FlocFormer - the best floc for every dewatering task

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Subjective of the project

- Controllable flocculation process -

benefits:

- improvement of dewatering
- improvement of separation
- maximum utilisation of flocculant
Common application
Municipal waste water sludge dewatering

flocculant: polymer

digester → pump → chamber filter press → decanter / centrifuge

Germany: mainly centrifuges but some move back to chamber filter press to get better %DS
Common application
Pathway of conditioning for chamber filter press

polymer

stirred tank

Aquen
Common application
Pathway of conditioning for chamber filter press

polymer

inline mixer

aquen
Common application
Pathway of conditioning for chamber filter press

polymer

polymer

pump
Common application
Pathways of conditioning for chamber filter press

- Polymer
- Buffer tank
- Inline mixer
- Pump
- Filter press
Common application
Conditioning for decanter / centrifuge

digested sludge

Polymer

decanter / centrifuge
Floc structure -
The key for the dewatering process

\[ \chi = 18.4 \times 10^{-6} \ \text{kg}^2 \text{s}^{-2} \text{m}^{-4} \]

\[ \chi = 1.87 \times 10^{-6} \ \text{kg}^2 \text{s}^{-2} \text{m}^{-4} \]

Target: Generation of a specific floc structure adapted to the dewatering / separation equipment

\[ \chi = \text{filterability [based on the CST (Vesilind, 1988)]} \]
Pixel = 40 \mu m
Floc structure -
The key for the dewatering process
Flocculation theory: Steps of the flocculation process

I. Network structures

II. Floc Interaction

III. Discrete Flocs

IV. a Floc Erosion/Destruction

IV. b Floc Pelleting = good dewatering
It is not possible to generate a specific floc structure with only one mixing device.
It is not possible to generate a specific floc structure with only one mixing device.

Requested floc structure:  

![Graph showing floc size, floc shear resistance, and floc density against Inline Mixer n [min⁻¹]]
Scheme of FlocFormer

Two step process:
1. Polymer mixing
2. Floc forming

The rolling motion in the gap between the rotating cone and the case improves the flocs. The sides of the gap remain parallel; width of gap adjustable. The speed of rotation of the cone is adjustable.
Flow within the gap

Top pic = slow rotation; bottom pic = faster and better dewatering result
Floc structure
FlocFormer application

36 m³/h FlocFormer (5L)

18 m³/h FlocFormer (3L)
Optimization of screw press

Huber ScrewPress
http://www.huber.de/products/sludge-treatment/dewatering/rotamatr-screw-press-ros-3q.html and
ISGK Ishigaki Screw Press www.ishigaki.co.jp
Municipal sludge dewatering optimization of screw press - results

Digested sludge
Note: typically longer HRT in DE and consequently more VSR
Municipal sludge dewatering optimization of screw press - results

(WWTP Graz, Austria –anaerobic digestion)

Polyelectrolyte expressed as active ingredient
Dewatering without FlocFormer was optimised by the WwTW
Optimization of decanter centrifuge operation
Optimization of decanter centrifuge operation

Common dewatering result – conventional poly system without FlocFormer
Optimization of decanter centrifuge operation (digested sludge)
Optimization of decanter centrifuge operation
Westfalia-Separator (WWTP Oelde) – results
Effect of changing cone speed and gap

polymer consumption: 6.5 - 7.0 g/kg DS
Optimization of decanter centrifuge operation

TS increasing WWTP Bremen Farge

- FlocFormer/flocculant II
- FlocFormer/flocculant I
- without FlocFormer
Sludge dewatering decanter centrifuge

FlocFormer like Digested sludge
Optimization of belt filter press
Optimization of belt filter press

Excess sludge, WWTP Linz-Unkel, Waste Activated Sludge
Optimization of Belmer Winkelpresse (belt filter press)

WWTP Olching, Germany, digested sludge
Optimization of chamber filter press

TS dewatered [%]

without FlocFormer | with FlocFormer

(WWTP Ratekau, Schleswig Holstein)
Optimization of chamber filter press

Increase of filling feed %

(WWTP Colone Wahn)
Optimization of Bucher press

WWTP Scharzfeld, Germany, 2-week test, conventional digested sludge c58%VS
Municipal sludge dewatering
Optimization of TornadoPress, Japan

The Tornado Press is similar to a Screw Press but with a vertical axis.
FlocFormer trials Kyoto and Niigata, Japan
Municipal sludge dewatering Japan
Optimization of TornadoPress operation

Polymer consumption [g/kg TS]

TS dewatered [%]

common process  FlocFormer

common process  FlocFormer

WWTP Kyoto, Japan
DeSiFloc
COD separation for landfill leachate treatment

**coagulation**
COD approx. 3.500 mg/L

Biological pre-treated leachate

**COD separation**
COD approx. 210 mg/L

rotating disc thickener

COD < 200 mg/L

effluent

Activated carbon to assure <200 mgCOD/L, which is the requirement for discharging to river; better COD removal in the thickener extends the life of the activated-C
DeSiFloc
COD separation for landfill leachate treatment
DeSiFloc
COD separation for landfill leachate treatment

Flocculation and separation effort
Resume

Important facts for a short payback period

1. Correct positioning of the FlocFormer in the process
   FlocFormer should be immediately before the dewaterer/thickener so that the conditioning is not damaged by pumping, etc.

2. Adjustability of the dewatering/separation device

3. Choice of a adequate flocculant
Thank you!

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