Research on Reduction of Flocculant Addition in Step Feeding Type Multistage Nitrification/Denitrification Process

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(Purpose)

Because the treatment facilities in Kobe were constructed rapidly from between 1965 and 1985, reconstruction and modernization will presumably be necessary during a single concentrated period 10-20 years from now. In 1995, environmental standards for phosphorous designated by water body type were applied to Osaka Bay, where the effluent is now released, and a "Master Plan for Sewerage Construction in Osaka Bay Region by Drainage Basin" has been established. This plan specifies water quality standards for releases from sewage treatment plants into Osaka Bay, applying strict standards of COD : 11 ㎎/ℓ, T-N : 7 ㎎/ℓ, and T-P : 0.6 ㎎/ℓ. Kobe is required to introduce advanced treatment technologies to meet these targets water quality standards and is responding.

In Kobe, joint research was carried out with this foundation (Japan Institute of Wastewater Engineering Technology) over a 3-year period from FY2001 to FY2003 in order to analyze operational data from an actual-scale facility using a step feeding type 3-stage nitrification/denitrification process at the Tarumi Treatment Plant and evaluate its applicability. Research to date has demonstrated a reduction of chemical consumption necessary for nitrogen removal and an efficient aeration method, and has confirmed that the treatment target water quality can be achieved throughout the year.

In the present fiscal year, operational conditions which make it possible to accelerate biological phosphorus removal were studied for the purpose of reducing flocculant (PAC) addition in phosphorus removal, as this accounts for a large percentage of treatment costs.

(Results)

1. High anaerobic operation results in an increased rate of contribution by biological phosphorus removal. However, performance did not reach the point where the target water quality can be achieved with no flocculant addition.
2. When high anaerobic operation was performed with an increased influent water ratio in the 1st stage, the PAC addition rate necessary to achieve the treatment target water quality can be reduced to approximately 60% in comparison with the basic flow. In high anaerobic operation with the influent water rate distributed equally to all stages, the PAC addition rate necessary to achieve the treatment target water quality can be reduced to approximately 40%.
3. Under conditions where the contact time is increased by changing the PAC addition position and conditions where recirculation to the 2nd stage is stopped, a high flocculant reduction effect was not observed in either case. In the latter case, an unstable effluent T-N condition was observed.
4. The cost per unit of treated water on a full-year base can be reduced by approximately ¥0.6/㎥ by high anaerobic operation in comparison with the basic flow.

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key words	Advanced treatment, Flocculant addition, Step feeding method