Application of Real-Time Rainfall Information System to CSO Control

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1. Introduction

Japan is steadily moving ahead wtih structural countermeasures, such as developing stormwater storage facilities, to mitigate flood damage and stormwater retention reservoirs for CSO control. At the same time, advanced stormwater control is needed for more effective operation of existing facilities in emergency situations, and better information has to be provided to enable prompt and effective responses to disasters by residents.

In this connection, Metawater and the Japan Institute of Wastewater Engineering Technology are undertaking field research on a real-time rainfall information network that will enable advanced stormwater control.

This paper presents an outline of this system and its application to CSO control.

2. Outline of the System

This system consists of rain gauges and other monitoring equipment; equipment for collecting data on pump operation; a data management system; a real-time runoff analysis system; and an information transmission system.

Using real-time data from the rain gauges and rainfall radar, the real-time runoff analysis system performs consecutive simulations of pipe internal water levels, computing forecast levels several hours ahead every five minutes. The results are transmitted to the information transmission system where it is integrated or processed with rainfall data as required by the data management system. Finally, the data thus established is the content for information distribution via the Web.

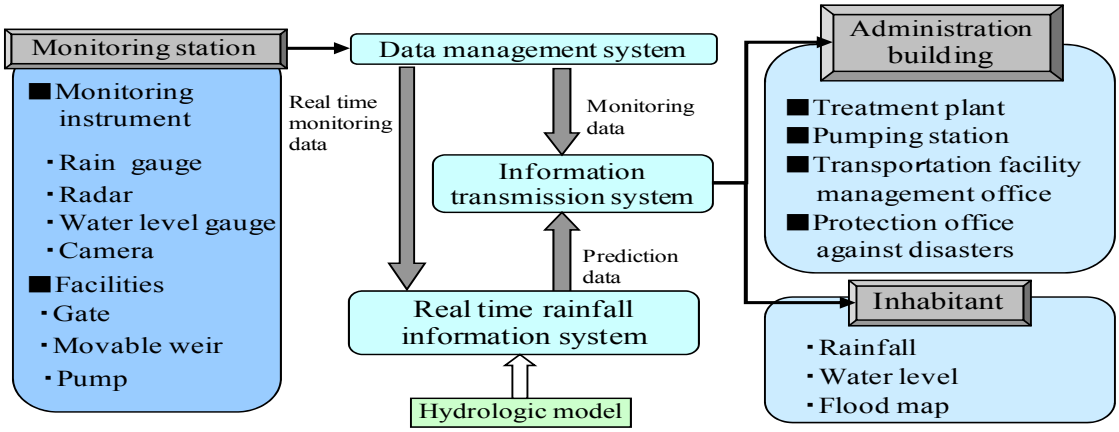

Figure 1. System block diagram

3. Outline of the Research Field and the Area covered by this Paper

At present, this system has been established for a research field; and a study of flood damage mitigation, CSO control, and energy conservation is being conducted. This paper covers a 120-hectare area within this research field that has a combined sewer system with pump drainage. CSO control is under way in this area. The target is a 50% reduction in the frequency of discharge through the retention of a volume equivalent to 2 mm. Storage pipes have already been put in place to cope with flooding.

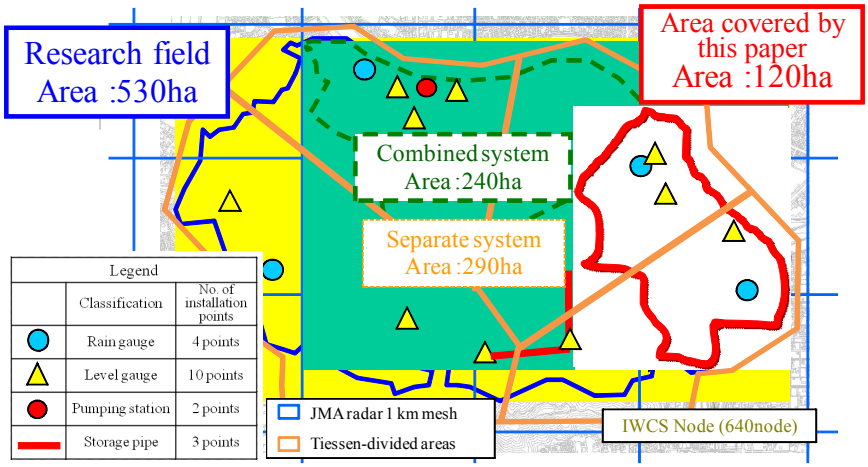

Figure 2. The research field and area covered by this paper

4. Application of System to CSO Control

This paper verifies the applicability of the system and that the forecast information distributed can be expected to lead to a 50% reduction of the frequency of discharges in the area covered by this paper. This result is expected from more efficient operation of the existing storage pipe, which is achieved by timely changes in storage pipe utilization to fight against flooding on the basis of forecast levels at water intake points. Since the forecast levels include a margin of error, operation switch is made at levels lowered by the amount of the error margin on the basis of conservative judgments. It should also be noted that this operating rule requires preparatory review and improvements being made in the course of actual operation.

5. Conclusions

The applicability of the real-time rainfall information network to the CSO control has been verified. The results show the importance of evaluating the accuracy of forecast information (rainfall, water level) and calculations indicate that the cost-effectiveness for the area covered by this paper is small. For the whole of research field, however, the calculations indicate that the overall cost-effectivness is satisfactory in view of the mitigation of flood damage achieved and the energy conserved.

A comprehensive approach will be needed in the future. This should include a focus on improving the accuracy of the system through distribution of data from MP radar, and in addition to CSO control efforts, the development of other facilities will be necessary.

References

Japan Institute of Wastewater Engineering Technology (2011). Technical Materials on Real-time Rainfall Information Network

Japan Sewage Works Association (2002). Guideline and Explanation of CSO Control