The FAST-process and sieves at Kalmar WWTP – effective pre-treatment for a nitrogen reduction plant

IWAMA Webinar 4

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Kalmar Water

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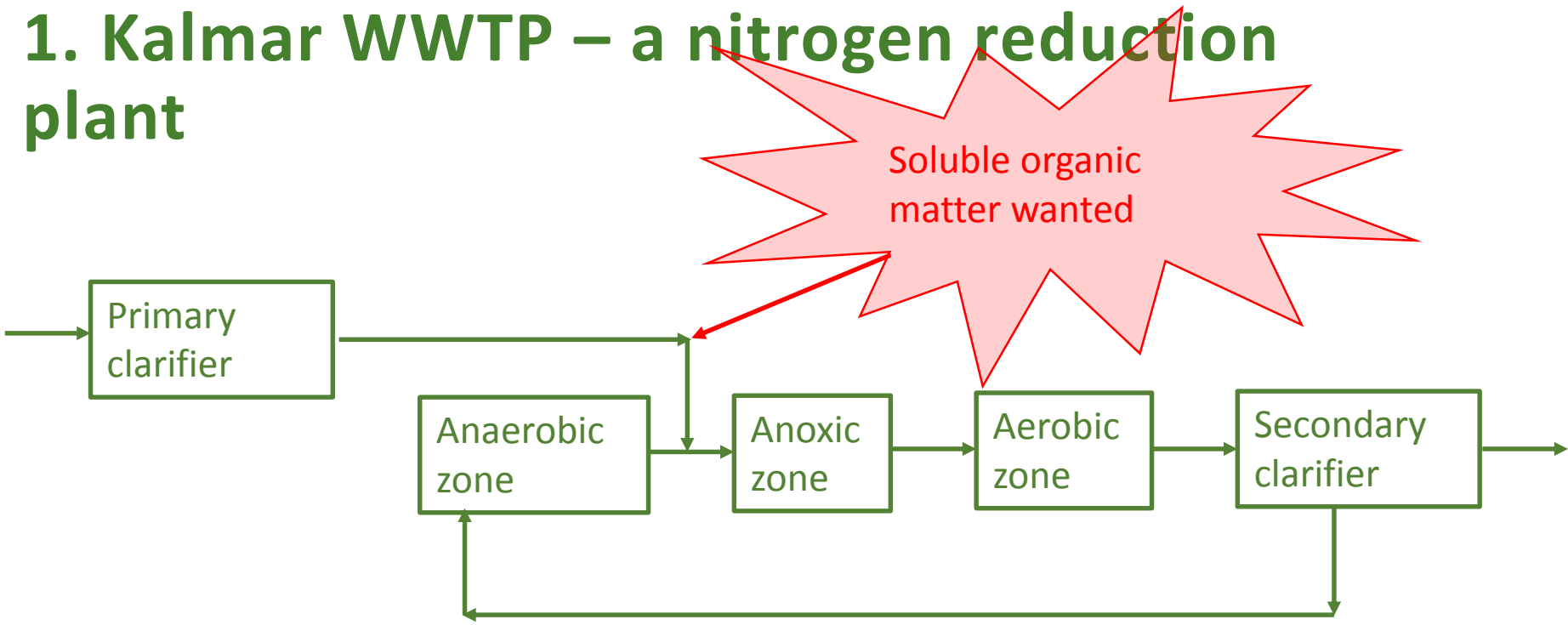
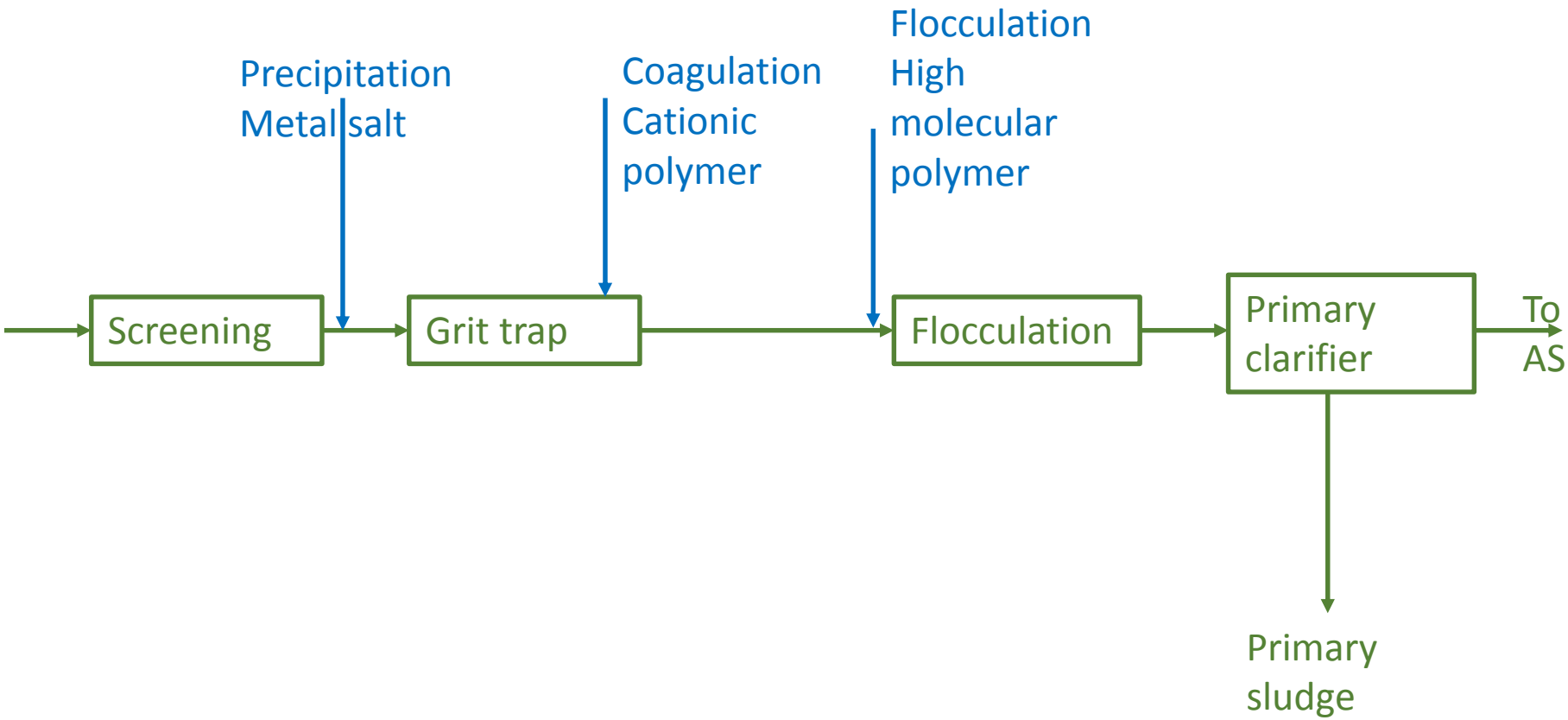
Content of presentation

