual for Structure Soundness”.

Regarding information sharing with the members, we created a website which can be used by simple registration process. In addition, we enhanced the search functions of the railway safety database.

In the sphere of technical support, we dealt with 100 inquiries from members on technical subjects and carried out three service visits and 18 field surveys. We compiled a textbook on rolling stock (rolling stock version II) for mid-level engineers. Furthermore, we held 14 forums on diagnosing the soundness of railway structures in major cities in Japan. We also held 10 seminars for technical committees of local railway associations.

3 Railway International Standards Center

In order to ensure that our work in the field of international standards was carried out strategically and systematically, we shared information with European and Asian experts on international standards. We hosted meetings for Planning and Administration Councils and the Strategy and Planning Council for International Standardization, promoted the review of international standards, in consideration of member company needs, and proposed new international standards for rolling stock air conditioning systems. Furthermore, the Railway International Standards Center office was moved to the newly-opened Chiyoda Office to meet the growing work load.

4 Other Activities

4.1 Development of Gauge-Changing EMUs

As a member of the Free-Gauge Train (FGT) Association, we conducted measuring at running tests of a new train set fitted with improved trucks.

All the running tests were completed, and the resulting evaluation was that “Basic durable performances of Gauge-Changing EMUs are highly likely to be confirmed” at Gauge-Changing EMUs Technology Evaluation Committee (hosted by MLIT, Ministry of Land, Infrastructure, Transport and Tourism). The Committee’s report also states that durability tests with a new testing vehicle should be continued and maintainability and cost performance should be further analyzed aimed at practical use. The Free-Gauge Train (FGT) Association was dissolved at the end of March 2013. We provided advice by participating in the design committee for a new test vehicle which will be developed by the Japan Railway Construction, Transport and Technology Agency (JRRTT) and designed and manufactured by the Kyushu Railway Company. In addition, we participated in the design meetings of Gauge-Changing EMUs which West Japan Railway Company has started to develop, and proposed specifications for truck and gauge conversion equipment.

4.2 Industrial Property Rights

We made 199 patent and utility model applications and 241 were registered in the fiscal year 2013. As a result, this fiscal year, the total number of patents and utility models owned by RTRI reached 2,076.

■ Administrative Organization

1 Human Resources Development

We recruited 17 new graduates and three mid-career employees to avoid generation gaps in our technological expertise between veterans and new engineers. We also re-employed four retired researchers, to ensure the smooth transfer of technical knowledge and skills from experienced to young employees.

In order to promote personnel exchanges, we seconded 54 researchers to other organizations, and accepted 114 in return. Among them, 26 were sent to JR companies and we accepted 63 from JR. In addition, we sent researchers to the Ministry of Land, Infrastructure, Transport and Tourism (MLIT), Japan Railway Construction, the 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 39 as part-time instructors. 178 of RTRI's researchers have doctoral degrees and 78 have been qualified as Professional Engineers.

2 Promotion of Compliance with Corporation Policy

We made efforts to ensure employee compliance with corporation policy, including the improvement of research ethics by using the RTRI version of the web learning system.

3 Strengthening Information Management

A review was made of methods used for information management and revised related rules in order to strengthen the management of confidential information relating to R&D. We also educated our employees to raise their awareness of confidentiality.

4 Visitors

RTRI's Kunitachi Head Office and the Maibara Wind Tunnel Technical Center received approximately 2,760 and 360 visitors respectively, in the course of the fiscal year 2013. About 1,730 participants attended the RTRI Technical Forum held at the Kunitachi Head Office on August 29 and 30, and 450 participants attended the Osaka Forum on September 12. In addition, approximately 5,230 people visited RTRI's Kunitachi Head Office on the open house day on October 12 and 7,000 people visited Maibara Wind Tunnel Technical Center on its open house days, October 12 and 13.

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 has also implemented individual joint research projects based on its own interests with railways and universities in foreign countries.

1 Joint Research with the China Academy of Railway Sciences and the Korea Railroad Research Institute

The tripartite joint research by Japan, China and Korea has been conducted 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.

Aimed at sharing research results and information, joint seminars have been held since 2001 on a rotating basis. In October 2013, the 12th Joint Research Seminar was held in Korea. The research themes for which RTRI participated were, "Wheel and Rail Adhesion", "Vibration Measurement Technologies for Trackside Buildings", "Monitoring Technologies for Catenary Systems", "Specifications for High-Number Turnout", and "Issues of Safety and Reliability of Power Supply Equipment".



▶ A scene of discussions in Korea

2 Joint Research with French National Railways

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. On December 10th 2013, we had an intermediate meeting in order to discuss the status of on-going research themes and newly proposed themes. The next joint research seminar will be held in Paris in September 2014. The 6th-phase of joint research is now in progress in the fields of "Behavior Issues of Ballasted Track", "Maintenance Technologies of Overhead Catenary Systems for High-Speed Railways", "Standing Comfort for Passengers", and "Energy Saving Systems of Power Supply".

3 Joint Research with the Railway Safety and Standards Board, UK

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 2013, two research themes, "An Effects Inspection of Finger-Pointing and Call" and "Dealing with Climate Change" were newly established and started.

4 Joint Research with Other Research Organizations

In the year 2013 and 2014, RTRI continued joint research with Massachusetts Institute of Technology in the USA (Theme: Technologies of High-temperature Superconductivity), the University of Cambridge in the UK (Theme: Technologies for Status Monitoring of Facilities), The University of Bristol in the UK (Theme: A Control Method of Actuator), and Chalmers University of Technology in Sweden (Theme: Fatigue Caused by Wheel-Rail Contact, Evaluation of Effects on Tread Damage of Wheels). RTRI also started new joint research with Columbia University in the USA (Theme: A Study of Earthquake-Proof Design Method on Structures).

