

Joint Research into New Structural Type Steel Plate Digestion Tanks

Period of Research

2010~2012

Establishment of energy and resource recycling

(Purpose)

In the past, digestion tanks at sewage treatment plants were generally constructed of reinforced concrete, but problems with these structures included a high initial investment and long construction period. In contrast, steel plate digestion tanks, which can be constructed more quickly at relatively lower cost and have been widely used successfully at many small-scale facilities using biomass other than sewage sludge, are structures with the potential to resolve these problems.

In this research, experiments and research were conducted concerning the economic efficiency, digestion performance, reduction in energy consumption, and visualization of the inside of tanks for the demonstration facility at the Nanbu Purification Center in Chiba City. The findings and validity of this research as well as the technical findings useful for a municipality when considering the introduction of the new digestion tanks are summarized.

(Results)

(1) Outline of the technology

The technology consists of the three components shown in **Figure 1**: a steel plate digestion tank, an impeller type agitator, and a heat exchanger.

(2) Outline of the verification test facility

A steel plate digestion tank (tank capacity: 750m³ approx., dimensions ϕ 10m×H10m) was installed and operated with 30m³ of sludge inserted per day (primary sludge 15m³/day + excess activated sludge 15m³/day, retention time of 25 days).

(3) Verification of test results and considerations

The results of test verification and considerations are shown below.

[1] Evaluation of economic efficiency, shortening the work period

Construction costs can be reduced by roughly half when compared to a concrete digestion tank. The construction period can also be reduced to less than half in comparison with a concrete digestion tank.

[2] Service life

It was estimated that the protective coating of vinyl ester resin can provide a service life of at least 20 years.

[3] Energy saving

Power consumption can be reduced to 1/4 of that of a draft tube through the application of an impeller type agitator. The amount of heat released to the external environment is the same or less than a concrete digestion tank.

[4] Easy maintenance and management

It is easy to install sensors and sight glasses with a high degree of freedom. "Visualization" of the inside of the tank allows us to see the operating conditions. The conditions of sediments can be measured from the side by using ultrasound. Maintenance and management can be also improved by performing continuous measurement of ammonia concentrations.



Figure 1. Exterior view of the demonstration facility

(Summary)

The results of this research are summarized in the "Technical Manual for Steel Plate Digestion Tank".

The anaerobic digestion of sewage sludge will gain more importance in terms of energy generation. The steel plate digestion tank is expected to be widely used as a facility that can provide flexibility in updating and rebuilding structures to meet future needs. We hope this technical manual will be useful for sewage treatment operators when working on energy generation and regional measures towards global warming.

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Key words

Anaerobic digestion tank, steel plate digestion tanks, shortening the work period, cost reduction