

## Study on Differential Rotary Screw Thickener

Whole term

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### ( Purpose )

In recent years, sewerage construction progresses and the amount of generating of sewage sludge is increasing every year. For this reason, reuse of sewage sludge is one of the most important subjects in sewerage works. Sludge coming from WWTPs comes in two types: primary sludge and excess sludge. Of these, the excess sludge concentration is low and the concentration nature is extremely bad. Therefore, the case of excess sludge, which carries out mechanical thickening, is increasing.

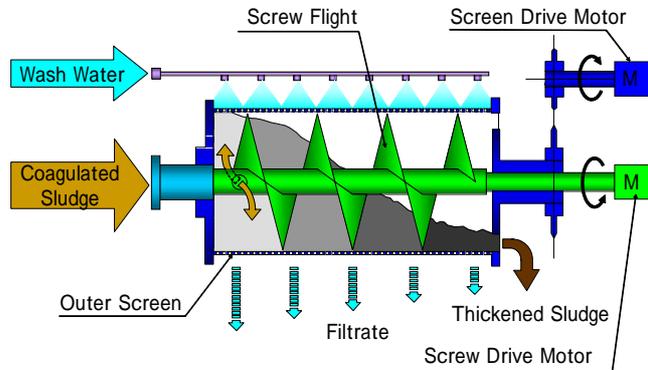


Fig.1 Details of Differential Rotary Screw Thickener

Mechanical thickeners for excess sludge come in several types, including centrifugal thickeners capable of treating relatively large quantities and dispersed-air floatation thickeners suited for small and medium quantities. In general, centrifugal thickeners consume large quantities of electrical power, while dispersed-air floatation thickeners require large installation space. For those reasons, to make sludge treatment efficient requires sludge thickeners which save more energy and space.

The differential rotary screw thickener was developed paying attention to the thickening mechanism in the former stage of the pressure-type screw press dehydrators being spread by the result of the joint research in 1999 and 2000. This research project aims to: (1) identify the considerations, advantages, and other details to be noted in the adoption of this system through demonstrative experiments regarding the use of this thickener for separation thickening, and (2) compile the technical manual containing such details.

### ( Result )

#### ( 1 ) Demonstrative experiment results

The authors performed thickening experiments for excess sludge coming from the conventional activated sludge process in the four seasons (at the S WWTP in M city) and thickening experiments for excess sludge coming from the advanced treatment process in the summer and winter (at the T WWTP in K city and at the K WWTP in O Prefecture). At K city, the authors also performed thickening experiments using raw sludge and thickening experiments using a practical-scale test plant for excess sludge (having a throughput of 30m<sup>3</sup>/hour).

The experiment was conducted for the purpose of the following investigations.

- 1 ) Grasp investigation of the concentration characteristic and operation factor.
- 2 ) Influence to drying of a seasonal variation and the effects on the surrounding environment.
- 3 ) Arrangement of an item required for maintenance management.

The experiments demonstrated that the test plant sufficiently satisfied the performance targets shown in Table 1. Demonstrative experiments on the practical-scale test plant demonstrated the upscaling status with a throughput of 10m<sup>3</sup>/m<sup>2</sup>/h per screen area.

Table 1. Performance targets of the differential rotary screw thickener

Item	Performance target
Throughput	10m <sup>3</sup> /m <sup>2</sup> /h or more
Thickened sludge concentration	4 TS % or more
SS recovery rate	95 % or more
Chemical dose	Polymer coagulant about 0.3 to 0.5% (of TS)

( 2 ) Effects of the plant

In a WWTP having design maximum daily wastewater flow of 70,000 m<sup>3</sup>/day, the authors performed trial calculations on the differential rotary screw thickening equipment (including auxiliary equipment), centrifugal thickening equipment, and dispersed-air floatation thickening equipment.

The trial calculations demonstrated that: (1) the differential rotary screw thickening equipment is more effective in saving energy than other thickening equipment; and (2) it has reduced installation; and (3) it effectively reduces carbon dioxide emissions and maintenance expenses.

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key words

Mechanical thickeners , Excess sludge