

Demonstration on the Deterioration Diagnosis of Sewerage Facilities by Vibration Diagnosis and Big Data Analysis (B-DASH)

(Research of FY 2015-2019)

1. Purpose

Today, sewerage facilities have concerns about facilities' aging and decreasing of engineers for their O&M. Technology to improve the efficiency of maintenance is required.

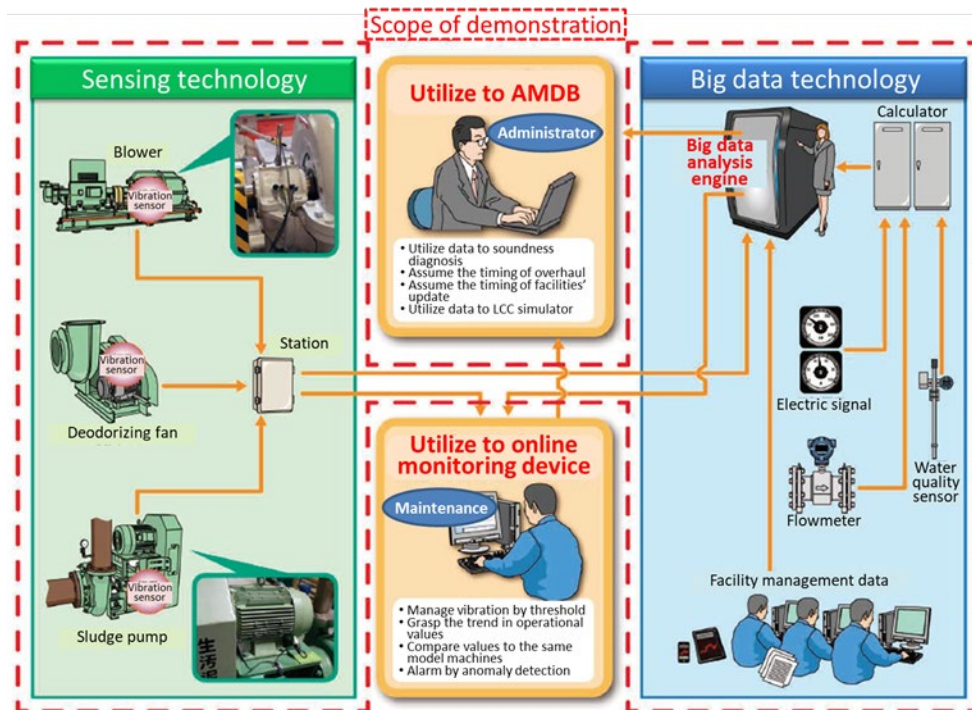


Figure 1. Overview of the demonstration

This demonstration aims to develop technology that supports efficient O&M and establish technology contributing to reducing LCC of wastewater treatment facilities.

The demonstration is adopted as B-DASH Project*¹ 2015 of MLIT*². The consortium of Water Agency Inc., NEC Corporation, Asahi Kasei Engineering Corporation, Japan Sewage Works Agency, Moriya City, and Hidaka City conduct the demonstration as an entrusted research project of NILIM*³

*1. B-DASH Project: Breakthrough by Dynamic Approach in Sewage High Technology Project

*2. MLIT: Ministry of Land, Infrastructure, Transportation, and Tourism

*3. NILIM: National Institute for Land and Infrastructure Management

2. Progress of the past year

FY2015: Apply technologies for other disciplines to sewerage facilities

FY2016: Verify the application in the previous year and the accuracy of deterioration prediction

FY2018: Verify the benefits of application and the effect of prediction accuracy improvement

3. Outcomes of this year

(1) Using the control standard value set in the past year, the cases of failure were analyzed. As a result, it was proved that the sensing technology was expected to reduce the sudden failures by 3.66%.

(2) The control standard value proved the validity that the period of overhaul and apparatus updates could be set longer than the standard period by more than 1.2 and 1.1, respectively.

(3) It was verified that the introduction of the invariant analysis enabled the narrowing of abnormal areas and prior actions. From this, the reduction

of maintenance/inspection works and the efficiency of the inspection of instrumentation facilities are expected.

(4) It was verified that combining invariant analysis with sensing technology can be expected to improve the accuracy of abnormal prediction detection.

(5) Heterogeneous mixture learning achieved results with less than 0.5% relative error of target value in the previous year by close investigation and cleansing of data.

(6) Though depending on the scale of facilities, profitability estimation of the demonstration technology proved the investment would be recovered in four to eleven years.

4. Conclusion and future schedule

This year, using the analysis of the actual failure cases, researchers verified the validity of the reference values for management set in the previous year. Also, using accumulated data of about a year, they attempted to improve the accuracy of big data analysis.

Next year, the research will be continued about the following issues.

(1) Collect more operation management and O&M data of the past year and vibration data.

(2) Analyze and learn collected data to improve the accuracy of deterioration prediction

(3) Create guidelines for this demonstration technology

Keywords: Sensing, Big data, Diagnosis, Prediction, Vibration, Invariant analysis, Heterogeneous mixture learning