

## Investigation of the practical application of a “sewage high-level treatment system using pre-coagulation and carriers”

Whole term

1998.12 ~ 2005.3

### ( Purpose )

The aim of this research was to look more closely at a “sewage high-level treatment system using pre-coagulation and carriers (without activated sludge)” (hereafter called “this treatment system”) enabling high-level treatment with the same capacity as the conventional activated sludge process, and to establish new technology by judging adaptability of the system to practical application, via actual scale experiments wherein one water channel was modified in an actual facility -- the Neyagawa River Northern Basin-wide Sewerage System, Kounoike Treatment Plant (hereafter referred to as “the treatment plant”).

In this research, practical application research was conducted jointly with the Osaka Prefectural Eastern Basin-wide Sewer Center over 6 years (from 1998 to 2003) as a project for promoting enhanced functionality (via new technology) within the new-generation sewer support project.

### ( Result )

#### ( 1 ) Results of water treatment verification experiments

In water treatment as a whole, it was possible (except for BOD) to achieve the target water quality (COD : 11 mg/l , SS : 8 mg/l , T-N : 6.7 mg/l , T-P : 0.49 mg/l) with a cumulative frequency value of 50%. For BOD, it was possible to achieve the target water quality (5 mg/l) with C-BOD, and it was determined that BOD attributable to organic substances achieved the target.

#### ( 2 ) Results of sludge treatment verification experiments

As SRT lengthens, there was a confirmed tendency for the reduction rate, and growth rate of the production rate to become smaller for the solids reduction rate, fermented organic acid production rate and S-BOD production rate.

#### ( 3 ) Applicability of this treatment system

For the treatment plants of separate sewerage system of Osaka Prefecture, it was estimated that almost all of the organic matter necessary for complete denitrification could be provided with organic acid filtrate. For treatment plants of combined sewerage system, it was estimated that it is possible to achieve the target values for “the Osaka Bay comprehensive basin-wide planning of sewerage system” for (averaging) about half of the days in the year, using just organic acid filtrate.

#### ( 4 ) Economy

As the object of comparison, research focused on the anaerobic-anoxic-oxic process with chemical addition (A2/O process) + sand filtration. Model design was conducted using 2 cases (10,000 m<sup>3</sup>/day and 100,000 m<sup>3</sup>/day), and the results showed that, although operation and maintenance (O&M) costs became more expensive, the facility became more compact, so site costs and construction cost (except for machine and electric facility) became less expensive, and overall this treatment system was less expensive. Also, it is hard for the scale advantages of this treatment system to act in a facility of 100,000 m<sup>3</sup>/day, and the result, conversely, was that this treatment system was more expensive. However, this treatment system has a greater ability to remove nitrogen than the A2/O process + sand filtration, and the degree to which it costs more is adequately justified by the treatment performance.

#### ( 5 ) Ease of operation and maintainability

It is troublesome to conduct O&M, in terms of periodically cleaning the carrier screen, and calibrating and cleaning the measuring devices which act as indicators for the addition of chemicals. Other than that, however, operation is almost entirely automatic, and O&M are good. Compared with the ordinary

activated sludge process, there are many advantages, including: the fact that less scum is produced, there are no worries about the occurrence of bulking, and there is no need for MLSS control.

### **( Conclusion )**

In this research, experiments were conducted to evaluate the practical application of a full-scale facility for a “sewage high-level treatment system using pre-coagulation and carriers”, which enables higher level treatment with the same capacity as existing facilities. The experiments showed that the is at a level where quality of the treated water can attain the target values, and, from the standpoint of cost, it was confirmed that there is a possibility of gaining further advantages if the cost of the carrier goes down in the future. Also, retention time in the bio-reaction tank can be about only 8 hours, and thus there are significant advantages for cities in particular, where it is difficult to purchase a facility site.

Joint researchers: Osaka Prefectural Eastern Basin-wide Sewer Center

Persons in charge of research: Shuji Tanaka, Touru Take, Hiroichi Sano, Kouji Takahashi

key words

High-level treatment , pre-coagulation settling , fermented organic acid production ,  
fermented organic acid liquor