Joint Research on Renewal of Synthetic Wood Covering Lids for Wastewater Treatment Plant

Year of research	2009～2010	Appropriate stock management

(Purpose)

With the progress of sewerage systems construction, the sewerage inventory volume increases year by year, for example, about 400,000 km-long conduit extension and about 2,000 wastewater treatment plants. Under such conditions, comprehensive inventory management is said to be needed, which covers judgments for rebuilding and renewal of sewerage systems, effective utilization of the facilities, streamlined maintenance control, and reduction of environmental burdens. Synthetic wood covering lids are used for securing safety, preventing odor of water treatment facilities, and others, and have a service record of exceeding 30 years. In this regard, however, when synthetic wood covering lids are scrutinized from the viewpoint of inventory management, they must be organized for things that must be kept in mind in maintenance management, judgment criteria for renewal, and renewal design techniques.

The present study purports to streamline technological matters related to inspection, diagnosis, and renewal design of synthetic wood covering lids, in order to optimally renew covering lids used for long time in wastewater treatment plant.

(Results)

(1) Performance test of synthetic wood material

For the purpose of generating and analyzing data, which served as criteria for determining material deterioration characteristics and renewal, the flexural Young's modulus was measured in the tests shown below:

[1] Diluted sulfuric acid solution test in a testing laboratory (1, 3, and 5% concentrations)

As the diluted sulfuric acid concentration increased, lowering of the flexural Young's modulus was observed at an early stage, but the estimated flexural Young's modulus after 18 years, which was the standard service life of the covering lid, indicated the results satisfying the design criteria values at 1% and 3% concentrations of diluted sulfuric acid solution.

[2] Exposure test inside treatment plant facilities (12 facilities of 5 treatment plants)

Of the facilities of corrosive environment Category I, in two facilities, about 10 to 16% lowering of flexural Young's modulus was observed. In these facilities, the pH of dew condensation water on the back side of the covering lid was 1. In the remaining 10 facilities, no lowering of flexural Young's modulus was observed, where the pH of dew condensation water ranged from 5 to 6, and the acid was diluted. Combined with the results of Paragraph [1], it was confirmed that the effect of the pH concentration of dew concentration water was greater than the effect of the hydrogen sulfide concentration in the gas phase for the environment where synthetic wood covering lids were deteriorated.

(2) Renewal design method of synthetic wood covering lids

[1] Inspection and diagnosis

The contents of inspection were decided by classifying the inspection into daily inspection, periodical inspection, and emergency inspection according to the inspection frequency. Diagnosis was performed when any abnormality was detected on the covering lid from the inspection results. By simplified diagnosis, the deterioration conditions of the main body, surface condition, and accessories were got hold of, and when any abnormality was detected in the covering lid main body, detailed diagnosis was performed and the need or no-need of the renewal was decided.

[2] Renewal design

A procedure for selecting a covering lid renewal method will be decided, and when the box type covering lid is renewed for the first time or when the residual strength of the covering lid is not less than 60% of the design standard value, presence or absence of the reuse effect will be investigated, and whether the covering lid should be renewed by new installation or reuse will be studied. For cases other than this, renewal design will be made by new installation.

(3) Investigation of effects by reusing the covering lid

For renewal of synthetic wood covering lids, either new installation or reuse will be selected. Advantages of renewal by reuse are two: cost reduction and reduction of environmental burdens. These points will be studied and the renewal of covering lids will be comprehensively determined.

(4) Products

"Engineering data concerning renewal of synthetic wood covering lids for facilities of wastewater treatment plants"

Joint researchers: Sekisui Chemical Co., Ltd. and Japan Institute of Wastewater Engineering Technology
Contact: Ryohei Sakane, Shizuo Yoshikawa,Shiro Tamura

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