

## RTRI and Nippon Densetsu Kogyo Develop a Device to Measure Wear of Overhead Conductor Rails Using a Light-Sectioning Method

RTRI and Nippon Densetsu Kogyo Co., Ltd. developed a device to measure wear of overhead conductor rails using a light-sectioning method (Fig. 1). With this device, the amount of conductor rail wear can be measured accurately and continuously without being affected by the various section shapes of conductor rails.

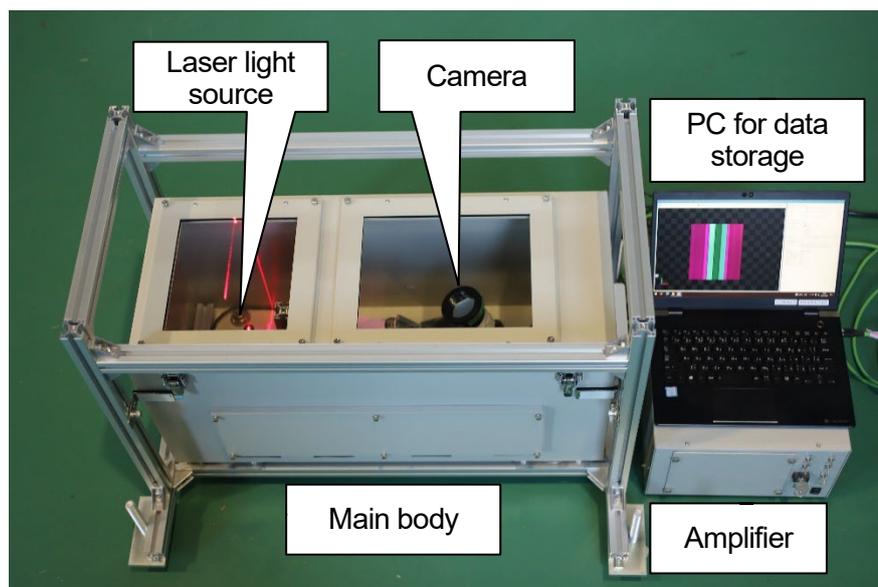
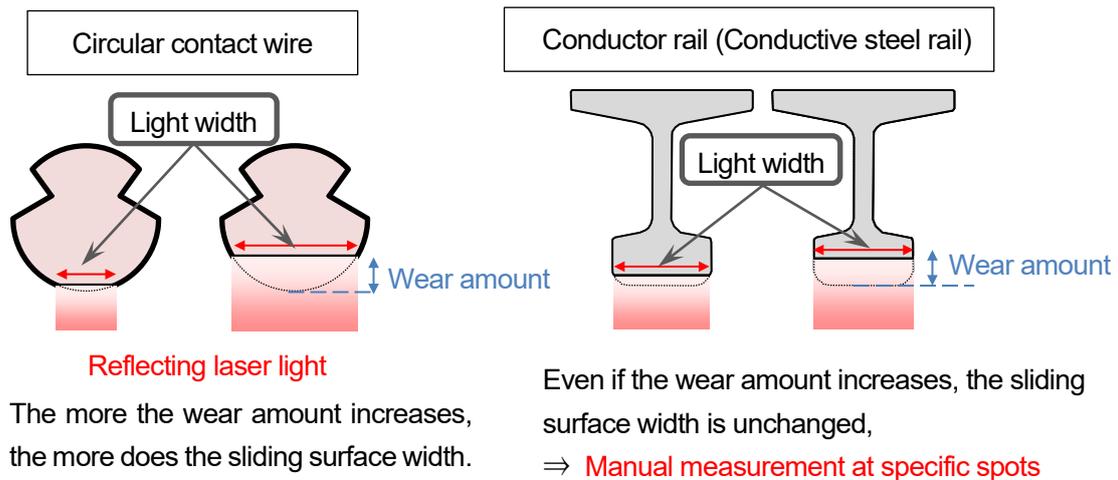


Fig. 1 Device for measuring wear of overhead conductor rails

### 【Overview】

In order to maintain contact lines in good conditions, wear of contact lines needs to be managed. Conventional measuring devices emit laser on the contact wire from beneath and measure the width of the light reflected on its sliding surface. Since a standard type of contact wire has a circular cross section, the width of the sliding surface changes as wear progresses. Therefore, the wear amount can be measured by the light width (Fig. 2, left side). However, for subways or narrow tunnel sections, overhead conductor rails, such as conductive steel rails or a type of contact wire with a flat bottom attached to conductor rails, are used. Even if wear progresses on the sliding surface of the conductor rails, the surface width and width of reflected light are nearly unchanged and it is impossible to measure the wear amounts with this method (Fig. 2, right side). So, for conductor rails, time-consuming manual measurements have been conducted.