1. Kalmar WWTP – a nitrogen reduction plant
2. FAST-process
3. Sieves for screening

1. Kalmar WWTP – a nitrogen reduction plant



2. FAST-process



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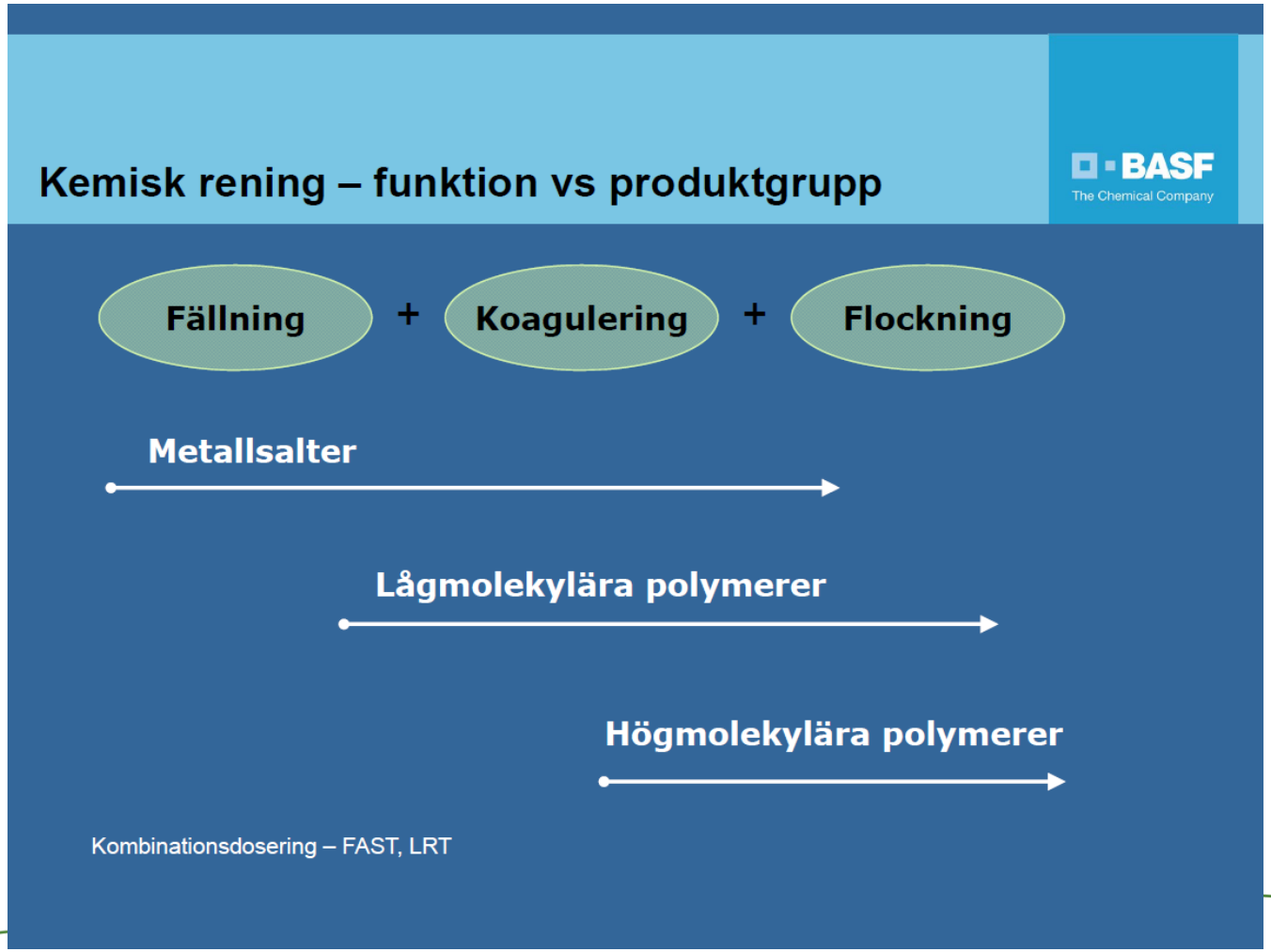

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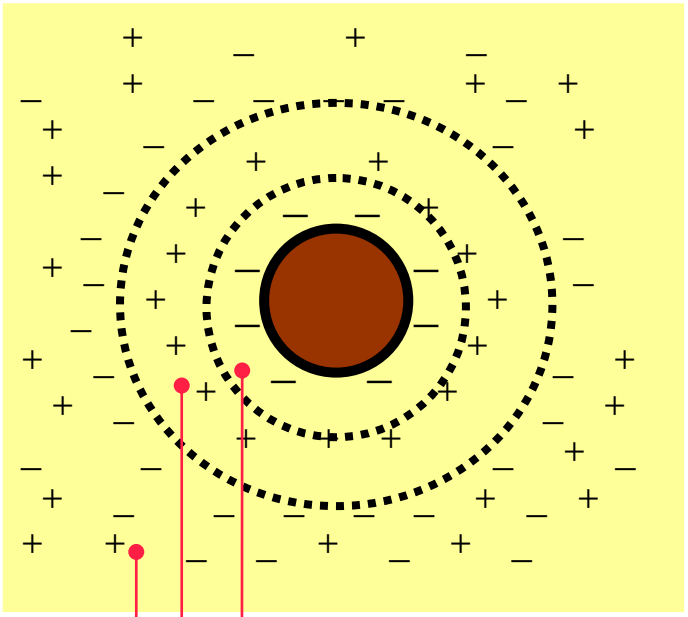
Chemical precipitation with $FeCl_3$

