Study on Treatment Performance Enhancement of Takase WWTP

(Research of FY 2019)

1. Purpose

In Takase WWTP of Funabashi city, five trains of 102,000m3/day run out of seven treatment facilities with a designed treatment capacity of 153,000m3/day as of 2019. It adopts an anaerobic anoxic aerobic (A2O) process satisfying planned discharge water quality of 10mg/L BOD, 15mg/L T-N, and 1.5mg/L T-P.

While the inflow of Takase WWTP is currently 70,000m3/day, it tends to increase yearly, which concerns the present facility's insufficient capacity.

On the other hand, the future Japanese population is assumed to decrease due to a low birthrate and aging, and inflow volume may reduce after the peak of 2052, 116,000m3/day.

This study aims to evaluate the treatment performance (treatment capacity volume) of the existing facilities of Takase WWTP, extract and compare the treatment performance enhancement manner to cope with the near future inflow increase, organize issues for the introduction of the treatment performance enhancement manner, and develop the primary documents for the future improvement plan of wastewater treatment facilities.

2. Outcomes

Researchers organized and analyzed the current inflow requirements and the treatment performance of the wastewater treatment facility based on the collected operation and water quality data. The current inflow water quality values were set into aeration tanks based on the above data and future

values, assuming the adoption of a digestion tank and the treatment capacity of the existing treatment facilities. Besides, treatment performance enhancement manners were considered in response to the future assumed inflow volume, and their costs and O&M performance were compared and evaluated.
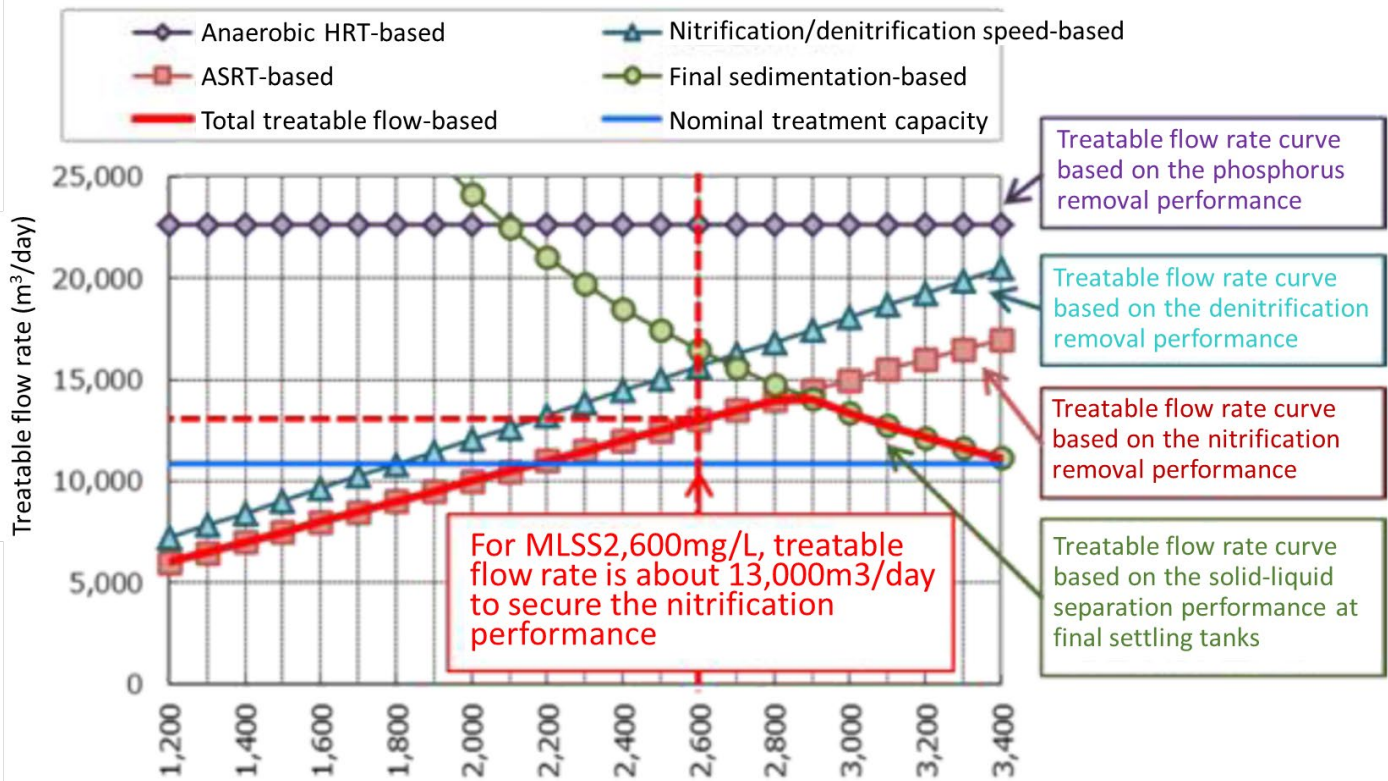

Figure 1. Image of treatable inflow rate calculation

- **Assumption of capable treatment**: The aeration tank and the final settling tank's functions were evaluated to estimate treatment capacity by combining the maximum treatment capacity and MLSS concentration which satisfy all functions (Figure 1.) As a result, the treatment capacity was calculated as 116,000m3/day, which is larger than the planned treatment capacity of 102,000m3/day for both current and future water qualities and equivalent to the assumed future treatment capacity. But, considering some trains, which are 15,000m3/day, stop at the aeration tank's retrofit, the system would have the insufficient capability; it was judged that it needs enhancement and expansion.

- **Consideration of the treatment performance enhancement manner:** Since figuring it was challenging to supplement insufficient capability by operation condition's change, we considered enhancement manners by changing treatment processes. Four treatment processes were extracted to calculate treatment capacity; they are combinations of Carrier treatment, MBR, Coagulant addition modified Ludzack-Ettinger process、A2O process(UCT process.) In addition, the number of trains that require enhancement was calculated against the target capacity considering decreased treatment capacity at retrofitting.

- **Comparison and evaluation:** LCC were calculated from annual construction costs and O&M costs, including power, chemical, and carriers and membranes replacement costs, against enhancement-required trains in each process. In addition, treated water quality, sludge generation, maintainability, domestic record of introduction, issues for installation, and retrofitting's impact on the existing facilities were compared to evaluate, including the adding a similar A2O process to the existing facility. As a result, the A2O extension is the most inexpensive and superior for O&M.

3. Conclusion

The researchers assumed while Takase WWTP has more treatment capacity than the planned capacity and is equivalent to the future estimation, retrofitting work will make it insufficient. They evaluated the most superior solution to enhance its treatment capacity was to extend the A2O process similar to the existing facility.