Disc Thickener Improves Performance of Digester
Chiquita WRF
Santa Margarita, CA

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Function and operation
The Challenge:

To improve the efficiency of the anaerobic digester.

Background:

• WAS and (Waste Sludge) WSL and Solid Contact Basin sludge combined before Gravity Thickener.

• Added water to convey sludge to thickener

• Inlet feed rate 0.4% – 0.8% DS

• Gravity Thickener could only achieve 2.7% DS
Part of a 2007 Chiquita Plant Upgrade Project.....

Set New Objectives for Sludge Thickening:

• Improve thickening to 5-6% DS

• Must be easy to retrofit, install, operate, energy efficient

• Evaluations included: Gravity Belt/Drum/Disk Thickeners
The Solution:

• Disc Thickener by Huber selected

• Delivered and started up fall 2009

• Atop the edge of the old gravity thickener

• Allows Disc Thickener output to be conveyed to the storage tank by gravity
ROTAMAT® Disc Thickener RoS 2S

Reaction tank

Thickener
ROTAMAT® Disc Thickener RoS 2S

Functional Description

The machine is an inclined, slowly rotating filter disc. The filter disc consists of a perforated carrier disc covered with a micro filter.

The filter disc is installed in a closed stainless steel tank and divides the tank into a thickening zone and a filtrate collection zone.

The pre-flocculated sludge flows from the reactor onto the filter disc surface. An adjustable guide plate distributes the sludge uniformly over the filter radius.

The flocculated sludge settles on the filter surface while the filtrate water collects in the filtrate chamber and leaves the tank via the filtrate outlet.
The residual solids on the micro filter dewater mainly statically. Due to the rotation of the disc the solids are transported on the disc from the inlet area along the discharge plate to the sludge discharge.

A rubber lip fitted to the discharge plate reliably removes the solids from the filter surface. In addition, the residual solids sticking inside the filter are washed back onto the filter surface by a spray bar mounted below the filter disc between the sludge discharge and sludge inlet.

The rotational speed and inclination of the ROTAMAT® Disc Thickener is adjustable to the specific quality of the sludge to be thickened. Flexibly supported chicanes are mounted in the thickening area to support filtration.
ROTAMAT® Disc Thickener RoS 2S

Size 1 Drawing (5'-2.5" diameter)
ROTAMAT® Disc Thickener RoS 2S

Size 2 Drawing (6’-7.25” diameter)
ROTAMAT® Disc Thickener RoS 2S

Throughput Chart

Performance also influenced by:
- sludge characteristics
- flocculant
- feed constancy
- ...

max. feed rate $Q_{\text{max}}$ [m$^3$/h]

feed solids $DS_{\text{in}}$ [%]

size 2
size 1
Disk Thickener start up

Starting the thickener

- Start the thickener in semi-automatic mode.
- Start the wash water supply (continuous washing).
- Start the filter disc drive and reactor stirrer with approx. 50 Hz.
- Start the polymer dosing pump.
- Start the sludge feed pump.
- Observe the flock structure inside the flocculation reactor.

A clearly visible phase separation should take place in the reactor. The flocks should have a minimum diameter of 5 to 10 mm.

If separated flocks can’t be seen, either the polymer is unsuitable, the dose is too low, or the stirrer speed or polymer mix-in energy is not correct.

If clear flock structures are seen but the watery phase is milky, the polymer dose is too high.
Under optimal setting conditions free water can’t be seen on the filter disc.

The chicanes are not submerged. The filter surface behind the chicanes is free and the sludge reliably transported along the sludge discharge plate into the discharge chamber.

Vary the number and position of the chicanes in order to achieve the requested thickening degree.

Check the throughput, polymer consumption, filtrate quality and thickening degree.
Goals:

Accepting 0.4-0.9% DS inlet feed
Produce 3-6% DS Consistently (with 0.1-0.5%)
Produce 5% DS if supplied 0.3% DS or better

Conclusions after 2 years operation:

Average inlet of 0.6% DS
Produces 5.5% DS average at 107GPM

Mix = 60GPM activated/7 GPM Trickling/40 GPM Service water
Best Result:

• 170GPM

• Inlet at 0.8% DS the RoDisc produced:
  • Average of 6.5%
  • Maximum of 7% DS

• Table inclination angle was reduced slightly to provide a desired: 5.5% DS at present.
If you detect any deviation from one of the set point values, the following parameters are variable:

- Polymer dilution
- Polymer dose
- Mix-in energy at the polymer addition point
- Reactor stirrer speed
- Rotational speed of the filter disc
- Adjustment of Inflow guide plate and chicanes
- Filter disc inclination
- Filter washing continuous or intervallic

Change only one parameter at a time for optimization of the settings.
Cleaning nozzles
Check the nozzles by examining the jet pattern. Screw out and clean the nozzles that are clogged.

Flocculation reactor
- Check if material has entwined around the stirrer in the flocculation reactor.
- Check if a scum layer has formed inside the reactor.

Electric cables
- Check all cables for damage.
- Have all damaged cables replaced by a specialist.

Connections
Check that all connections of the machine are tight (leak-proof) and undamaged.

Weekly function check
Execute the following work once a week:
- Checking the chicanes
- Checking the filter disc sealing
Chicanes

- The chicanes are self-adjusting. Replace the chicanes as soon as a gap appears between chicane and filter disc resp. the filter disc does not get cleaned anymore under the chicane.
Maintenance considerations

Filter disc sealing

The filter disc sealing has the function of both a support for the filter disc in the disc thickener casing and a sealing between the thickening and filtrate room.

Visual inspection of the sealing is possible through an opening provided in the thick sludge discharge.

Both the wear protection bars (item 3) and journal bearing (item 4) are subject to natural wear. The degree of wear increases with the increasing filter disc speed and the rate of minerals or coarse material contained within the sludge.

1. Sludge discharge plate with rubber lip
2. Filter disc frame
3. Wear protection bar at the filter frame
4. Journal bearing
Sludge discharge plate with rubber lip

The rubber lip on the sludge discharge plate serves for a rough cleaning of the filter disc from sludge settlings. As soon as the following spray bar does not remove these settlings completely the lip must be adjusted or replaced.

- Loosen the fixing screws on the cover plate for adjusting the rubber lip.

- The rubber lip can then be adjusted from above towards the filter disc.

- Tighten the fixing screws again.
Thank you