■ 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.

The 10th WCRR 2013 was held in Sydney, Australia, hosted by Australian Railway Association (ARA) and Cooperative Research Centre (CRC) for Rail. WCRR 2013 was held from November 24th to November 28th 2013 and successfully finished with 559 participants from 32 countries, 188 presentations, and 124 poster sessions. According to the Organizing and Executive Committees held in Sydney, the 11th WCRR 2016 will be held in Milan in Italy, from May 29th to June 2nd 2016 hosted by Trenitalia.

■ Co-operation with Government and Domestic Organizations

Responding to requests from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) 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 July and August 2013, RTRI's researchers gave lectures on rolling stock and power supply systems in Thailand. Also, RTRI received visits from National

Science and Technology Development Agency in Thailand in August, from diplomats at the British Embassy in Japan, representatives of Scottish Development International, Heriot-Watt University, and University of Southampton in November. In January 2014, RTRI received the Ministry of Railways of the Government of India by a request of the MLIT.

■ Collection of Overseas Technical Information and Participation in International Conferences

We seconded a researcher 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 Asia-Pacific Regional Assembly held in Astana, Kazakhstan, in May, in the UIC General Assembly and International Railway Research Board (IRRB) meeting held in Paris, France in June and in December.



▶ The UIC Asia-Pacific Regional Assembly in Astana

Publication

In the year 2013 and 2014, we issued the newsletter "Railway Technology Newsletter" on a quarterly basis to introduce our latest R&D activities and researchers. Also, we issued our Annual Report 2012-2013 (English Version) using an edited version of the original Japanese-language report.



▶ "Railway Technology Newsletter"

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

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

	Asia	Europe	North America	Central and South America	Africa	Oceania	Others	Total
WCRR	1	2	0	0	0	39	0	42
Conference/Meeting	33	101	13	0	1	3	1	152
Survey/Research	7	4	3	0	0	0	2	16
Joint research	17	10	2	0	0	0	0	29
Technical guidance	2	0	0	0	0	0	0	2
Contract	5	7	0	0	0	0	0	12
Others	17	27	1	0	0	1	0	46
Total	82	151	19	0	1	43	3	299

▶ Number of guests from overseas by country (including attendants)

Asia	Europe	North America	Central and South America	Africa	Oceania	Others	Total
190	91	7	7	10	10	73	388

Railway International Standards Center

To facilitate the smooth operation of the Railway International Standards Center (RISC), 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 which are significant to operate RISC. 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. The overview of the activities of Planning and Administration Council's meetings and income and expenditure are as follows.

1 Operation and Management

1.1 Planning and Administration Council

The business report for the year 2012 and 2013 and the business plan for the year 2014 and 2015 were discussed at Planning and Administration Council meetings held in May 2013 and February 2014.

1.2 Income and Expenditure for fiscal 2013

The total income for the fiscal year 2013 was approximately 264 million yen, including 88 million yen from membership fees, 140 million yen from JR contributions and 35 million yen in carry-over from the fiscal year 2012.

The total expenditure was approximately 232 million yen, including 79 million yen for business activities, 34 million yen in travel expenses and 117 million yen as personnel expenses.

1.3 Membership

Membership as of March 2014, end of fiscal 2013, was 132 with 10 new members and two resignations.

1.4 General Member Meeting

General Member Meetings were held in August 2013 and March 2014, and discussions at the Planning and Administration Council were reported and views shared among members.

2 Review of IEC and ISO Standards

RISC, continued in its role as the National Mirror Committee for IEC/TC 9 (Technical Committee of the International Electrotechnical Commission for Electric Facilities and Systems of Railways), ISO /TC 269 (Railway Applications), and ISO/TC 17 (Technical Committee of the International Standardization Organization for Steel) /SC 15 (Subcommittee of ISO/TC 17 for Rails and Auxiliaries), and hosted the 2nd Plenary Meeting of ISO/TC 269 in Tokyo in November 2013.

2.1 Activities of IEC/TC 9

Meetings of the IEC/TC 9 Mirror Committee were held in September 2013 and in March 2014, and the status of standard development was reviewed and reported. The 53rd Plenary Meeting of IEC/

TC 9 was held in Firenze, Italy on November 5th to 8th, 2013 and nine persons attended from Japan. Regarding the discussions on standards, the Mirror Working Group met more than 90 times and 150 experts from RISC and other divisions of RTRI were sent to international conferences. Regarding IEC/TC 9, 11 standards which RISC reviewed as part of its role as a secretariat of the National Mirror Committee went into effect. In addition, standards for power storage systems on the ground proposed by Japan and standards for lithium ion battery led by Japan were approved officially.

2.2 Activities of ISO/TC 269 (Fig.1.)

In July 2013, the 3rd meeting of ISO/TC 269 Mirror Committee was held, and its strategic business plans were reviewed and AHG's activities were reported.

In October 2013, the 4th meeting of ISO/TC 269 Mirror Committee was held and discussions included how to contribute to the 2nd ISO/TC 269 Plenary Meeting.

