

## Study on the utilization of the high-rate filtration

Whole term

1993. 10 ~ 1994. 3

### (Purpose)

The functions of the preliminary settling tank of the activated sludge process are to reduce the pollution load to the secondary treatment by removing solids which can precipitate, and to be used as a simple treatment unit of the combined sewage system in case of rain.

In the province of Tokyo, Japan, the BOD concentration of sewage has been increasing due to suspended particles from the growing number of large scale restaurants and the change of life style, thus it is clear that the aeration power per unit discharge and sludge generation rate have increased for last 20 years. As a result, the problems related to the treatment cost and obtaining landfills for sludge disposal have to be solved.

The advanced treatment of nitrogen and phosphorus and the improvement of the quality of the water discharged from the combined sewer system in case of rain are important tasks.

The high-rate filtration, an alternative for the preliminary settling tank has been developed by Tokyo Metropolitan Government for saving the land and energy by high-efficient solid-liquid separation, a reduction of the quantity of sludge generation and guaranteeing the quality of the water discharged from the combined sewer system in case of rain.

In 1993, Tokyo Metropolitan Government and the Japan Institute of Wastewater Engineering Technology investigated the utilization of the high-rate filtration as an example project to use the new technology.

### (Results)

The results of the investigation on the efficiency of the high rate filtration by using an experimental treatment plant with a capacity of 2,000 m<sup>3</sup>/day, at the eastern part of Sibaura Sewage Treatment Center in Tokyo Metropolitan Government are as follows:

#### 1. Selection of media

It was concluded that a medium with the shape of an empty cylinder having inner projections and a polypropylene grid, specific gravity of 0.9 and porosity of approximately 90 % would be the most suitable.

#### 2. Characteristics of the removal rate in a fine weather.

The results of the experiment showed that the SS removal efficiency was approximately 60 % at the maximum filtration rate of 400 m/day without any chemical injection.

#### 3. Characteristics of the removal rate in case of rain

The experimental results for the rainfall showed that SS removal rate was approximately 70 % at the maximum filtration rate of 1000 m/day with a polymer injection of 1.5~2 mg/L and the backwashing interval of 3 hours.

#### 4. Amount of SS capture

The amount of SS capture has a tendency to decrease as the filtration increases without chemical injection. Also, the amount of SS capture was 10 kg/m<sup>3</sup>-media at the operational condition with a filtration rate of 1,000 m/day in case of rain.

#### 5. Height of the filtering layer

The optimum height of the high-rate filtering layer is proved to be 2 m.

#### 6. BOD removal rate

BOD removal efficiency in a fine weather is 30~40 %, or 50~70% in case of rain.

#### 7. Dehydration of the condensed sludge from backwashing.

The dehydration of the condensed sludge from backwashing demonstrated superiority over the existing waste sludge from the preliminary settling tank (excluding excess sludge).

#### 8. Area for installation

In comparison with the area required for the existing preliminary settling tank, the area for the installation of the high-rate filtration was observed to be much smaller.

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Keywords

Filtration, Up-flow, Suspended media, Polymer, Backwashing