

## Study on the practical use of the deep shaft

Whole term

1993. 11 ~ 1994. 3

### (Purpose)

Deep shaft is a hyperdeep-well type aeration tank with a water depth of 40-150m, which can be used instead of the aeration tank of a conventional activated sludge process.

The area occupied by the aeration tank can be reduced by using a deep shaft, resulting in the reduction of the land cost. In addition, the deep shaft possesses a high oxygen utilizing-efficiency with a low rate of air feed.

The deep shaft process has no aeration device such as a diffuser etc. and has a simple mechanism for aeration. Therefore, no man power is needed in order to maintain the aeration mechanism of the deep shaft process.

There are small terrains in Japan and it is difficult to acquire sites for treatment plants.

In addition, acquisition of manpower for maintenance and management is difficult in the present modern society facing aging problems.

It is very important to examine the adoption of the deep shaft process. In order to achieve this, the constructional and operational performances of the deep shaft process based on actual experiments, literature data and etc. were studied for practical application and disseminating the application across treatment plants. This study was limited to the deep shaft and the degas-facility which are different from the conventional water treatment plant.

### (Results)

The design considerations of a deep shaft are expressed briefly in the research results.

#### 1. Design of the deep shaft

The deep shaft is designed based on the basic data of influent water quantity and water quality, the desired treatment level, geological features and etc.

#### 2. Shape and the number of tanks

The deep shaft is cylindrical shaped with a diameter of 600 mm. The number of tanks should be more than 2 when the cleaning and damage control are taken into account.

#### 3. BOD-SS loading rate

It is 1.0 kg/kg·d or less than the standard.

#### 4. MLSS and return sludge ratio

The MLSS ranges from 2,000~4,000 mg/L as the goal

#### 5. Aeration time

It is 1.2 h or more than the standard. This value should be maintained for a design flow rate.

#### 6. Water depth of the shaft

It is 40~150m.

#### 7. Volume of the head tank

The head tank establishes a bulk of 25% of the total shaft volume.

#### 8. Oxygen requirement

It is 0.8 kg O<sub>2</sub>/kg BOD removed or more than the standard.

#### 9. Air feed rate and etc.

The quantity of ventilation is decided from the air quantity which is necessary for treatment and circulation.

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Keywords

Sewage treatment plant, Hyperdeep-well type aeration, Degas-facility, Saving area