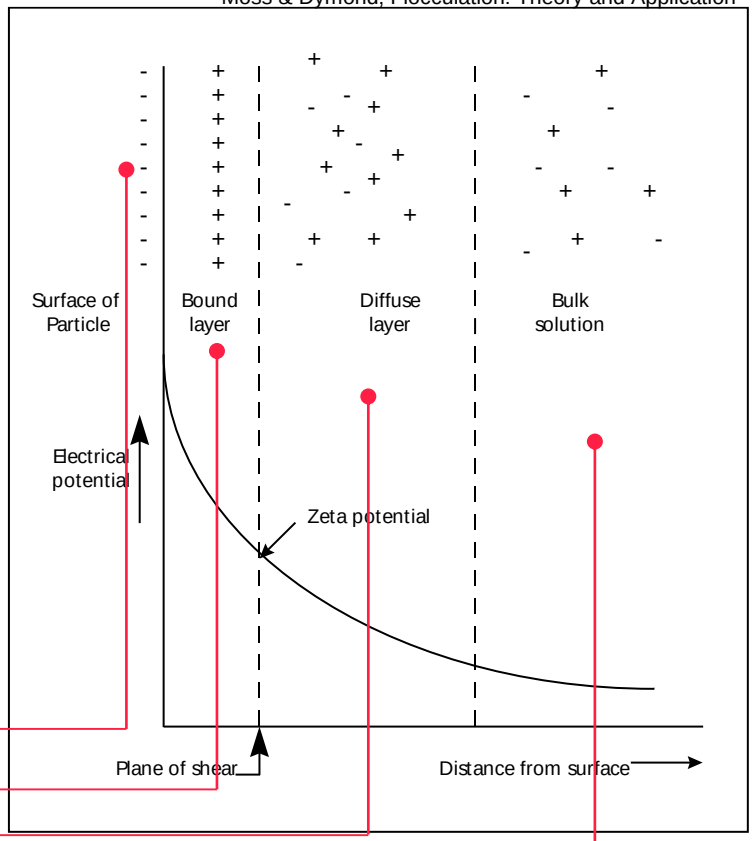
$$2Fe^{3+} + 6Cl^{-} + PO_4^{3-} + 3H_2O \rightarrow Fe(OH)_3 + FePO_4 + 6HCl$$

Soluble substances/ions -> soluble molecules/crystals + acid

Principle FAST-process (BTC)



Moss & Dymond; Flocculation: Theory and Application



Colloid with **negative particle surface**

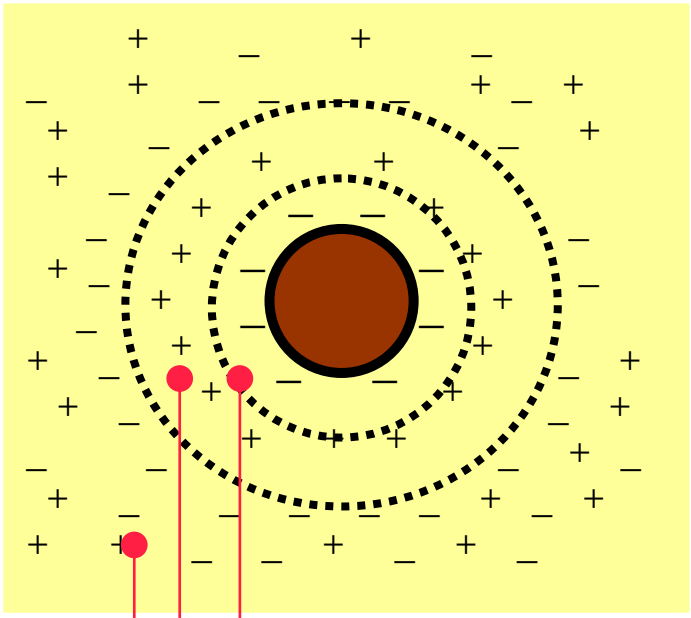
Compakt layer of antiions = **Sterns layer**

Diffuse layer of antiions, Zeta potential

Bulk solution, **Gouy Chapmans layer**

Figure 3: The Zeta Potential

Principle FAST-process (BTC)



