4-3-1 Reconstruction of wastewater treatment facilities utilizing the network of Wastewater treatment plants

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Introduction

Recently, a number of accidents occur due to degradation of infrastructure, and it is required to promote measures against infrastructure degradation. As with other infrastructure, taking measures regarding infrastructure degradation is essential for wastewater treatment plants (WWTP) as well.

Shibaura WWTP and Morigasaki WWTP in Tokyo are processing about 40% of sewage in the ward area together. However, there are facilities which are 60 years old after they are equipped and have problems such as a lack of capacity resulting shallow water depth and unavailability to ensure seismic adequacy. Thus, it is needed to reconstruct existing facilities.

Although processing ability reduces during the reconstruction period, facility expansion is difficult due to the limitation on sites. Even if facility expansion is possible, it would be an excess equipment after completion of the reconstruction. Therefore, a plan to conduct reconstruction while delivering a part of sewage to other centers is formed. With this plan, the reconstruction of facilities can be conducted efficiently and it is possible to ensure backup functions at times of disaster.

Here, an approach to conduct efficient facility construction and to practice stable water treatment and sludge treatment even at times of disaster by mutually accommodating processing capacities of two WWTPs.

1. Steps of Reconstruction in Shibaura WWTP and Morigasaki WWTP

Compare two WWTPs (Shibaura WWTP and Morigasaki WWTP), and conduct reconstruction from the high-priority lines.

Priority is decided by 1. operating years and 2. processing efficiency.

As a result, it is decided to firstly conduct reconstruction of the central line at Shibaura WWTP and secondary the west line at Morigasaki WWTP.

Processing facilities will be upgraded to advanced waste treatment after the completion of reconstruction by utilizing a substitute facility.
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<td><strong>Reconstruction</strong></td>
<td><strong>Ensuring substitute capacity of 110,000m³/day</strong></td>
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※1(Step1) Construction of connecting pipe and reconstruction of the central line at Shibaura WWTP
※2(Step2) Reconstruction of the central line at Shibaura WWTP
※3(Step3) Reconstruction of the west line at Morigasaki WWTP

Figure-1  Steps of Reconstruction in Shibaura WWTP and Morigasaki WWTP
2. Effect by using connecting pipe

It became possible to ensure necessary processing capacities and reconstruct facility with the limitation on the sites.

- Conduct of reconstruction at each facility without using connecting pipe
  110,000 m$^3$/day at Shibaura WWTP, 240,000 m$^3$/day at Morigasaki WWTP
  \(\rightarrow\) Substitute facility with 35 m$^3$/day in total is needed.

- Reconstruction plan using connecting pipe
  130,000 m$^3$/day at Shibaura WWTP, 110,000 m$^3$/day at Morigasaki WWTP
  \(\rightarrow\) Sufficient by fitting out substitute facility with 240,000 m$^3$/day in total.
  \(\Rightarrow\) Reducing facility construction of 110,00 m$^3$/day compared to the case to fit out substitute facilities at each WWTP.

3. Utilization at times of disaster

When one of the WWTP is affected by a disaster, water is delivered to the other WWTP to ensure backup functions at times of disaster.

![Figure-2 Overview of the connecting pipe](image)

4. Conclusion

Substitute facilities required to reconstruction are installed dispersedly and these are shared for multiple facility reconstructions by the networked connecting pipe. Therefore, the size of substitute facilities and energy required for water delivery can be minimized.

After the completion of reconstruction, substitute facilities are ensured as back up functions at times of disaster.

From now on during the long-term facility reconstruction, process control of both WWTP will be done carefully and speeding up the reconstruction by developing more efficient processing method will be examined continuously.