

Broad-based water facility management via efficient monitoring system

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INTRODUCTION

A large number of small water facilities are scattered in the suburban area in the Western Tokyo called Tama area.

Bureau of Waterworks, Tokyo Metropolitan Government efficiently conducts broad operations by managing an integrated monitoring system for these water facilities. There are still a great number of small water facilities in Japan and abroad that are operated and monitored either individually or in small groups.

Therefore, our example of centralizing operation and management of the water supply in Tokyo can contribute to domestic and foreign water utilities.

History and Background of Waterworks in the Tama area

1. History and Background of Water Facilities Centralization

- Tokyo is broadly divided into the Ward area (urban area) located in the east and the Tama area which is consisted by municipalities (suburban and mountainous area) located in the west.

- Until 1972, each municipality in the Tama area operated water supply businesses independently.

- However, due to a serious shortage of water resources in the context of the rapid population growth from the 1960s onwards, and in order to narrow gaps in rate levels, coverage, and maintenance of water facilities among the wards and municipalities, the supply of water was gradually centralized to the Tokyo Metropolitan Government.

- Currently, the Tokyo Metropolitan Government runs the water supply business for 26 out of the 30 municipalities in Tokyo.

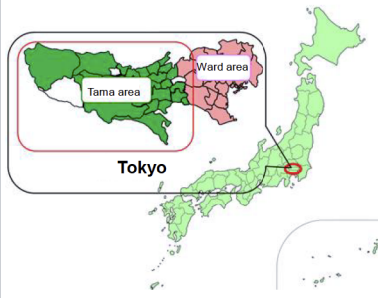


Figure 1 - Location of the Tama area

2. Comparison of Waterworks Business Scale in Wards area and Tama area

- The water supply area is the same as the Ward area
- The water supply population is 1/3 of the total 13 million for all of Tokyo
- There are approximately 550 small, diverse facilities, including water purification plants, water supply stations, water pumping stations, and wells

Table 1 - Metropolitan water supply in Ward area & Tama area
- Current state of operation in 26 municipalities
(As of March 31, 2016)

(As of March 31, 2016)			
Item	Waterworks Scale		
	Ward area	Tama area	
Water Supply Area	627 km ²	612 km ²	
Water Supply Population	9.27 million	3.90 million	
Number of Water Sources	Ground Water (Wells)	3	278
	Surface/Flowing Water	13	24
Number of Facilities (Water Purification Plants/Water Supply Stations, etc.)	44	273	
Distribution Reservoir Capacity	2.19 million m ³	1.00 million m ³	
Distribution Pipe Length	16,546 km	10,369 km	

Centralization of Tama District Staffed Control Rooms

1. Process of centralizing staffed control rooms

- As of 1984
 - Related waterworks facilities are remotely monitored and operated from 51 staffed facilities scattered each municipality.
- 1984 onwards: Gradually phased in monitoring system centralization and power savings in operations and management
 - 1st Phase: Started centralizing so there is one staffed facility per municipality
 - 2nd Phase: Promoted centralization of facility management beyond municipality borders
 - 3rd Phase: Divide the Tama area into 4 areas and build a system to centrally manage each area from one control room (When dividing management areas, take the travel distance from transmission lines to facilities and local characteristics into consideration)

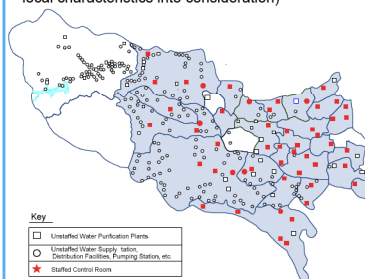


Figure 2 - Distribution of central control rooms and facilities (1984)

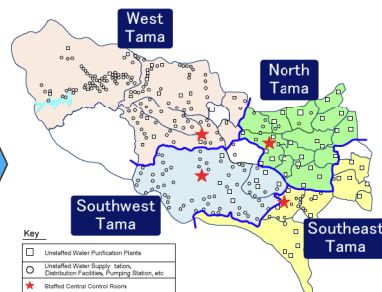


Figure 3 - Distribution of central control rooms and facilities (2008 to present)

2. Methods of Centralization

- Build a system for remote monitoring and control while enhancing efficiency and reliability
 - 1) Improve reliability by securing system redundancy and backup power supplies.
 - 2) Realize efficient operation management through automated operation of facilities, such as membrane filtration equipment and so on.
 - 3) Improve maintainability through standardized equipment instruments.

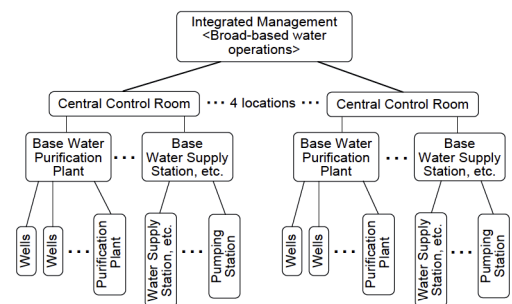


Figure 4 - Hierarchical Structure of Tama Monitoring Control System

Current Operations and the Maintenance and Management System

The Tama area has a large number of small facilities. Each facility has equipment, and operation monitoring and regular inspection are regularly required.

• Operations Management System

Of the 4 central control rooms, the North Tama control room is the main control room, responsible for operating and managing transmission trunk lines and facilities.

• Operations Management System

Each central control room has 6 staff, who are responsible for operating distribution reservoirs and monitoring and controlling equipment in the facilities under their jurisdiction.

• Maintenance Management System

In each of the four areas, install 2 to 3 inspection bases and build a system for conducting regular inspections, as well as responding swiftly in the event of an accident or a breakdown.



Figure 5 - Tama Waterworks Main Control Room

CONCLUSION

Costs are very high to streamline by centralizing the monitoring systems of many facilities and automating operations control, so we must develop systems with more rational methods and optimize our control system.

- Maximize use of available facilities and equipment.
- Gradually make updates and consolidate systems when the cost needed for post-facto maintenance rivals the cost for making updates.
- Streamline the maintenance and management system by centralizing and closing old facilities.

References

- 1) 2012 40 years of metropolitan water supply in the Tama area - transition of operation improvement -. Bureau of Waterworks, Tokyo Metropolitan Government, Tokyo.
- 2) 2016 Water Supply in Tama. Bureau of Waterworks, Tokyo Metropolitan Government, Tokyo.