RTRI hosted the 2nd ISO/TC 269 Plenary Meeting on November 20th to 22nd, 2013, with 36 participants from eight countries. At the meeting, a decision was taken that a technical report be prepared combining the first part "Stakeholders and their demands" and the second part "Basic requirements" of "Comprehensive Standards Regulating Design and Planning Process of Railway Projects" (Generic Standards) which had been examined by AHG02, that Japan propose as new standards the first part "terms and definitions" of "Standards for Railway Vehicle Air Conditioning Systems" which had been examined by AHG03, and that establishment of AHG05 be discussed in order to examine the setting up of three subcommittees for infrastructure, rolling stock, and operations and services.

Moreover, as a technical visit, the participants visited the Tokyo General Rolling Stock Center and the Technical Training Center for Signalling and Communication Technology and Track Maintenance in Omiya Branch Office with the cooperation of the Japan East Railway Company.

In February 2014, the 5th ISO/TC 269 Mirror Committee meeting was held and the results of the 2nd Plenary Meeting were reported and future actions were discussed.

Furthermore, RISC held more than 40 Mirror Working Group meetings and approximately 80 experts in and out of RISC participated in international conferences.



▶ Fig.1. The 2nd Plenary Meeting of ISO/TC 269

2.3 Activities of ISO/TC 17/SC 15

At ISO/TC 17/SC 15, the secretariat country China had proposed that the committee draft be approved as the Draft International Standards for rails. Japan gave their approval to the proposal, adding three technical comments and the proposal was adopted by vote in October 2013.

2.4 Activities for Other ISO Railway Standards

Regarding the review activities for other ISO railway standards, such as noise measurement, ground vibration, synthetic sleepers and fare collection control systems, RISC participated in the Mirror Committees and sent experts to international conferences.

3 International Standardization Strategies for Railways

Based on the basic strategies of “offence” and “defense” shown in the business plan of Railway Technology Standards Committee’s railway technology standardization, RISC has been organizing and carrying out specific activity plans.

In order to carry out international standardization activities based on those continuously, RISC examined and discussed medium- and long term activity plan and tasks which should be tackled preferentially as a foundation for promoting international standardization activities.

3.1 Discussions about strategies and plans

RISC held International Standardization Strategy and Planning meetings in August 2013 and January 2014, and the recent status of IEC/TC 9 and ISO/TC 269 was reported. Also, opinions were exchanged about our long to medium-term tasks, such as improvement of Japan’s presence in the international standards field, human resources development, and cooperation with overseas.

3.2 Discussions about ISO/TC 269

Regarding ISO/TC 269, RISC promoted discussions about necessary tasks which are related to maintain Japan’s presence in this field. As specific activities, RISC proposed some activities of standardization including “Comprehensive Standards Regulating Design and Planning Process of Railway Projects” and “Standards of Air Conditioning System for Rolling Stock”. Also, AHG05, which will establish three subcommittees including operations and services in accordance with the proposal by Japan will be launched in cooperation with France.

4 Proposals for Domestic Standardization

RISC shared information related to the needs of domestic standardization which is going to be or has already been published as international standards with its members. RISC also supported the work required to incorporate these standards in Japanese Industrial Standards (JIS).

5 Collection, Analysis and Providing Information

5.1 Collecting Information

In order to collect information related to international standardization of railways, RISC conducted these surveys below.

- A survey of analytical methods to study the effects of standardization
- A survey of planning procedures for infrastructure projects and supplementary standards
- A survey of operational standards in Europe
- Translation of important overseas standards

5.2 Opening of Separated Section Members Meeting

The Separated Section Members Meeting is composed by ten sections including rolling stock, rolling stock electrical appliances, components, power supply, contact line structures, signalling, station facilities, tracks, non-manufacturers, and Japan Railway Companies. RISC shared opinions about the needs to develop international standards with experts from European international standards in each field.

6 Overseas Dissemination of Japanese Railway Technical Information

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

7 Awareness Enhancement for International Standardization and Human Resource Development

7.1 Seminars

We introduced basic knowledge and recent developments in international standardization at Seminars held twice in February 2014 (level: beginner and intermediate).

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

Japan's Railway Technology Standards Committee presents honors to those who have contributed to domestic and international standardization in the railway field, and RISC is responsible for the supporting secretarial work. In fiscal 2013, six people were honored for their contributions.

8 Promotion of Co-operation with Overseas Railway Experts

8.1 Co-operation with Railway Standards Experts Personnel in Europe

An information sharing meeting of the JISC-CEN (European Committee for Standardization) was held in London, the UK in October 2013, and eight

persons including the chairman of CEN/TC 256 (Railways Applications) 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 in Tokyo, and four participants from Europe including an organizer of CENELEC/TC 9X (Electrical and Electronic Applications for Railways) and eight participants from Japan attended and actively participated in the discussions.

Furthermore, RISC concluded a memorandum of cooperation with French Organization for Railway Standardization (BNF) by the suggestion from BNF in February 2014.

8.2 Co-operation with Railway Standards Experts in Asia

In June 2013 RISC's experts visited the Ministry of Transport and the Land Transport Authority of Singapore to exchange opinions. Also in September 2013, a Standardization Information Exchange Meeting between Korea Railroad Research Institute (KRRI) & RTRI was held in Osong, Korea, and shared information with KRRI. To cooperate with Southeast Asian countries, we shared opinions with Malaysian Railways Limited (KTMB) and State Railway of Thailand concerning cooperation procedures for international standardization activities by visiting them. In addition, at the railway executive meeting of Association of Southeast Asian Nations (ASEAN) held in October 2013, presentations of international standards about railways were made by the cooperation with International Union of Railways (UIC). In the presentations, RISC showed the necessities of international standards and the importance of participating international standards activities to the directors of each country.

Based on the results of these activities, we will promote cooperation with Asian countries.

