

Research on the Development of Pipeline Life Extension Plan

Year of Research

2011 • 2012

Appropriate stock management

(Purpose)

A City plans to draft an operations/maintenance plan in about two years in preparation for the development of a pipeline life extension plan. In order to operate and maintain the massive pipeline network within a limited budget, efficient survey/inspection methods need to be employed.

The purpose of this research is to continue the previous fiscal year's basic study and analysis on the pipeline facilities life extension plan, including inspections in pipes (wide angle TV camera inspection + impact elastic wave test), and visual inspections of manholes to be implemented newly in order to analyze and sort out the deterioration tendencies and compile basic data and materials toward the development of the life extension plan in the future.

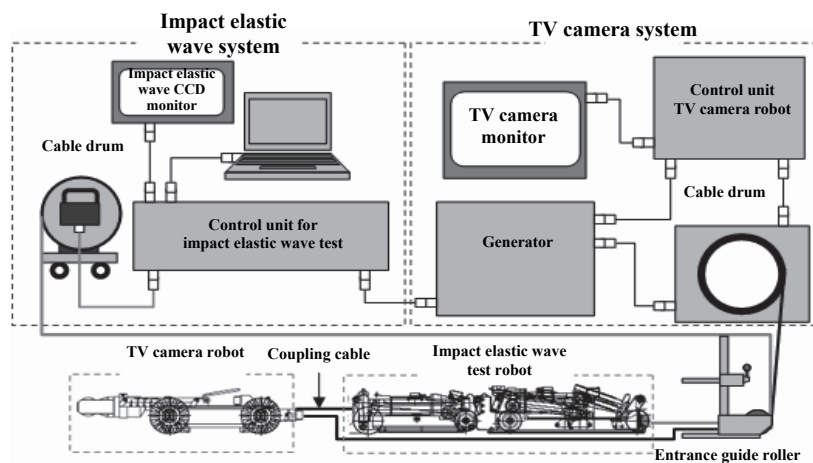


Figure-1: Outline of Impact elastic wave test

(Results)

- (1) As a basic survey, we identified and organized sewage-related complaint locations, as well as locations that had already been surveyed, based on which we selected 34 target pipelines for this fiscal year's study (approx. 1,500m). In addition, inside of medium- to large-diameter pipes are visually inspected from inside the manholes.
- (2) The interior of the pipelines was inspected by using a wide-angle TV camera and by conducting impact elastic wave tests as well (**Figure-1**).
- (3) In A City, the conditions of pipelines were determined to be evaluated based on the results of TV-camera expansion inspection, with the assessment of individual pipes by the impact elastic wave method. This method made possible the quantitative identification of flaws that would affect the self-sustainability of the pipes (**Table-1**).
- (4) The deterioration degree of each sewer pipe has been estimated by applying the Markov transition probability based on the inspection results. According to the estimation, 29% of the pipes has been ranked as "Urgency II" at present (42 years elapsed after construction), and this ratio has been projected to increase up to 35% at 50 years after construction.
- (5) Then, the deterioration tendencies of the pipes based on the inspection results were summarized, and possible approaches to prioritization for pipe repair and replacement were examined. In case of small-diameter pipes, deterioration has been found most prevalent in pipes that "are laid less than 1.5m deep in covering, less than 400mm in diameter and were installed in or before 1980." As for medium- to large-diameter pipes, deterioration has been found to occur frequently in pipes installed "in corrosive environment (around cesspits of buildings) with less than 1.5m covering."

Table-1: List of Flaws (soundness ranking A)

Pipeline No.	Upstream manhole no.	Downstream manhole no.	High-frequency component ratio	Virtual pipe wall thickness	Presumed fracture load	Degree of soundness	Soundness rank	Degree of safety	Crack	Erosion	Classification
1	1-01	1-02	46.2%	34.0	19.92	40.6%	A	0.74			2
1	1-11	1-12	44.9%	32.7	24.17	54.7%	A	1.11			2
1	1-11	1-12	46.7%	33.7	25.87	58.5%	A	1.19			2
1	1-12	1-13	27.8%	25.0	11.56	26.2%	A	0.53	B		1
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮
6	6-02	6-03	43.5%	31.8	22.81	51.6%	A	1.13	B		1
6	6-00	6-01	33.7%	17.5	6.16	19.0%	A	0.44		C	1
6	6-00	6-01	46.3%	19.8	11.37	35.1%	A	0.80		C	1
6	6-00	6-01	47.2%	20.4	12.66	39.1%	A	0.89		C	1
6	6-00	6-01	49.3%	21.8	15.68	48.4%	A	1.10		C	1
7	7-01	7-02	48.8%	26.0	12.81	33.5%	A	0.73			2

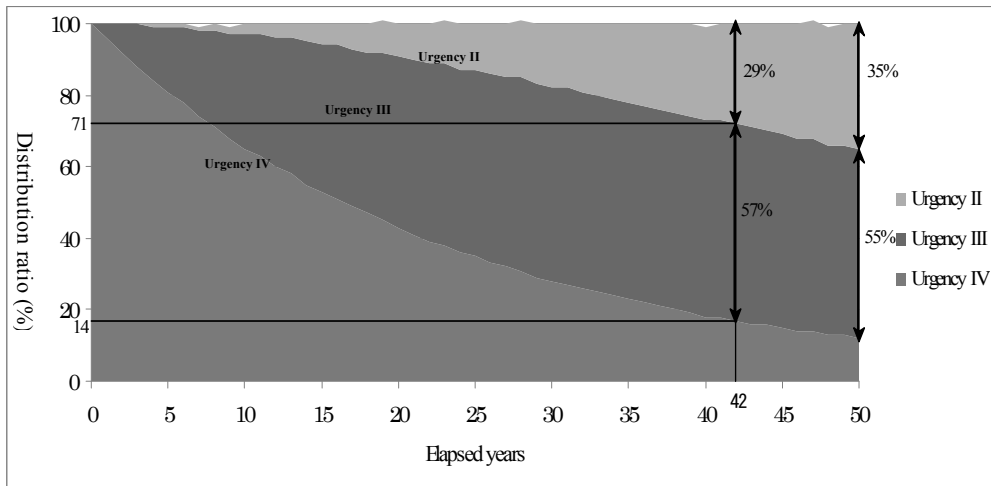


Figure-2: Distribution of Urgency levels

(Conclusion)

The above analysis suggests the presence of many deteriorated pipes in the 3rd sub-district of A treatment district. During the next five years, it is intended to inspect and study the pipelines of said sub-district in preparation for the development of a life extension plan.

※ A City, Japan Institute of Wastewater Engineering and Technology
 Inquiries ; Masataka Ikeda, Yuji Ito, and Osamu Igawa, 2nd Research Department [03-5228-6598]

Key words | Life extension plan, Impact elastic wave method, Risk matrix