Creating "Social Value" —Social—

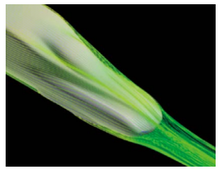
Promotion of Technological Development

Technological development to support JR Central's growth

In order for JR Central to fulfill its mission and develop in the future, it is essential to work continually to ensure safe and stable daily transportation and pursue comfortable transportation services, as well as to build hardware and systems that will serve as the foundation to support such transportation and services through technological development. To address various technological issues in a more integrated and comprehensive manner, we have been systematically promoting technological development that will lead to ensuring safe and reliable transportation in our railway business at the Komaki Research Center, which was established in 2002, by setting issues that contribute to company policies from a medium- to long-term perspective.

Komaki Research Center

Basic cycle of railway R&D



Acquisition of large amounts of field data
(from commercial trains, ground facilities, testing cars, etc.)

Understanding phenomena occurring in the field

Analytical study and simulation

Verification using testing facility

Analytical study

Field verification
(tests on actual train lines, etc.)

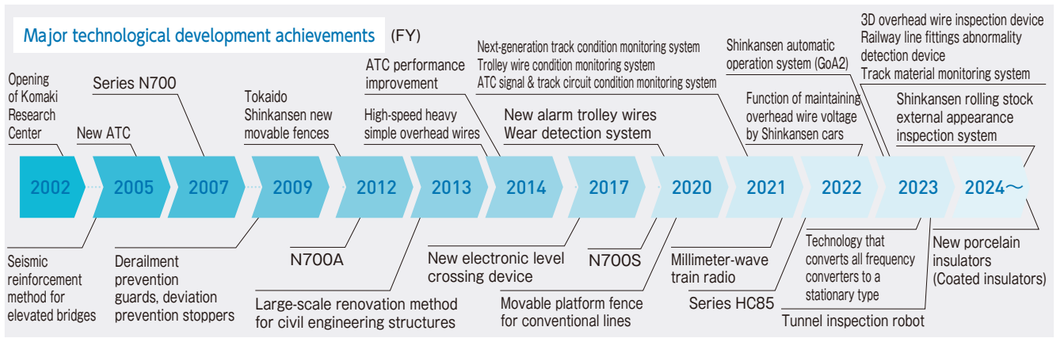
Demonstration using large full-scale testing facility

Key themes of technological development

Based on the themes of "improving safety," "promoting reform of business operations," "realizing next-generation railway systems," and "applying technology to the Chuo Shinkansen," we are promoting technological development to provide safer, more convenient, and more comfortable services efficiently by actively incorporating technologies such as sensing, image recognition, and robotics.

We also promote further innovation of railway systems and initiatives to expand our technological scope by broadening our horizons to include a wider range of technical fields to sustain and develop the company into the future.

Major technological development achievements



Technological development, technological capability enhancement, and human resources development for the future

In addition to improving railway technology for the Shinkansen and conventional lines, JR Central is striving to develop technologies that will support the company's future, as well as to improve our technological capabilities and develop human resources. At the Komaki Research Center, we have utilized its characteristic full-scale testing facilities to achieve various technological developments, including new rolling stock, measures to prevent derailment and deviation of the Shinkansen, large-scale renovation methods for civil engineering structures, and high-speed heavy simple overhead wires for the Shinkansen. We are also working on numerous technological developments in light of the rapid advances in information and communications technology (ICT) and the progress of digital transformation in recent years.

Since the opening of the Komaki Research Center, we have been striving to enhance the technological capabilities of the entire company through close cooperation between the Railway Operations Divisions, which manage daily train operations, and the Technology Research and Development Department to address the technological challenges faced by the Railway Operations Divisions and conduct regular technology exchanges, and through sharing personnel between the two departments. Going forward, we will pay close attention to technological trends in other industries and fields, broaden our inspiration and application, and actively incorporate external knowledge to enhance our organizational capabilities so that we can meet the difficult technological challenges we face in the railway business.

