

Trains entrusted with railway inspections, high-tech rolling stock serving functions in the metro area

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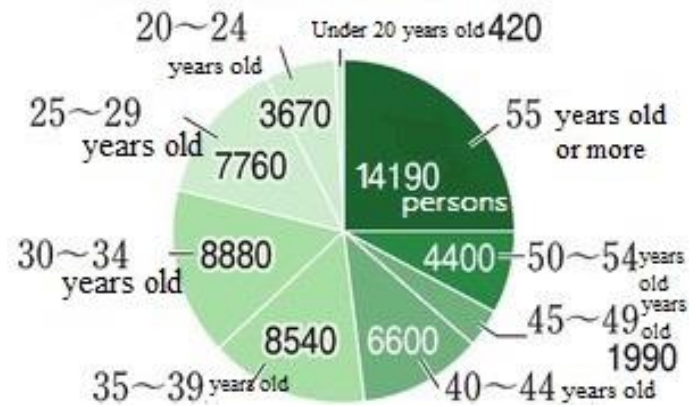
A JR-East E235 Series train having the function of monitoring facilities all the time while running, with their various sensors mounted. (Courtesy of JR-East)



A JR-East E233 Series train, inspecting the railway track while running. A red laser beam emitted by a device under a vehicle is being applied to the railway track. (Courtesy of JR-East)



Age distribution of JR-East employees As of April, 2017



■ Examples of utilization of sensors and other technologies in railway maintenance

JR-East	Automatically detect track distortion and damage with sensors and/or cameras mounted on revenue trains Sensors of rolling stock acquire and accumulate the data of facilities/equipment including pantographs and doors for grasping of signs of failures.
JR-West	Monitor the friction of the wheels and foreign objects on the roofs of the trains passing through, and others by sensors and/or cameras installed on railway tracks.
Japan's Railway Technical Research Institute	Use cameras mounted on the driving cabs to detect risk factors in waysides (e.g. trees that might fall down over) for databasing.

Trains that transport passengers, checking the railway track and rolling stock for abnormalities at the same time - JR companies are introducing these kinds of trains. - State-of-the-art technologies save labor required for the maintenance and inspection of railway facilities as labor shortages tend to occur due to retirements of experienced workers.

- Red beams illuminate the rail. - Lasers emitted by the device under the vehicle detect distortions of the railway track. - A camera continuously shoots the railway track, and an image diagnostic system checks for any damage of rail-fastening hardware and sleepers.

The E233 Series train, running on the Keihin Tohoku Line of JR-East, has the function of inspecting the rail during its revenue operation. The train was put into trial operations in 2013 on this line, and is starting its trial runs also on other lines such as the Yamanote Line and Chuo Line. One of the advantages of this train is that it enables early detection of failures, allowing immediate measures, such as repairs, to be taken.

The current maintenance system for the railway facilities of JR-East is to inspect them manually on a regular basis, for example, at an interval of three months. Railway tracks require regular, on-foot visual inspections performed by track maintenance workers. To inspect rolling stock, workers need to climb onto the roof, and/or crawl under the vehicles to check for any abnormality.

Now that the reduction in the workforce due to the declining birthrate and aging population makes it difficult to rely on manpower-based maintenance/inspection. It is under such circumstances that JR companies set out to start full-fledged utilization of high-tech equipment.

As an example of utilization of sensor technology, Doctor Yellow is known for its function of inspecting the Tokaido Shinkansen line track. However, in the case of an inspection car, which runs during intervals in normal services, the frequency of operation needs to be restricted. Therefore, a more efficient way is to enable rolling stock that transports passengers during revenue operation to sense.

Apart from the E233 Series, the E235 Series, which was put into service on the Yamanote Line in 2015, is also capable of monitoring the equipment of the rolling stock itself all the time. From the behavior of the pantograph receiving electricity from the overhead contact line, to the current of the motor for opening/closing doors, various types of sensors acquire the data for as many as 700 items. The accumulated data is used for research into the prediction of faults from changes in the facilities/equipment.

Named "smart maintenance", this function is aimed not only at finding failures but also at grasping signs of failures, allowing proactive measures to be implemented in the future. "Our goal is not only to adapt to the age of personnel reduction but also to establish a maintenance/inspection method superior than the conventional system by means of advanced technologies," the person responsible says.