Facilities

We newly installed, renovated, and renewed 15 types of testing apparatus, including introduction of a new hydraulic fatigue testing machine for vibration isolating material that can perform fatigue tests in which actual testing conditions of material with low elasticity are properly simulated and which can be used for evaluation tests on temperature-dependent polymeric material. Major items are summarized below.

New Hydraulic Fatigue Testing Machine for Vibration Isolating Material

A new hydraulic fatigue testing machine for vibration isolating material has been installed. The fatigue testing apparatus can conduct compression and tension tests in one axial direction with the use of a maximum-load carrying capacity of $\pm 100\text{kN}$ and a maximum stroke of $\pm 50\text{mm}$.

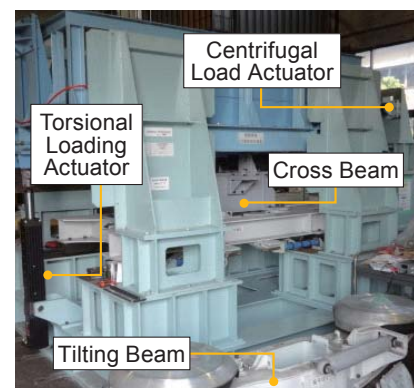
Conventional testing machines used to evaluate vibration isolating material such as track and sleeper pads, do not always maintain a state of excitation since some low-elasticity material has a low repetition speed (approximately 5mm/s) for small loads. This testing machine has a higher repetition speed (approximately 20mm/s) by virtue of its higher capacity hydraulic driving system; the machine can therefore be used to conduct tests in which actual testing conditions of material with low elasticity are properly simulated. In addition, the machine has a thermostatic oven that can control temperature within a range of -30°C to 200°C , allowing for an evaluation test of temperature-dependent polymeric material. Meanwhile, the machine is equipped with an energy saving control unit that can significantly decrease electric power consumption (by 30% or more compared with a conventional testing machine).



► New Hydraulic Fatigue Testing Machine

Improvement of Vibration Load Test Equipment

We have improved vibration-load test equipment that is capable of testing the pendulum motion of a full-scale vehicle. Specifically, major improvements include: attachment of an electric actuator that can apply external force to a vehicle equivalent to a centrifugal force and distortion load; building of a control system; enhanced compressed air supply, and cross beams corresponding to a bogie frame that enable testing in accordance with the presence or absence of a tilting beam in the vehicle to be tested. These improvements have made it possible to simulate loads caused by track distortion, in, for example a transition curve, in addition to centrifugal forces generated when a vehicle is running in a curve. Furthermore, operational tests can be performed not only of a car equipped with a tilting beam but also of a car-body tilting system using air spring that needs a great amount of compressed air when running in a section with successive curves. Our new equipment allows us to check the performance of various types of car-body tilting systems, and to develop, verification etc. related constituent elements.



► Vibration Load Test Equipment



► Centrifugal Load Actuator

Publications

RTRI Report

Vol. No.	Titles
Vol. 27 No. 4 (Apr. 2013)	<p>Special Features: Track Technology</p> <ul style="list-style-type: none"> Recent Tendencies of Development of Track Structures According to the Performance Based Design Code Experimental Study on the Prediction of Fatigue Life of Corrosion Rail Improvement in Evaluation Method of Lateral Stability of Turnout Connected with Continuous Welded Rail A Method of Preventing Hanging Sleepers on Rail Joints using Automatic Irregularity-Correcting Short Sleeper Development of Railway Roadbed Improvement Method for Existing Lines by Reusing Deteriorated Ballast Modeling an Optimal Track Maintenance Schedule in Consideration of Train Derailment Accident Risk Track Monitoring Based on Both the Axle Box Vertical Acceleration of the Leading Axle and That of the Trailing Axle Attenuation Characteristics and Resistance Forces of the Ballast Layer against Traffic Impact Loads Based on In-situ Measurements Gas Pressure Welding Method of Rails by Mixed Gas of Hydrogen and Ethylene Gas
Vol. 27 No. 5 (May. 2013)	<p>Special Features: Vehicle Technology</p> <ul style="list-style-type: none"> Simulation Technology for Rail-vehicles to Improve Environmental Issues Simulation of Passing a Turnout by Considering Wheel/Tongue Rail Contact Proposed Method of Roller Rig Excitation Test for Simulating Vehicle Running Conditions on Actual Track Development of the Active Mass Dampers for Reduction of Flexural Vibration of Carbody Practical Use of a Vehicle Vibration Control System Using Secondary Variable Vertical Dampers Evaluation of Strength of End Structures of Intermediate Rolling Stocks of a Train during Train Crash Accidents Development of the Composition Brake Shoe for Reducing the Heat Load to the Wheel Tread with Keeping the Brake Performance under Wet Condition Development of Fault Locators of the Train Command Line used in Automatic Electromagnetic Air Brake Systems for Freight Trains Durability Analysis of Fuel Cell by the Vehicle-Running Tests
Vol. 27 No. 6 (Jun. 2013)	<p>Special Features: Structural Technology</p> <ul style="list-style-type: none"> Recent Research and Development in Structural Technology Evaluation of Seismic Slope Stability Based on Model Tests Using Different Scale Shaking Tables Development of Three-dimensional Measurement System for Earth Retaining Wall for Excavating Work Prediction Method of Ground Displacement Caused by Chemical Grouting Development of a Tunnel Monitoring Method Based on a Wireless Sensor Network Development of Partially Reinforcing Method for Prestressed Concrete Girders Evaluation of the Influence of Installing Continuous Welded Rail on Existing Steel Bridges Safety Evaluations of Crowd Walking on Stairs and Platforms in Stations Improvement of Articulation of Broadcast Announcements at Station Concourses
Vol. 27 No. 7 (Jul. 2013)	<p>Special Features: Maglev Technology and Applicable Attempts on Conventional Railway System</p> <ul style="list-style-type: none"> R&D of Superconducting Maglev and Applications of its Technology to the Conventional Railway System 5T Class RE Magnet with Simplified Cooling System Study on Locating Internal Defect of Ground Coil by Detecting Electromagnetic Waves Development of Power Supply Unit for Anomaly Detection Sensors in Ground Coils of Superconducting Maglev Development of A Rail Brake Derived from Linear Motor Technology Study of the Loss by the Proximity Effect of the Conductor in Contactless Power Supply Coils Development of Permanent Magnet Synchronous Motor Driving for Superconducting Flywheel Energy Storage System Characteristic of a Magnetocaloric Refrigerator with New Magnetocaloric Materials Technology Trends of Magnetic Refrigerators
Vol. 27 No. 8 (Aug. 2013)	<p>Special Features: Power Supply Technology</p> <ul style="list-style-type: none"> Recent Topics on Power Supply Technology Improvement of Control Method for Fixed Energy Storage System Study on Application of Wide-bandgap Semiconductor Devices to Electric Traction Infrastructure Evaluation Technique of High Voltage Insulators under Contamination Environments Development of Compound Catenary Equipment Equipped with Feeder Messenger Effect of High-Speed Shinkansen Train Draft in Tunnel on Current Collection Characteristics Wear Modes of Contact Wire and Contact Strip under Electric Current Condition Measurement of the Contact Force of Pantograph by Image Processing Technology
Vol. 27 No. 9 (Sep. 2013)	<p>Special Features: Signalling, Telecommunications and Transportation</p> <ul style="list-style-type: none"> R&Ds related to Signalling, Telecommunications, and Transport Operation Analysis of Lightning Overvoltage on Signalling and Telecommunication Cables A Unification Method of the Computer-aided Logic Design for the Railway Signal Control Units Development of Train Location Detection Methods for Signalling Design Methodology of Wireless Sensor Networks with Consideration for Installation and Operation Costs Development of Interactive Timetabling System with Fast Estimation of Train Congestion under Planning Timetables Analysis Method of Passenger Flow under Disrupted Train Traffic by Using Accumulated Passenger Data Development of a Method of Evaluation of Rail-Bus Transfer Convenience Considering Characteristics of Station Surroundings An Analysis on the Possibilities to Increase the Railway Freights Based on the Actual Transport Situations