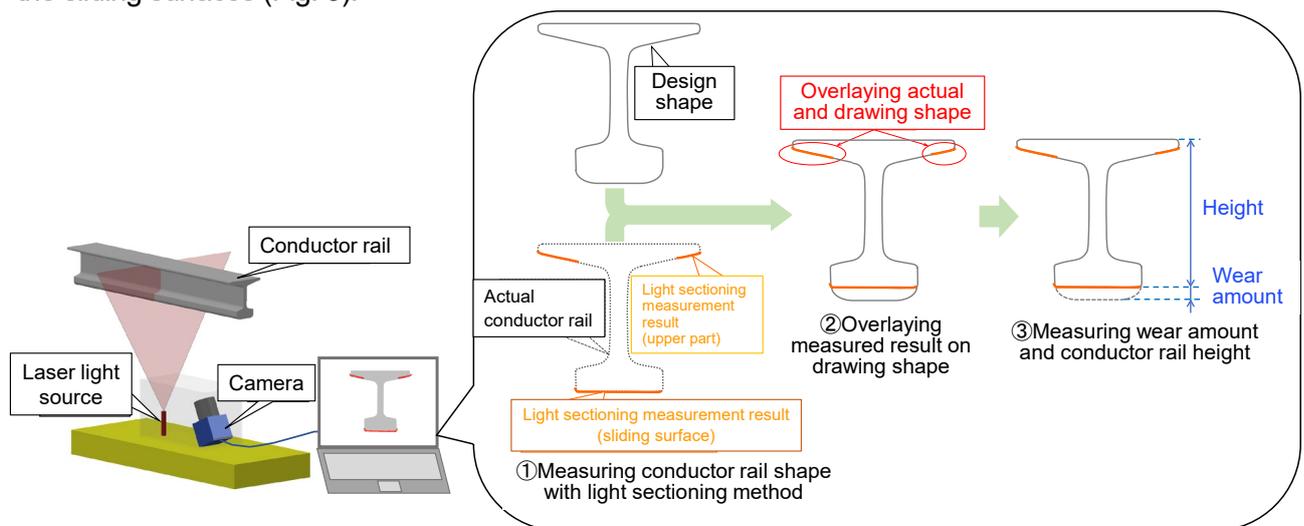
In order to solve this issue, RTRI and Nippon Densetsu Kogyo Co., Ltd. developed a device to continuously measure wear amounts of conductor rails using a light-sectioning method. In the light-sectioning method, band-form laser is emitted to an object, and the area projected by the laser light is photographed from a different direction using a camera, and the cross-section shape is identified. If mounted to a maintenance vehicle, this device enables continuous measurement of cross-section shapes of conductor rails and thus raises the efficiency of maintenance work.



**Fig. 2 Wear measurement using conventional devices**

**【Measuring method】**

- Cross-section shapes of conductor rails are measured with the light-sectioning method, and the wear amount and heights of conductor rails are measured by comparing design shapes and actual shapes of the sliding surfaces (Fig. 3).



**Fig. 3 Conductor rail wear measurement device and its measuring method**

**【Features of the device】**

- The measuring error is within  $\pm 0.5$  mm which means it has sufficient accuracy for maintenance purposes. It is also possible to measure changes in conductor rail heights and stagger at the same time.
- As the device has a width of 600 mm, length of 800 mm, height of 500 mm and weight of 25 kg, it is easy to mount on maintenance vehicles.
- It is able to take measurements continuously with the interval of 20 mm in the longitudinal direction of the rail when running at speeds of 30 km/h or lower. Measurement is completed in an hour for 20- to 30-km-long sections.
- Since it is capable of measuring two-dimensional shapes, it can also measure the distance between the sliding surface and fittings.

## 【Device used for Toei Oedo line】

Tokyo Metropolitan Bureau of Transportation introduced maintenance for conductor rails (conductive steel rail) on the Toei Oedo line based on results of measurements using this device (Fig. 4). So far, maintenance staff have been inspecting the conductor rails by manually checking wear amounts at specific points. A maintenance vehicle with this device is capable of continuous measurement, and now the entire section of the 40.7-km commercial line can be measured in 4 night-time inspections.



Fig. 4 Measurement of the conductor rail of the Toei Oedo line