

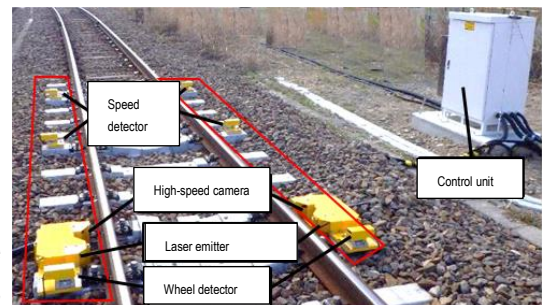
Development and introduction of a wheel shape measuring device

Train wheels wear down as they travel, and their shape gradually changes. Since this change in shape affects ride quality, currently all wheels are ground at regular intervals or distances (the surface that comes into contact with the rail is ground) to return them to the proper shape.

We have now developed a wheel shape measuring device that automatically measures the shape of wheels of running trains. By introducing this device for Shinkansen and conventional trains, we will be able to perform wheel grinding at the appropriate time depending on the wear condition of each wheel, thereby maintaining and improving ride quality while reducing costs. Moreover, this device is equipped with Japan's first technology that can automatically measure the shape of wheels of trains passing at speeds of up to 80 km/h.

1. Overview (Attachment 1)

- This device consists of measuring equipment such as a wheel detector, a laser emitter, a high-speed camera, and a speed detector, as well as a control unit that controls the measuring equipment and analyzes the captured image.
- It can identify the trainset number and wheel position of passing trains and automatically acquire data, and it is available for trains passing at speeds of up to 80 km/h.
- With its compact configuration and weather-resistant and dust-proof structure, it can be installed in outdoor environments such as main lines.



Wheel shape measuring device

2. Benefits of introduction

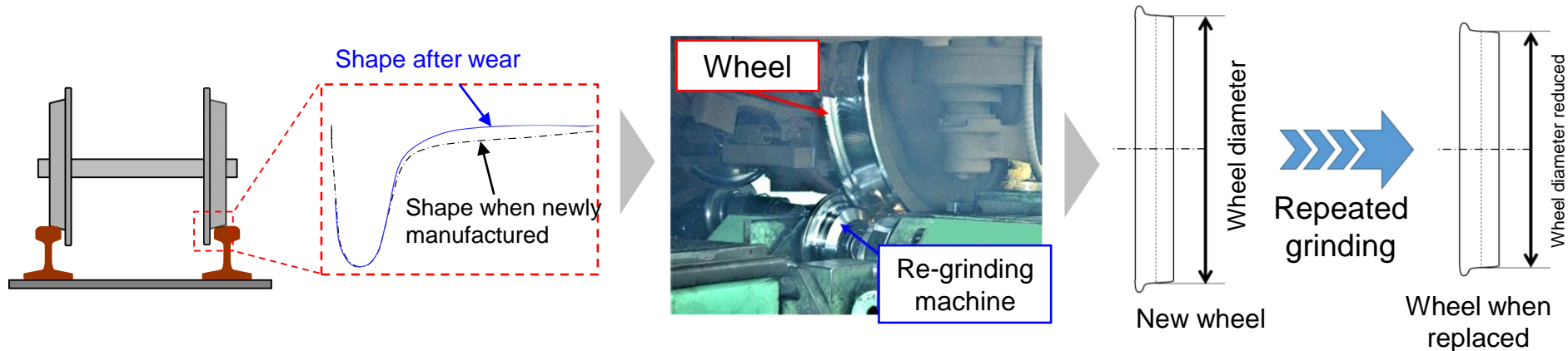
- Since the wheel shape can be frequently grasped for both Shinkansen and conventional trains, wheel grinding can be performed at the appropriate time depending on the wheel wear condition, thereby maintaining and improving ride quality.
- Currently, wheels on conventional trains require frequent grinding. However, this device can reduce the frequency of grinding, extending the lifespan of the wheels and reducing costs.