Vol. No.	Titles
Vol. 27 No. 10 (Oct. 2013)	<p>Special Features: Railway Dynamics</p> <ul style="list-style-type: none"> Recent Research and Development in Railway Dynamics Optimization of Control Parameters for Active Control Pantograph A Basic Study of Aerodynamic Noise Reduction Method of a Pantograph Head using Plasma Actuators Development of the Crushable Stopper for Countermeasures against Derailment in Case of Earthquake Development of Bogie Rotational Resistance Test Machine Analysis of Rolling Contact Behavior between Wheel and Rail by Large-Scale Parallel Computing Tangential Force Characteristics of the Wheel/Rail Interface with Fine Unevenness on Wheel Tread Dynamic Response Characteristics of the Tall Noise Barrier on Railway Structures during Passage of Trains and Its Design Method Analytical Study on Structure Member Vibration Characteristics of Reinforced Concrete Rigid Frame Viaduct
Vol. 27 No. 11 (Nov. 2013)	<p>Special Features: Disaster Prevention Technology</p> <ul style="list-style-type: none"> Recent Research on and Prospects of the Disaster Prevention Technology Real-time Prediction of Earthquake Ground Motions using Seismic Records Observed in Deep Boreholes Estimation of Earthquake Ground Motions along a Railway for Early Resumption of Regular Train Operation after Earthquakes The Correction Coefficient of Nonlinear Response Spectrum Corresponding to the Difference of the Initial Damping Factor Method to Pinpoint Locations along Railway That Are Subject to Strong Winds with Due Consideration on Local Winds A Simplified Method for Estimating Outflow from the Bottom of Snowpack Risk Evaluation of Debris Flow using Digital Terrain Model Reproducing Simulation of Track Inundation Caused by Overflow of a Small-scale River An Analytical Study on Applicability of a Hammering Measurement Method to Rock Stability Evaluation
Vol. 27 No. 12 (Dec. 2013)	<p>Special Features: Vehicle Technology</p> <ul style="list-style-type: none"> Recent Research Topics on Truck Monitoring Quantitative Evaluation on Flaw Echo of Railway Axle in Consideration of Contact Pressure with a Wheel Development of Electro-Hydraulic Actuator with Fail-Safe Function for Steering System Development of Bogie to Control the Decrement of Wheel Load which Adopted the Three Block Construction Bogie Frame Dynamic Response of a Moving Vehicle to a Sudden Gust of Wind Multi-modal Vibration Control of Flexural Vibrations in Railway Vehicle Carbodies using Compact Active Mass Dampers Development of Small-sized Aerodynamic Brake for High-speed Railway Degradation of High-Voltage / High-Current Power Semiconductor Modules for Trains Estimation of the Energy Consumption of a Train Equipped with a High Efficiency Induction Motor through Running Simulations
Vol. 28 No. 1 (Jan. 2014)	<p>Special Features: Design Technology of Steel and Concrete Hybrid Structures</p> <ul style="list-style-type: none"> Recent Trends of Design Technology for Railway Steel-Concrete Hybrid Structures Evaluation Method of Shear Capacity of Steel Reinforced Concrete Beam Considering Shear Span Effective Height Ratio and Support Condition Evaluation of Deformation Performance and Flexural Strength of Steel Reinforced Concrete Column Using High-Strength Materials Evaluation of Flexural-Load Capacity for Composite Member with Considering Initial Stress of Fabricated Steel at the Concrete Casting Evaluation Method of Bending Capacity and Ductility of Concrete Filled Steel Tube Members with Small Shear-span Ratio Evaluation of Bending Capacity and Ductility of Concrete-Filled Circular Steel Tube Members Using High-strength Materials Improvement of Evaluation Method of Load Carrying Capacity of Beam-to-Column Insert Joint A Trial Design and Evaluation of Steel-Concrete Hybrid Structures Applying a Comparative Design between the Revised Design Standard and the Current One A Comparison between the Revised Design Standard and the Current One for Various Types of Joint Panel
Vol. 28 No. 2 (Feb. 2014)	<p>Special Features: Materials Technology</p> <ul style="list-style-type: none"> Recent Trend of Research and Development on Materials for Railway Development of a Simple Non-destructive Evaluation Method for the Permeability of Cover Concrete Experimental Fiber Reinforced Short Sleeper by the Geopolymer Method Improvement of the Low-temperature Characteristics of Resilient Rail Pads by Foam Structuring Improvement of Noise Insulation Material for a Rail Joint Evaluation of Wheel Flange Contact Using Ultrasonic Wave Long-life Gear Oils for Conventional Railway Electric Trains Application of the Flame - resistant Magnesium Alloy to Body Shell Development of a Contact Strip for Shinkansen with Improved Lubricating Properties Applicability Evaluation of Superconducting Cables for Railway Systems
Vol. 28 No. 3 (Mar. 2014)	<p>Special Features: Preservation of Wayside Environment</p> <ul style="list-style-type: none"> Recent Studies on Wayside Environmental Problems Study on a Prediction Model for Wayside Noise of Shinkansen in Cut Sections Reducing Effect of Absorbing Materials Covering the Inner Walls of the Tunnel Entrance Hood on Noise from a Tunnel Portal of Shinkansen The Influence of the Variation of Track Support Rigidity Around an Overbridge on Ground Vibration Experimental Investigation of the Effects of Topography Around the Tunnel Portal on the Micro-pressure Wave Micro-pressure Wave Emitted from a Tunnel Hood with Side Openings Influence of Train Nose Shape on Pressure Variation in Tunnel Numerical Simulation of Flow Around a Railway Vehicle in a Turbulent Boundary Layer Over Flat Terrain

