New Technologies Harmonized with Global Environment

Part 2 - Activities of Water and Wastewater Engineering Division -

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This Part 2 paper presents the history of pioneering businesses initiated by NKK's Water and Wastewater Engineering Division, and unique plants and technologies developed by the Division for improving the water environment.

1. Introduction

NKK's water engineering operations have a history of a considerable length when the sale and installation of water supply pipes are included. However, its modern involvement in this field began with a proposal at NKK's top management conference in 1972 to move into the business field of constructing water treatment plants. Initial product strategy was centered on advanced water treatment, and technical agreements were concluded with overseas plant makers such as Zurn and Techfina, and sales, engineering, and research sectors were integrated to obtain required technologies and to commence new business operations. The Environmental Plant & Water Supply Dept. was es-

(1) The relative surface area is large, providing for adhesion of large volumes of microorganisms.
(2) A specific gravity similar to that of water ensures that they are evenly distributed in the aeration tank.
(3) The polypropylene base material is not biodegradable and has a high physical strength, thus providing good resistance to wear, and eliminating the need for replenishment of the carrier.
(4) It can hold effective microorganisms having low growth rates (e.g., nitrifying bacteria) in the aeration tank.
(5) It needs not be held under moist conditions, thus simplifying storage.

2.3 Representative xases of bio-tube systems installed

A variety of uses are possible for a fluidized bed bio-reactor system using bio-tubes. The most representative cases are shown in **Figs.1** to **5**, and are described below.

(Case 1)

In the system shown in **Fig.1**, the influent is introduced into the aeration tank (fluidized bed bio-reactor) containing the carriers, and subjected to a treatment using the microorganisms adhering to the carriers. Next, the SS in the treated water is removed in the solid-liquid separation equipment to produce clean water[1),2)].

Fig.1 Flow diagram for BOD removal system (Case 1)

In this system, the microorganisms are maintained at a high concentration in the aeration tank, thus reducing the size of the tank. The system differs from conventional activated sludge systems in that it does not require the pre-

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3. Bio-reaction simulation technology

3.1 Background of the development

Simulation technology has been employed in the field of academic study on sewerage treatment for a considerable time, however methodology has varied significantly between researchers. Indeed, methods used differ between adjacent research laboratories, and even within individual research laboratories. Each method is employed by a small group of researchers without being verified using on-site

(2) Development of an oxidation ditch model

The oxidation ditch is a suitable system for small- to medium-scale sewerage treatment facility. It employs an endless circulating water channel as a reaction tank, and its use as a treatment system is rapidly increasing due to the ease with which its operation may be controlled.

The volume and quality of water entering the oxidation ditch varies considerably with local conditions, and a range of variation, or a considerable margin, needs to be incorporated for establishing a uniform set of standard design values. Methods of design and operational control for

Fig.9 Work flow diagram for using support tool

5. Conclusion

In 1998, regulations governing general discharge of nitrogen and phosphorus were implemented to deal with eutrophication of sea areas. In 2002, total emissions of nitrogen and phosphorus became subjected to regulations. It is anticipated that these regulations will be further tightened according to local conditions in many areas in future.

To implement countermeasures and responses in view not only of the water environment, but also of the entire global environment, will be increasingly required. Under these circumstances, it is hoped that the bio-tube system and bio-reaction simulation technology described above, and NKK's expertise in environmental technologies and systems, will make contributions to the improvement and