

Joint development with JR Central ‘Track Materials Inspection System’ ~ First system in Japan ! Measuring the condition of track materials while the Tokaido Shinkansen is running at high speed~

The Advanced Technology Division of Kurabo Industries (Capital 22 billion yen, Head office: Chuo-ku, Osaka, President: Haruya Fujita) has jointly developed the “Track Materials Inspection System,” first system in Japan to measure the track materials of the Tokaido Shinkansen at high speed, in collaboration with Central Japan Railway Company (Capital 112 billion yen, Head office: Nagoya, Aichi Prefecture, President: Shunsuke Niwa, hereinafter” JR Central”). In the future, verification will be carried out for practical use and further accuracy improvements will be carried out with JR Central expecting to start using the system from 2027 onwards, and Kurabo aims to introduce the system to conventional lines and private railways as well.



■Tokaido Shinkansen (N700S) ※Provided by JR Central

1. Background

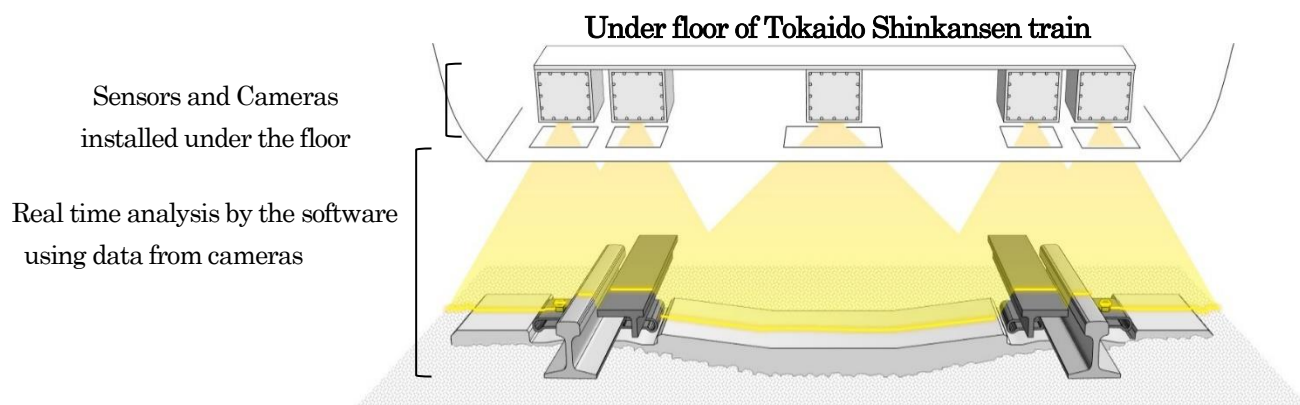
In the railway industry, inspections of track materials such as rails, sleepers, fastening bolts, and ballast are carried out daily to ensure safe and stable transportation by staff members who walk the entire line with visual inspection and using measuring instruments, which requires a lot of time and labor force. In anticipation of future decline in the labor force, there is an urgent need to improve work efficiency and manpower saving. Kurabo has been working on developing a system to apply its road surface inspection system “PG-4” (Note), which can accurately inspect highway road surfaces even when traveling at 100 km/h speed, by utilizing high-speed image processing skill, one of its core technologies of Kurabo, to the measurement of railway track materials. In this context, Kurabo has decided to work with JR Central to develop

a system that can measure track materials on the Tokaido Shinkansen while trains are running. By combining JR Central's accumulated Shinkansen track measurement skill and know-how with Kurabo's high-speed image processing skill developed with "PG-4," and by further improving the accuracy of high-definition cameras and analysis systems, they have now completed the "Track Material Inspection System" that can accurately measure the condition of track materials even at speeds of 300 km/h.

2. The detail of the system

(1) Overview

Data acquired by profile sensors and line sensor cameras installed under the floor of Tokaido Shinkansen trains can be analyzed using Kurabo's original track material analysis software, "Track Analyzer" to analyze the condition of track materials such as fastening bolts, sleepers, ballast in real time. This system was installed on JR Central's test train and test measurements were conducted on the Tokaido Shinkansen track, confirming that it is possible to measure at equal to or better than visual inspection, even at a speed of 300 km/h.