Quarterly Report (QR)

Vol. No.	Titles
Vol. 54 No. 2 (May. 2013)	<ul style="list-style-type: none"> • A Support System for Early Resumption of Regular Train Operations Applying Public Earthquake Information • Calculation Method of Time History Including Large-scale Earthquake and Its Aftershock • Assessment of the Incidence of Landslides Using Numerical Information • Visibility Checking Method for Railway Signals by Cab-mounted Camera • Method for Verifying System Requirement Specifications Based on Train Control System Safety Requirements • Method to Evaluate the Appropriateness of Introducing a High Speed Data Transmission System Using Metallic Telecommunication Lines onto Railways • Deformation Behavior of Ballasted Track during Earthquakes • Numerical Dynamic Simulation of a Train Set Running on Ballasted Track after Derailment • Numerical and Experimental Study on Measuring Method of Rail Axial Stress of Continuous Welded Rails Based on Use of Resonant Frequency
Vol. 54 No. 3 (Aug. 2013)	<ul style="list-style-type: none"> • Safety Evaluation of Railway Vehicle against Crosswind Applying a Full-vehicle Model • Fault Detection of Vertical Dampers of Railway Vehicle Based on Phase Difference of Vibrations • SOC Estimation Method of Lithium Ion Battery for Contact Wire and Battery Hybrid Electric Railway Vehicle • Effect of Short Period Ground Motion on Seismic Design of Bridges and Viaducts • Stability Inspection Method for Existing Retaining Walls • The Influence of the Details of Reinforcement Arrangement on Deformation Performance of Reinforced Concrete Members • High Temperature Superconducting Cable for Railway System • In Situ Analytical Method of Interfacial Substances between Wheel and Rail • Mechanical Analysis of Soundproof Plate with Function of Wind Load Reduction and Experimental Verification Using a Full-scale Prototype
Vol. 54 No. 4 (Nov. 2013)	<ul style="list-style-type: none"> • An Algorithm for Crew Route Scheduling Focusing on Manpower Efficiency • Application of Verification Methods to Specifications of Signalling Equipment • Method for Quantitatively Defining Station Territories in Areas where Multiple Railway Companies Compete • Contribution of Rolling Noise and Aerodynamic Noise to the Total Noise Generated from the Lower Part of Shinkansen Cars Running at High-speed • Improving the Aerodynamic Performance of Flat-fronted Trains on Meter-gauge Railway Lines • Countermeasure for Reducing Micro-pressure Wave Emitted from Railway Tunnel by Installing Hood at the Exit of Tunnel • Practical System for Implementing Vocational Training Program for Improving Train Driver Skills for Coping with Abnormal Situations • Investigation into Visual Acuity Required for Recognizing Trackside High Speed Signals • Measurement of the Right Hand Operable Area under a Simulated Driving Situation
Vol. 55 No. 1 (Feb. 2014)	<ul style="list-style-type: none"> • Development of Active Mass Dampers for Reducing Multi-modal Flexural Vibrations of Carbody • Development of Composition Brake Shoe for Reducing Heat Load to Wheel Tread with Keeping Brake Performance • Evaluation of Strength of End Structures in Intermediate Rolling Stock of a Train During Train Collision Accidents • Development of Three-dimensional Measurement System for Earth Retaining Wall for Excavating Work • Tunnel Monitoring Method Based on Wireless Sensor Network • Evaluation for Soil Liquefaction Due to Long Duration Earthquakes with Low Acceleration • Gas Pressure Welding Method of Rails by Mixed Gas of Hydrogen and Ethylene Gas • Development of Railway Roadbed Improvement Method for Existing Lines by Reusing Deteriorated Ballast • Modeling an Optimal Track Maintenance Schedule in Consideration of Train Derailment Risk

