1. Development of Internal Water Level Monitoring Technologies for Sewerage Pipelines

Yuki Nagumo, Osamu Yamaguchi

Real-time monitoring of water levels would assist in maintaining sewerage pipelines, although few reports of such systems currently exist. Pilot trials of operating sewerage pipelines have identified various key issues in the expanded use of such systems, including the reduction of power consumption of the monitoring equipment and communications, and the time required to install and uninstall monitoring equipment.

To address these issues, we focused our efforts on basic sensor and communication technologies and installation and uninstallation procedures. We also examined ways to reduce power consumption, reduce costs, and improve efficiency. With respect to sensor technologies, we found that hetero-core optical fiber water level gauges should reduce power consumption and costs. With respect to communications technologies, the data acquired was transmitted by cost- and power-efficient LoRa systems. Furthermore, for efficient installation and uninstallation of monitoring equipment, we designed and manufactured an easily loaded and unloaded anchorless water level sensor fixture. In conclusion, these three core technologies demonstrated the improvements originally envisioned.

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