System technologies for urban drainage and combined sewer overflow

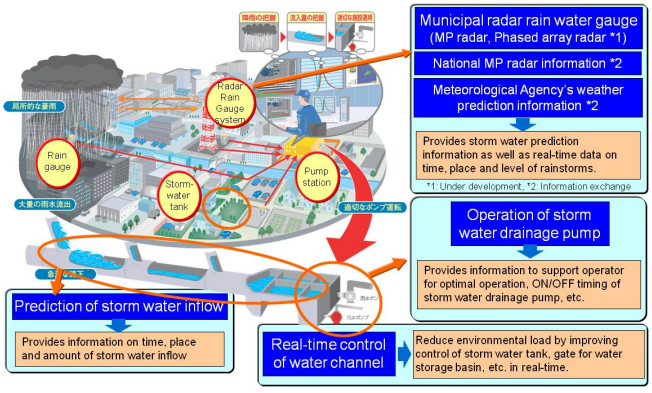
Naoto Yoshizawa [1, *)], Kenji Umeda [1)]

1) Toshiba Corporation
1-1, Shibaura 1-Chome, Minato-Ku, Tokyo, 105-8001, Japan
e-mail: naoto.yoshizawa@toshiba.co.jp

1. Introduction

Sewerage facilities are required to reduce the effluent load on receiving water bodies such as rivers and to prevent flooding as well as overflowing of combined sewers. Toshiba has been developing and supplying various advanced operational control systems to support the efficient operation of sewerage facilities, based on system technologies such as instrument and control, simulation, prediction, and optimization technologies.

This paper addresses the subjects of drainage pump control in a combined sewer facility for simultaneous prevention of flooding and combined overflow by using rainfall radars and so on.



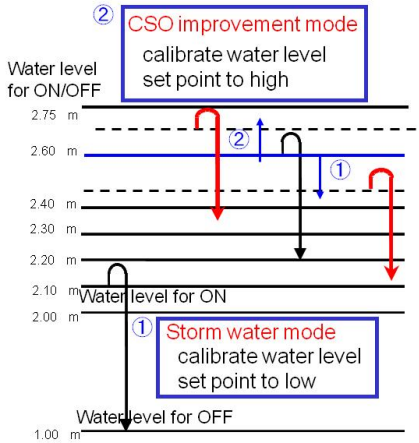


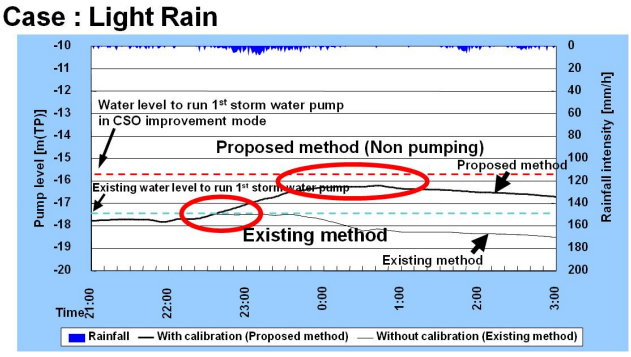
Figure 1(left). System technologies for urban drainage and CSO
Figure 2(right). Main concept of the proposed method

2. Methods

Figure 2 shows the main concept of the system mentioned in this paper. By using rain water information and predicted inflow, the system switches operational mode appropriately. In CSO improvement mode the system calibrates water level set point to be high according to rain information and predicted inflow for CSO, and in storm water mode water level will be set to be low for safety pump operation.

3. Results and discussion

Figure 3 and Figure 4 show that the results for the proposed method. Figure 3 shows that the system can correct water level to be high in case of light rain operation of pump for reduction of operational cost and pollution load. Figure 4 shows that based on weather condition, the system changes operational mode of storm water pump to prepare for flooding.



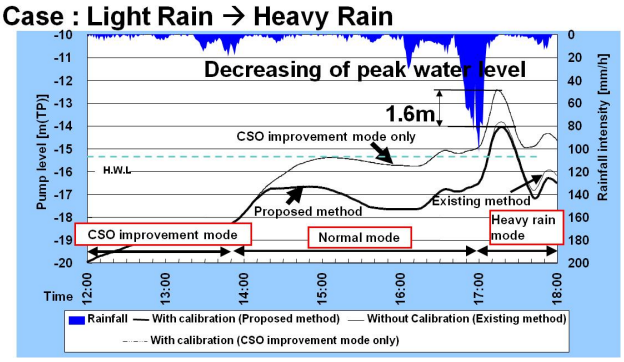


Figure 3(left) and Figure 4(right). Results for the proposed method

4. Conclusions and future

This paper has described a system for urban drainage and combined sewer overflow using rain water information and predicted inflow. As a result reduction of operational cost and pollution load was achieved in case of light rain operation of pump, and based on weather condition, the system changed operational mode of storm water pump to prepare for flooding.

Toshiba has been focusing the development of rainwater rainfall radars that can precisely monitor rainfall over a wide range. Toshiba's X-band MP radar is characterized by improvement of transmitter life-span and shorten replacement time adopting solid-state transmitter. Furthermore we are developing an innovative rainwater drainage system using phased-array radar, which it possible to predict local torrential downpours by analyzing cumulonimbus clouds in three dimensions with high time resolution. By using these new rainfall radars, more performance of the proposed method will be expected.

5. References

Yamanaka O. et al (2000). Sewerage Stormwater Inflow Prediction Based on System Identification Method with Hammerstein Type Nonlinear Model, WATERMATEX 2000, pp.8.64-8.71.