Railway Technology Newsletter

No.	Titles
No. 43 (Jun. 2013)	<ul style="list-style-type: none"> • Preface • Prize Winning - UIC Innovation and Research Awards • Visit to RTRI by the Rt Hon Simon Burns MP, Minister of State for Transport • Effect of Surface Condition and Lubrication on Flange Climbing of Turned Wheels • Development of a Pneumatic Floating Brake Caliper for High-Speed Rolling Stock • A Technique to Analyze Passenger Flow at Transport Disturbance Using Accumulated Passenger Data • A Three-Dimensional Dynamic Simulator for the Pantograph-Catenary System
No. 44 (Sep. 2013)	<ul style="list-style-type: none"> • Why Not Share the Outcomes of R&D Activities across the World for the Safety of Railways? • Appointment of New Board of Directors • A Research Director Awarded a Decoration by Japanese Government • Development of "Micro-ribbed Wheel Tread Profile" to Reduce the Lateral Force in Curves • Development of High-Efficiency Induction Motors for EMUs • Development of Integrated Bridge with Geosynthetic-Reinforced Soils • A Guideline for the Installation of Contact Wires for High-Speed Train Operation
No. 45 (Dec. 2013)	<ul style="list-style-type: none"> • Foreword • The 10th WCRR 2013 Held in Sydney • Japan to Cooperate on Sweden's Plans for High Speed Rail • Improving Reliability of Thermite Head Repair Welding • A Risk-Based Technique to Support Decision-Making on Falling Stone Preventive Measures • Estimation of the Probability of Lightning Hazard on Railway Signalling Systems by Observing Induced Overvoltage • Friction Stir Welding Technology to Apply Flame-resisting Magnesium Alloy to High-Speed Rolling Stock
No. 46 (Mar. 2014)	<ul style="list-style-type: none"> • Research and Development for the Future of Railways • Renewal of RTRI's Supercomputer • A Taiwan Rail Technology Seminar Held at RTRI • The 1st Workshop of Ballasted Track Maintenance between Japan and United Kingdom • Designing Railway Noise Barriers to Account for Resonance due to Train Draft Pressure • High-precision Prediction of Tunnel Micro-pressure Wave Based on Theoretical Analysis • A Reflecting Back Support System for Train Driver Training • A Preliminary Study of Magnetic Fields on Railway Vehicles

Lectures

Annual Symposium

Special address	Strong, durable, and beautiful railway structures
Keynote address	Maintenance technology for evaluation and remedy of deteriorated structures
General address	<ul style="list-style-type: none"> • Monitoring and diagnosis technology for ground facilities • Monitoring and diagnosis technology for rolling stock • Maintenance technology for keeping soundness of track • Maintenance technology for keeping soundness of electrical equipment • Renewal technology for deteriorated railway structures

Monthly Seminar

Month	Theme
April	Recent research and development on environmental engineering / Development of railway simulators
May	Recent research and development on rolling stock materials
June	Recent research and development on signalling and telecommunications technologies
July	Recent experiment technology on structures
August	Recent research and development on rolling stock technologies
September	Recent research and development on power supply technologies
October	Recent research and development on signalling and transport information technologies / Recent research and development on power supply technologies
December	Recent research and development on disaster prevention technologies
January	Recent research and development on track technologies
February	Recent research and development on human sciences
March	Recent research on maglev systems technologies and their application

Statistics

Recognition

Title	Name of awardee	Category of prize	Month
Commendation by Minister of Education, Culture, Sports, Science and Technology, Japan	Susumu NAKAJIMA	A study of evaluation model for displacement and motion of retaining wall at earthquake	April
Medal with Yellow Ribbon	Shun-ichi KUBO	Evaluation method for wear characteristics of carbon type pantograph contact strip	April