3. Future plans

- Starting operation for Shinkansen trains in FY2025
- Starting operation for conventional trains from FY2026

○ Current wheel grinding

- Since changes in wheel shape due to wear affect ride quality, all wheels are ground at regular intervals or distances to restore them to the proper shape.



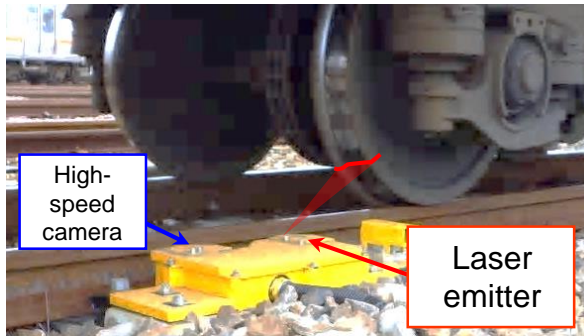
(1) The shape changes due to wear caused by driving.

(2) The shape is restored by grinding at regular intervals or distances.

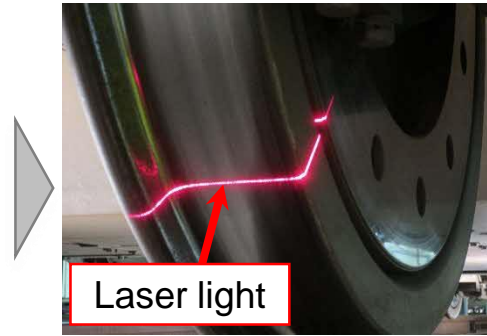
(3) Grinding reduces the wheel diameter, and if this process is repeated, the wheel will need to be replaced.

○ Measurement method

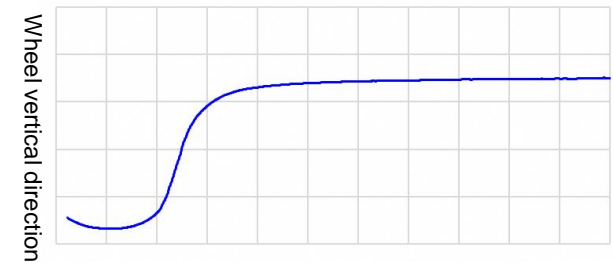
The wheel shape is calculated by shining a laser light onto the wheel and analyzing the captured image.



Laser light projected onto the wheel



Photographed with a high-speed camera



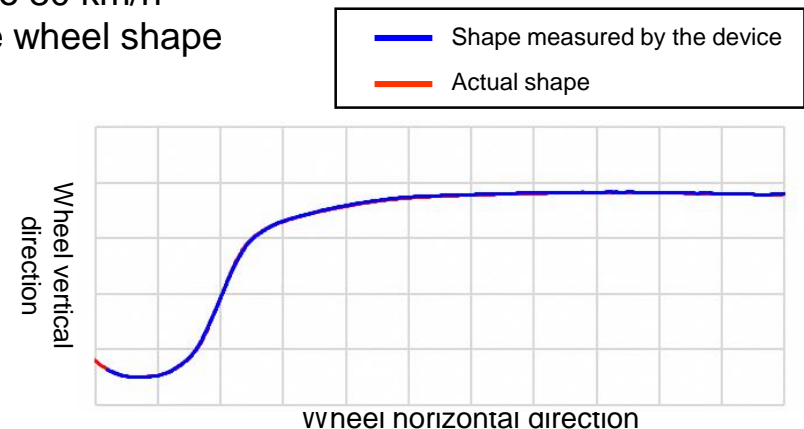
Wheel shape calculated through image analysis

○ Features of the device

- The measuring equipment, including a laser emitter, is compact and has a weather-resistant and dust-proof structure, allowing it to be used outdoors.
- Measurement possible for trains passing at speeds up to 80 km/h
- An image analysis method that can accurately calculate wheel shape developed



Field test



Comparison of the shape measured by the device and the actual wheel shape
=>It was confirmed that wheel shape could be measured with high accuracy.