

Joint Research on the Performance of Rotating Drum-Type Thickener

Year of Research

2012

Establishment of energy and resource recycling

(Purpose)

The performance of thickening is reduced due to increased organic content in sludge, resulting in an increased load of return water and a reduction of treatment efficiency in the dewatering process. In the sludge flocculation process, long distance transportation causes a decay and change in the sludge property, resulting in poor thickening performance.

In this study, a performance evaluation through a verification test, a review of planning, design and operation and maintenance methods, and economic evaluation for operation and management are conducted. The results are summarized in the technical manual.

(Results)

(1) Structure and principle of the thickening process

The thickener consists of a drum-shaped screen, washing system, drive unit, and a jacket for odor control. The drum-shaped screen is a filter in which a series of wedge wire screens with the inverted triangle-shaped cross section are placed at regular intervals to form a slit, and then it is shaped into a cylinder.

This thickener has a drum-shaped screen that rotates flocculated sludge with added polymer flocculants at a low speed of a few rpm to 20 rpm. While the sludge is transported by spiral-shaped guide which is fixed inside the drum, it is inverted inside the drum-shaped screen to separate water efficiently.

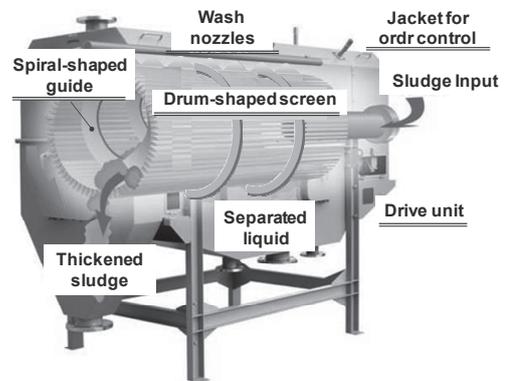


Figure 1. Rotating Drum-Type Thickener

(2) Thickening performance

A demonstration facility was used to study the thickening performance for the excess sludge and the stability of control operation in four seasons. Throughout the seasons, it was confirmed that the SS recovery efficiency was 97% or more when the polymer coagulant injection rates were 0.3%/TS in winter and 0.25%/TS in spring, summer and fall. It was confirmed that the thickened sludge concentration was 4% or more when the polymer coagulant injection rate was 0.25~0.35%/TS.

Proportional control is generally used for the control of the polymer coagulant injection rate. However, this control cannot regulate the polymer coagulant quantity when it is necessary to increase the injection rate for a low thickened sludge concentration, or when it is necessary to decrease the injection rate for a high thickened sludge concentration. Hence, control by thickened sludge concentration was added to the proportional control in order to control the polymer coagulant injection rate to be within the target values.

(3) Benefits of introducing the thickener

The benefits of introducing this thickener are compared to those of the belt filter press and centrifugal thickener. For a treatment plant with a treatment capacity of 70,000 m³/day, it was confirmed that the construction cost, operation and maintenance cost, and CO₂ emissions for this thickener are reduced to half that of a centrifugal thickener and are the same as or less than the belt filter press.

(4) Benefits of introducing the high capacity treatment process

The high capacity treatment process for the mixed raw sludge can be applied to thickening and dewatering treatment systems that do not include an anaerobic digestion process. The polymer coagulant injection rate for the thickening process is set higher than the excess sludge concentration in the separation and thickening system. Maintaining the flocculates from the thickening process, the polymer coagulant injection rate is reduced in the next dewatering process. This can help reduce the total amount of polymer flocculants used in the process.

A sewage treatment plant with a treatment capacity of 70,000 m³/day was assumed in the study of the introduction benefits. It was confirmed that the conventional mechanical thickening of mixed raw sludge has higher utility costs and CO₂ emissions while the high capacity treatment process has lower utility costs and CO₂ emissions.

(Summary)

The results of this research are summarized in the "Technical Manual for Rotating Drum-Type Thickener".

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Key words

Rotaiting Drum-Type Thickener, wedge wire, excess sludge, mixed raw sludge