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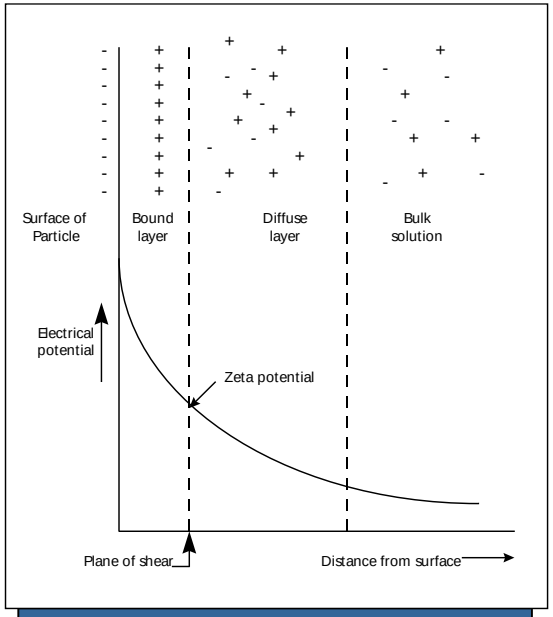
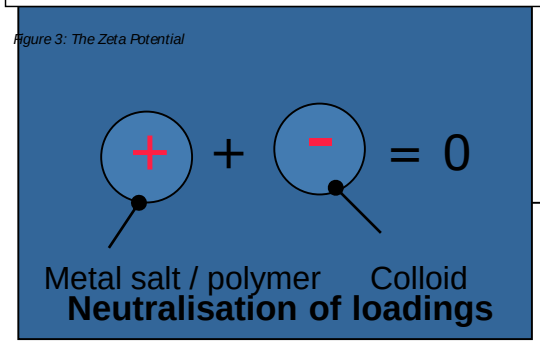


Figure 3: The Zeta Potential



Take out the electro static forces

↓

Colloids can come close to each other

↓

Coagulation, joining with van der Wals forces

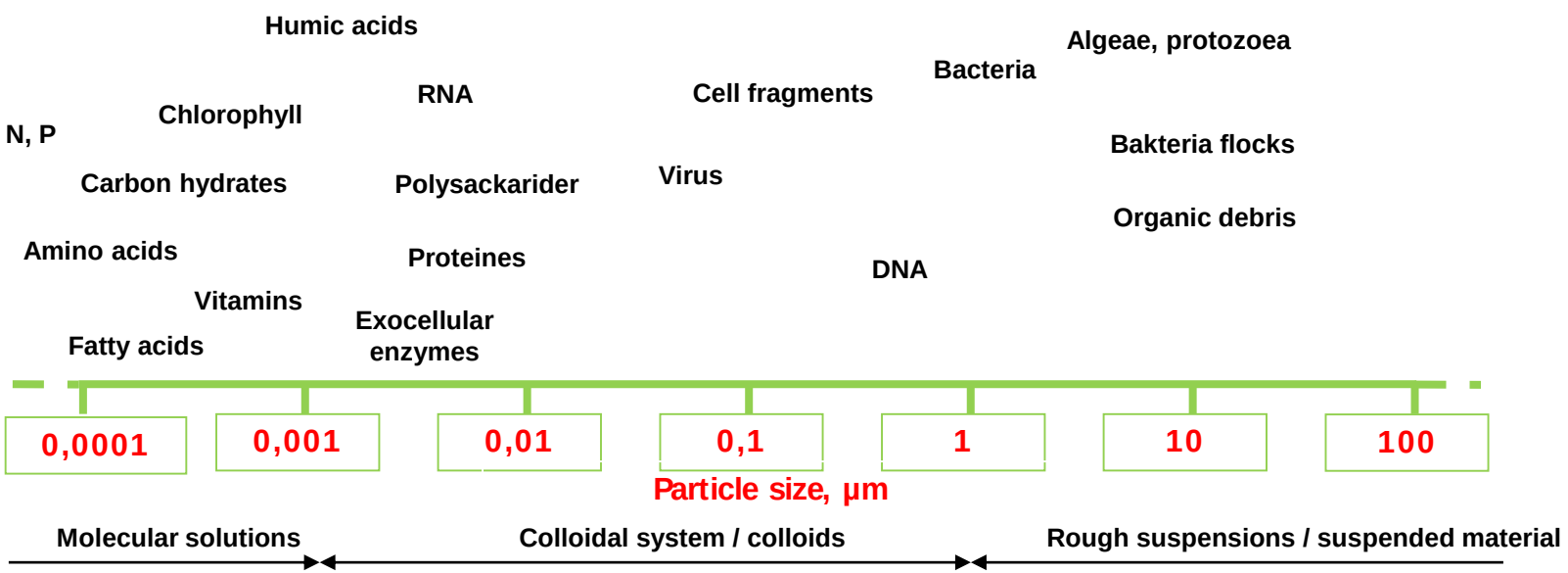
Principle FAST-process (BTC)

