

Joint Research on Steel Plate Digestion Tanks

Year of research

2010~2012

Research of resource and energy in sustainability

(Goals)

In the past, digestion tanks at wastewater treatment plants were generally constructed of reinforced concrete, but problems with these structures included a high required initial investment and long construction period. In contrast to this, 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 the above problems.

And not only sludge digestion at medium to large scale wastewater treatment plants performed in the past, but small-scale digestion equipment which reflects regional characteristics (by accepting combined biomass for example) are also expected to come into wider use, so it is assumed that knowledge about steel plate digestion tanks which have been used to treat sewage sludge will become increasingly important.

Thus, the goals of this research were to conduct proving tests of steel plate digestion tanks, collect technical information for use by regional governments consider their introduction, and prepare a technical manual to be used for their planning and design.

(Results)

(1) Development goals

[1] Life cycle cost: equal to or lower than that of a reinforced concrete digestion tank (draft tube as its agitator)

[2] Construction period: less than 1/2 of that of a reinforced concrete digestion tank

[3] Service lifetime: 20 years or more

[4] Heat applied: equal to lower than that of a reinforced concrete digestion tank

(2) Proving test method

A steel plate digestion tank (tank capacity: about 750m³, dimensions: diameter 10m × height 10m) was installed and operated at a rate of 30m³/day (case of retention time of 25 days) of injected sludge. Its agitators were impeller type two-level blade agitators (output; 1.5 to 2.2kW). Table 1 shows the items verified and evaluated.

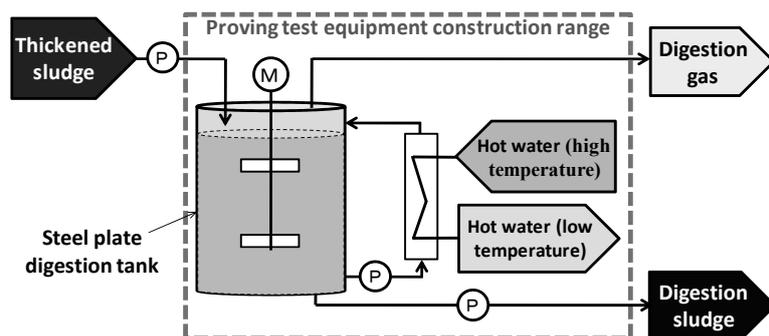


Figure 1. Proving Test Equipment Flow Chart

Table 1. Items Verified and Evaluated

Contents of evaluation	Items verified and evaluated
Evaluation of economic efficiency	Study of construction cost, life cycle cost, construction period, and service lifetime
Evaluation of performance of the steel digestion tank apparatus	Visualization of internal state (monitoring, ammonia concentration, flow rate, state of deposition, temperature distribution, sludge concentration distribution, etc.), strength, heat release, corrosion protection, etc.
Evaluation of performance of the impeller type agitator	Agitator RPM, flow rate, drive power density, tracer test
Evaluation of digestion performance	Material balance, digestion sludge, digestion gas properties
Evaluation of running performance/maintainability	Verification of correlation of visualization data and operating data, verification of state of production of bottom deposition and surface scum

(Future plans)

In 2010, development goals were set and the basic specifications of the proving test system were established. Based on this, the proving test facility will be constructed in 2011, and operation will begin in August of 2011. And operating data will be accumulated until 2012 and used to prepare the technical manual.

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Key words

Anaerobic sludge digestion, steel plate digestion tank, work period shortening, cost reduction, small-scale sewage system