Major technological developments: Sophistication and labor saving in maintenance, cost reduction in maintenance and renewal of facilities

We are developing technologies to advance operations, reduce labor, and cut costs, such as mechanizing and systemizing maintenance operations by using new technologies such as sensing, image recognition, information communication, mass data analysis, and robotics, under the basic premise of ensuring safety.

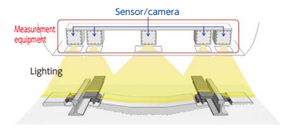
(Example of technological development 1)
Development of a new commercial vehicle inspection equipment compatible with the high-speed operation of the Shinkansen

For the Tokaido Shinkansen, in addition to measurement of the tracks and electrical equipment by Dr. Yellow, a train dedicated to measurement, various inspections are carried out by employees, including daily inspections by walking along the lines, in order to ensure safe and reliable transportation. To further promote sophistication and labor saving in maintenance operations in anticipation of future labor shortages, we have developed equipment that can be mounted on commercial Shinkansen trains traveling at high speeds to measure tracks and electric line facilities.

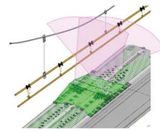
To grasp the conditions of track materials such as rails and sleepers, we have developed a "track material monitoring system" that can perform inspections using data acquired by sensors and cameras mounted on commercial trains while they are traveling at high speeds. For tracks that are made up of various materials of different shapes and raw materials, by obtaining point cloud data for detecting changes in height and image data that provides a detailed understanding of the conditions of track materials, and by automatically extracting the information needed for maintenance while trains are in motion, the system enables us to understand track conditions in a more timely manner.

The positional relationship between overhead lines, and details of overhead lines such as railway line fittings can be inspected using the "3D overhead wire inspection device" and "railway line fittings abnormality detection device" that we have developed. With these devices, it is possible to measure the complex positional relationships of overhead wires, such as at overhead line crossings, in three dimensions, and automatically determine whether they are good or bad. Also, by capturing images of railway line fittings, it is possible to automatically detect deformation, damage, and other abnormalities in the fittings.

These devices will be installed on some of the additional N700S trainsets that will be introduced from FY2026, and are scheduled to begin operation in 2027. They will be able to conduct some of the inspection work currently performed by personnel on site, reducing the labor required for maintenance work on tracks and railway line facilities. In addition, inspections currently carried out by Dr. Yellow can be replaced by newly equipping commercial Shinkansen trains with a railcar inspection system, separate from these devices. This system enables us to collect data equivalent to or greater than that obtained with Dr. Yellow at a high frequency, using commercial trains, thereby improving the safety and reliability of the facilities.



Track material monitoring system



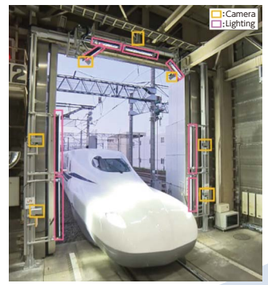
Railway line fittings abnormality detection device

(Example of technological development 2)
Development of Tokaido Shinkansen rolling stock external appearance inspection system

Appearance inspections of Tokaido Shinkansen rolling stock are carried out approximately once every two days and require a lot of labor, as employees perform inspections visually or using measuring tools by walking on the roof and under the floor of the 400-meter long train. In anticipation of a future decline in the working population, we have developed a system that automatically inspects the exterior of railcars as they enter a depot or station.

This system consists of "appearance inspection equipment" and "pantograph slider inspection equipment." The "appearance inspection equipment" automatically inspects for any abnormalities by automatically photographing the external appearance of the car body, underfloor equipment, etc. using cameras and sensors installed at the entrance to the inspection shed at the rolling stock depot, covering the entire car. The "pantograph slider inspection equipment" can automatically inspect the condition and shape of the pantograph slider, by irradiating laser beams onto the pantograph slider of a Shinkansen vehicle to take 3-D measurements using sensors.

We plan to install the appearance inspection equipment at Oi Depot and the pantograph slider inspection equipment at Shinagawa Station by the end of FY2024 to conduct verification tests on commercial trains, in order to consider the optimal specifications. After that, after a period of installation work, this system is expected to go into full-scale operation around FY2029.



Appearance inspection equipment