Process:

Precipitation	Coagulation	Flocculation

Precipiation, coagulation and flocculation chemicals:

Me^{2+} / Me^{3+}	/ PAC	Low molecular p	High molecular p



Size relations:

Hail corn *Tennisball* *Fotball* *The Globen (Stockholm)*

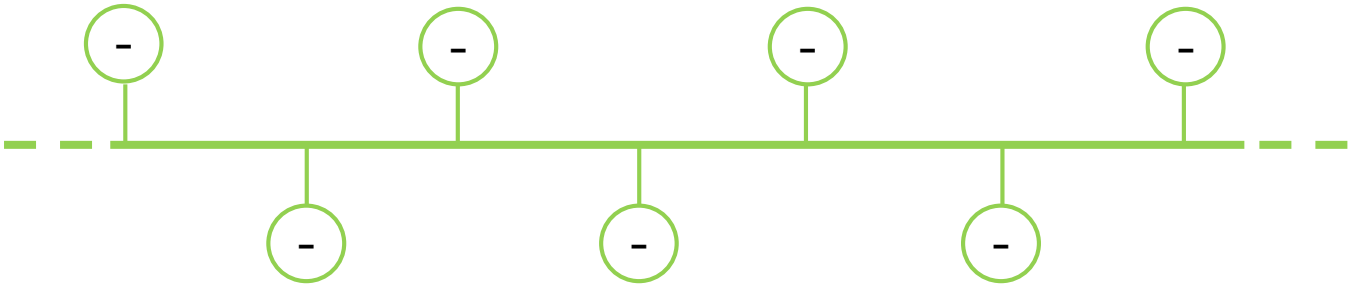
Freely adjusted figure, originLevin et al

Description of polymers

Substance that is made up of long chainlike molecules.

The parts of the chain are called monomers.

Types of polymers



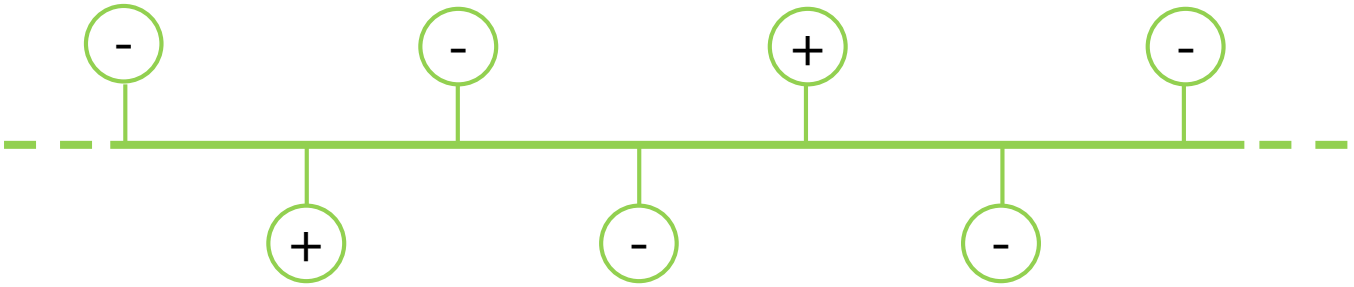
Type av loading: nonionic (0), anionic (-) eller cationic (+)

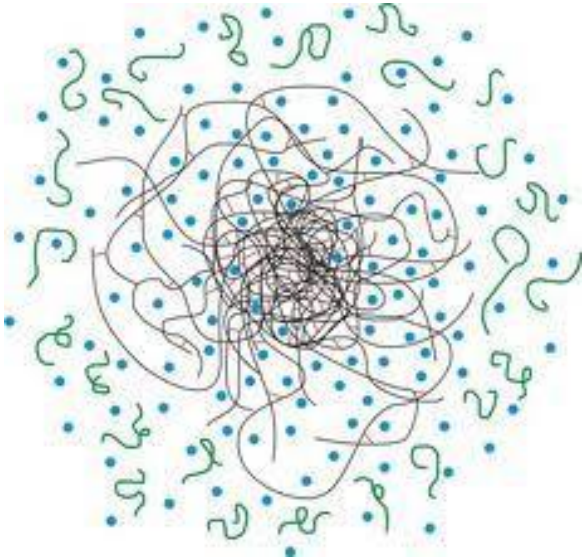
Density of loading: Strength of loading (high, low, average)