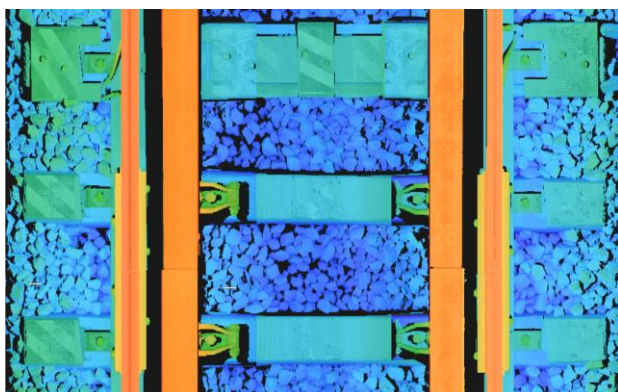
(2) Features

①Changes in track material height can be confirmed

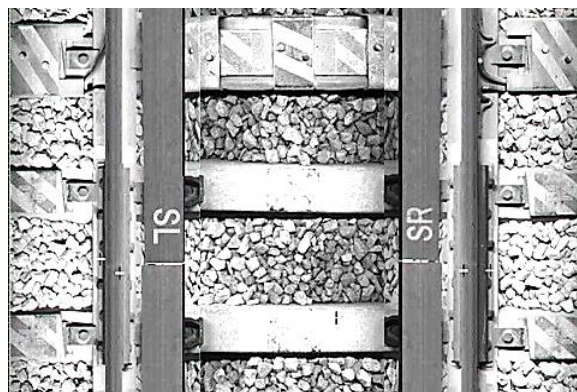
By taking images with profile sensors, height differences can be identified by color, making it possible to check for changes in the height of fastening bolts, sleepers, ballast and others.

②Detailed condition of track materials can be confirmed

By capturing high-resolution images with line sensor cameras, it is possible to grasp the condition of the track materials in detail and accurately.



①Image by profiler sensor
Height difference is identified by color



②Image by line sensor camera
Track materials condition in detail can be checked

③Fast analysis of large volumes of images

Kurabo's original track material analysis software "Track Analyzer" automatically judges deformation in track fastening devices such as bolts and sleepers, ballast and others.

Using our core technology of high-speed image processing skill, the large volume of captured image data can be analyzed quickly and stress-free.

3. Future outlook and schedule

By utilizing this system, JR Central will be able to measure the condition of track materials during commercial operation of the Tokaido Shinkansen. This will reduce the number of on-site inspections by staff and allow maintenance work to be carried out in a timely manner, thereby improving the efficiency of operations related to the management of track facilities. JR Central and Kurabo will continue to develop the technology for this system, improving its accuracy and durability, and striving to further improve the accuracy of the system in preparation for its expected start of actual operation in 2027 or later. Kurabo will also utilize the measurement technology cultivated through this joint development to introduce this system to conventional lines in the JR Central. In the future, we are considering introducing the system to high-speed railway vehicles not only in Japan but also in overseas railway companies. Kurabo will continue to deepen its "visualization" technology, which allows it to clearly capture fleeting phenomena that cannot be captured by the naked eye, into "observation" and "diagnosis" technology that allows it to observe with higher precision and diagnose normality and abnormality, thereby contributing to the efficiency and labor saving of automation in not only the infrastructure field but also in the robot field and others.

(Note) Compact pavement inspection system "PG-4"

Utilizing Kurabo's original image recognition technology and high-speed, large-volume image handling technology, this system can accurately and quickly detect deteriorated areas on roads from images taken with high-definition camera. The laser and camera are in compact unit that can be easily attached to general vehicles, making it possible to perform inspections while driving at speed of 100 km/h. There is no need for lane restrictions during inspections, and work time and costs can be reduced, allowing for efficient road surface inspections. Sales began in March 2017, and the system is currently widely used for road inspections both in Japan and overseas.

- 「PG-4」 Web site : <https://www.kurabo.co.jp/el/world/en/products/image/infrastructure/road/>