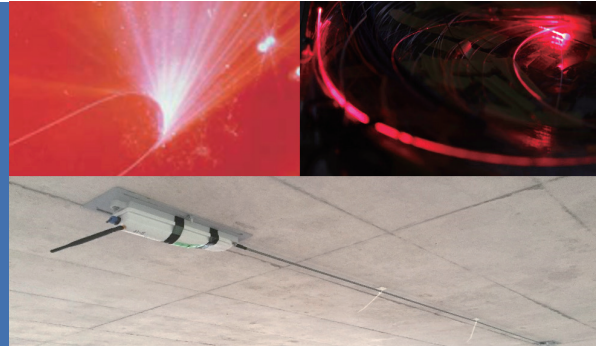


Strain Measurement Technology

Strain measurement using optical fiber sensors utilizing the principle of microbending



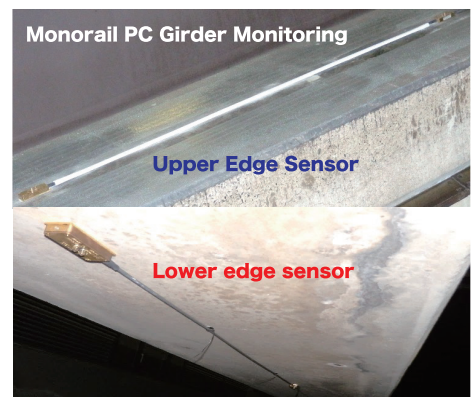
Optical fiber-based measurement sensors are widely used not only for data communication but also as sensors for strain, vibration, temperature, and other parameters. They are classified into various types based on their measurement principles, each possessing distinct characteristics. However, a common feature shared by all optical fiber sensors is their resistance to electrical noise and excellent durability. At Kamiharu, we utilize sensors based on the microbending principle (where the amount of infrared light leaking changes as the optical fiber bends) to perform strain measurements and other applications.

Long-term monitoring measurements are possible (wired type)

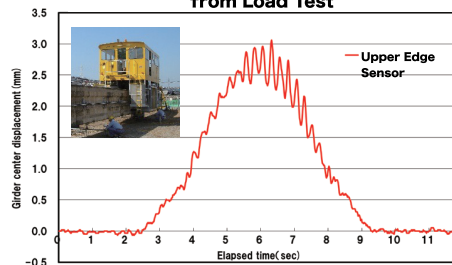


As shown in the left photo, sensor mounting fixtures are located at both ends and are fixed to the measurement target. This sensor stably measures the relative displacement between these two points with high precision, both

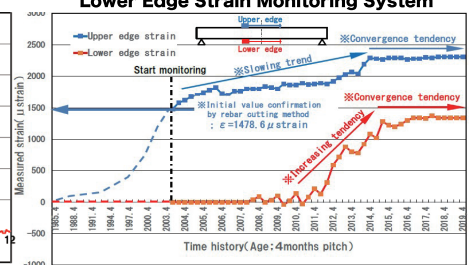
statically and dynamically, when external forces are applied. At Ueharu, we have a proven track record with wired types covering distances between these two points ranging from 1.000 to 4.000 meters. As part of the PC girder management for the Kitakyushu Monorail, we have been conducting monitoring measurements of the main girder strain since 2003, and also measuring its dynamic behavior through periodic loading tests.



Monorail PC Girder; Mid-Span Deflection from Load Test



PC Beam Upper/Lower Edge Strain Monitoring System



Battery-powered, no external power source required !! Enables data collection via WiFi (wireless type)

When measurement tasks become diverse, field operations become cumbersome. Additionally, it is desirable for measurement data to be instantly analyzable and evaluable, with backup capabilities. At Kamiharu, we utilize optical fiber sensors that can be battery-powered and self-driven, while also supporting wireless multi-hop communication. We conduct construction management monitoring for structural deterioration monitoring and reinforcement work.