Commending Organizations	Category of prize
Academic societies	• Japan Society of Tribologists, Tribology Legacy Award
	• Japan Association for Earthquake Engineering, Prize for Achievement
	• The Institute of Electrical Engineers in Japan, Prize for Progress
	• Institute of Noise Control Engineering of JAPAN, Prize for Encouragement of Research and Development
	• The Laser Society of Japan, Prize for Achievements
	• The Japan Fluid Power System Society, The Best Lecture Prize
	• The Japan Fluid Power System Society, Prize for Technology Development
	• The Japanese Geotechnical Society, 2012 Outstanding Paper Award
	• The Japan Society of Mechanical Engineers, Department of Environmental Engineering, Research Encouragement Prize at Environmental Engineering Symposium
	• Japan Society of Civil Engineers, Structures Engineering Committee, Railway Engineering Committee, Paper Encouragement Award
	• Japan Concrete Institute, 35th Concrete Institute Lecture, Paper Encouragement Award
	• Japan Concrete Institute, SCMT3 Award Winning Paper
	• The Japanese Society of Snow and Ice, Prize for Achievement
	• Japan Society for Natural Disaster Science, 2013 The Best Academic Presentation Award
	• Japan Society for Simulation Technology, JSST2013 International Conference on Simulation Technology Outstanding Presentation Award
	• The Japanese Geotechnical Society, 48th Geo-hazard and Risk Mitigation Presentation, Award for Excellent Paper Presentation
Associations	• Congress of Japan Railway Cybernetics, Award of Excellence
	• Congress of Japan Railway Cybernetics, Prize for Technology, Award of Excellence
	• Japan Railway Civil Engineering Association, Prize for Excellent Publication
	• Japan Railway Rolling Stock and Machinery Association, Award of Excellence
	• Hokkaido Development Engineering Center, Prize for Cold Region Technology

Commending Organizations	Category of prize
Associations	<ul style="list-style-type: none"> The Japan Electric Association, 2013 Shibusawa Award Japan Train Operation Association, A Letter of Thanks
	<ul style="list-style-type: none"> Zhejiang University/International Symposium on LDIA2013 Best Paper IEC 1906 Award Ministry of Economy, Trade and Industry, Industrial Standardization Award, Prize of Prime Minister Ministry of Economy, Trade and Industry, Prize for Contributors at International Standardization
RTRI	Reward for Outstanding Research and Development <ul style="list-style-type: none"> Development of superconductive cable for railways Calculation method for the probability of earthquake damage to railway rolling stock on massive structures Development of high-efficiency AC traction motor
	Reward for Outstanding Service Achievement <ul style="list-style-type: none"> Recovery support on lines suffering from heavy rain in North Kyushu Review of the Great East Japan Earthquake and revision of earthquake-proof design standards
	Prize for Outstanding Research and Development <ul style="list-style-type: none"> Development of long-life, sintered-alloy contact strip for Shinkansen Construction of earthquake and disaster simulator using databased archives Information guidance on possibility for reopening operation from passenger's view Proposition and verification for implementing linear rail brake Evaluation of characteristics of creep force focusing on slight uneven faces on wheel tread
	Prize for Outstanding Service Achievement <ul style="list-style-type: none"> Revision of guideline for earthquake-proof design on contact line Technical guidance relating to improvement on vertical motion of running trains Preparation and establishment of ISO/TC269 review systems Wind tunnel tests relating to evaluation on aerodynamic force affecting on rolling stock when strong wind blows
	Prize for Encouragement of Research and Development <ul style="list-style-type: none"> Development of direct acting wear test machine and research on controlling factor for electrificated wear Construction of geo-hazard analysis method considering transferring and scattering of ground water Improvement of piezoelectric rubber performance by particle orientation Development of on-board electromagnetically-coupled reactor

Industrial Property Rights

Regarding the patents applied for, we do not claim examination of those with little working 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 working is expected.

As of the fiscal 2013-2014, the results of the scrutiny are as follows.

Newly registered patents : 241

Patents of which the rights has expired : 11

Abandoned patents : 97

Consequently, we have 2,093 domestic industrial property rights including 18 trademarks and 97 overseas patents.

▶ Domestic industrial property rights in possession

Category		Independently owned	Jointly owned	Total
Patent	Registered	737	552	1289
	Applied for (Examination applied for)	466 (160)	287 (99)	753 (259)
	Subtotal	1203	839	2042
Utility model	Registered	0	0	0
	Applied for	0	1	1
	Subtotal	0	1	1
Design patent	Registered	12	15	27
	Applied for	6	0	6
	Subtotal	18	15	33
Trademark	Registered	17	0	17
	Applied for	0	0	0
	Subtotal	17	0	17
Total	Registered	766	567	1333
	Applied for	472	288	760
	Total	1239	855	2093

▶ Overseas patents in possession

Status	Number of applications	Number of the countries
Registered	27	84
Registered (In some countries)	7	13
Applied for	10	-
Total	44	97

Press Release

April	RTRI developed "MPMSOIL-3D", an analysis system for large-scale ground deformation using a particle method
	RTRI's researcher commended for his achievement by the Ministry of Education, Culture, Sports, Science and Technology
	RTRI's director awarded Medal with Yellow Ribbon by Japanese government
June	New board members appointed
	New president of RTRI greeted
July	Running test of a train by superconductive cable successfully done
September	New super computer introduced
	RTRI Technology Forum 2013 held
October	RTRI Signalling and Telecommunications Technology Meeting held
	Railway International Standards Center moved to newly-opened Chiyoda Office
	RTRI Structures Technology Meeting held
	RTRI Track Technology Meeting held
	RTRI Power Supply Technology Meeting held
	Vertical Vibration Control System loaded on "Seven Stars in Kyushu"
	RTRI Transportation Technology Meeting held
RTRI Human Science Technology Meeting held	
November	RTRI Disaster Prevention Technology Meeting held
	RTRI Rolling Stock Technology Meeting held
December	2nd General Assembly of ISO/TC 269 held
	WCRR 2013 in Sydney held
	Anniversary ceremony for 2013 held
	Railway Technology Promotion Center Lecture held
February	A wireless accelerometer for "IMPACT IV", a measurement system to diagnose of bridge base and retaining walls developed
	A party of Indian Railways visited RTRI
March	A high-temperature superconducting magnet for next-generation flywheels successfully developed
	Customers' Square opened
	Workshop on wheel and rail damage with Chalmers University of Technology held

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