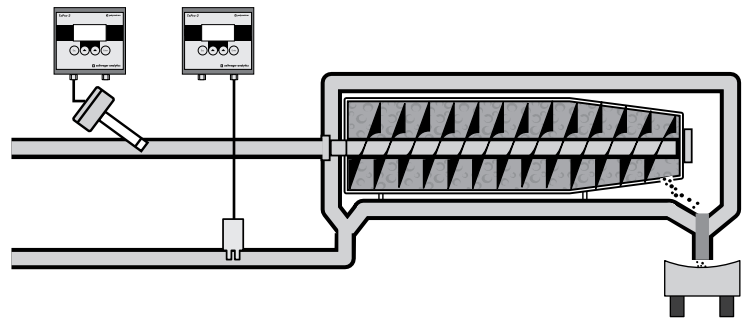


Centrifuge monitoring / control in wastewater treatment plants

application note



An HC-300 High Concentration sensor with a TxPro™-H transmitter (left) monitors the feed solids. An RD-240 sensor with a TxPro-2 transmitter monitors the centrate of a centrifuge dewatering sludge.

Description

A centrifuge applies centrifugal force to sludge to separate solids from liquids. Centrifuges are typically used to thicken or dewater primary sludge, often mixed with waste activated sludge (WAS) to produce thickened sludge or sludge solids (cake), respectively. The cake must be disposed of by the wastewater treatment plant (WWTP).

Critical factors

The critical variables that determine the efficiency of a centrifuge are feed solids characteristics, solids concentration, flocculant dosage and temperature. Feed solids comprised of relatively large particles (which are heavier and have greater surface area) floc readily

and are more easily separated from water within the centrifuge. Stale sludge, often associated with WAS, produces higher cake moisture, which presents a disposal problem for WWTPs.

Influent

The sources of centrifuge feed solids are primary sludge and thickened primary sludge mixed with WAS. The primary / WAS sludge ratio affects the capacity of the centrifuge, the output concentration and the flocculant dosage.

Warm sludge thickens or dewateres better than cold sludge—winter to summer output concentrations may vary as much as 2% to 4%. Centrifuge feed solids are seldom heated, however.

Retention time

Sludge flows through a centrifuge in minutes. Fluctuations in the flow-through time depend on the feed rate. If the feed solids concentration drops, operators must slow the feed rate to give the sludge more time in the centrifuge.

Effluent

Centrate, the liquid by-product of centrifugation, is returned to the head of the plant. The centrate must be monitored for suspended solids. Deviations from the expected solids concentration can be caused by polymer underdosing or overdosing or by feed flow fluctuations. Sludge solids (cake), the end-product of dewatering in a centrifuge, are incinerated or disposed of as landfill or fertilizer. Cake concentrations range between 15% and 34% depending on the feed solids, polymer dosage or centrifuge setup. The cake concentration, wetness and chemical content are important issues for cake disposal.

Thickened sludge, the end-product of thickening in a centrifuge, is stabilized in an anaerobic digester before being dewatered. Thickened sludge concentrations are typically between 3% and 7%.

Zellweger Analytics solutions

To fully monitor a centrifuge system, both feedforward and feedback data are needed. For the feedforward data on the feed solids, an HC-300 sensor with a TxPro-H transmitter has the necessary range (0% to 10%) to monitor the feed solids concentration. The sensor can be mounted to the feed pipe through a ball valve.

For feedback data on the centrate, use an RD-240 sensor with a TxPro-2 transmitter. Depending on the requirement, the sensor can be pipe-mounted through a ball valve, mounted to a PVC pipe for suspension in a channel or inserted in a degassing tank.

With influent flow rate data (customer-supplied flow meter not shown in the figure) combined with the solids concentration data, an operator can adjust the polymer dosage accordingly to achieve a consistent cake yield.

Related application notes

Belt filter press monitoring / control in wastewater treatment plants

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