Molecular weight: ”high molecular, HM”

” low molecular, LM”

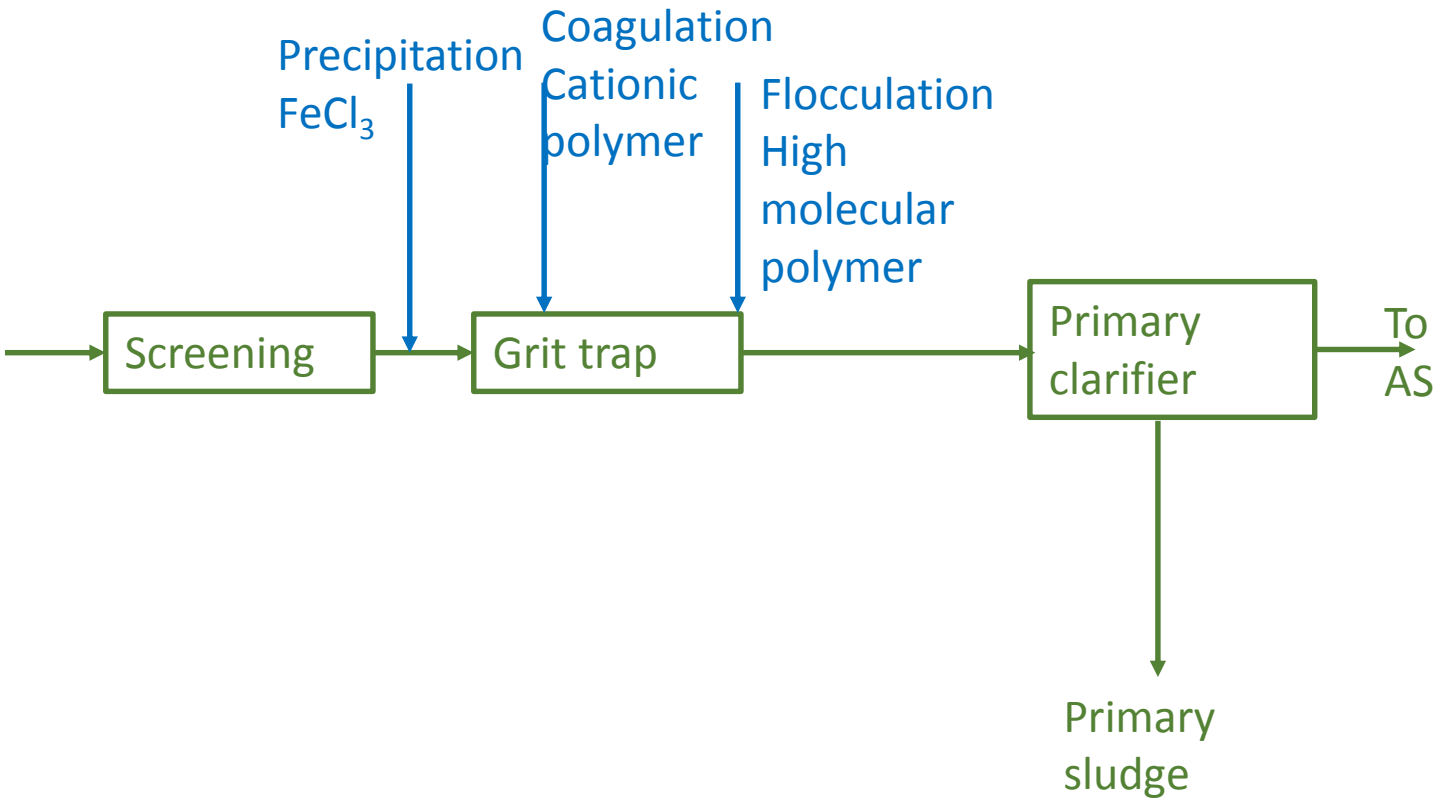
High molecular polymer





Source: www.DocPlayer.se

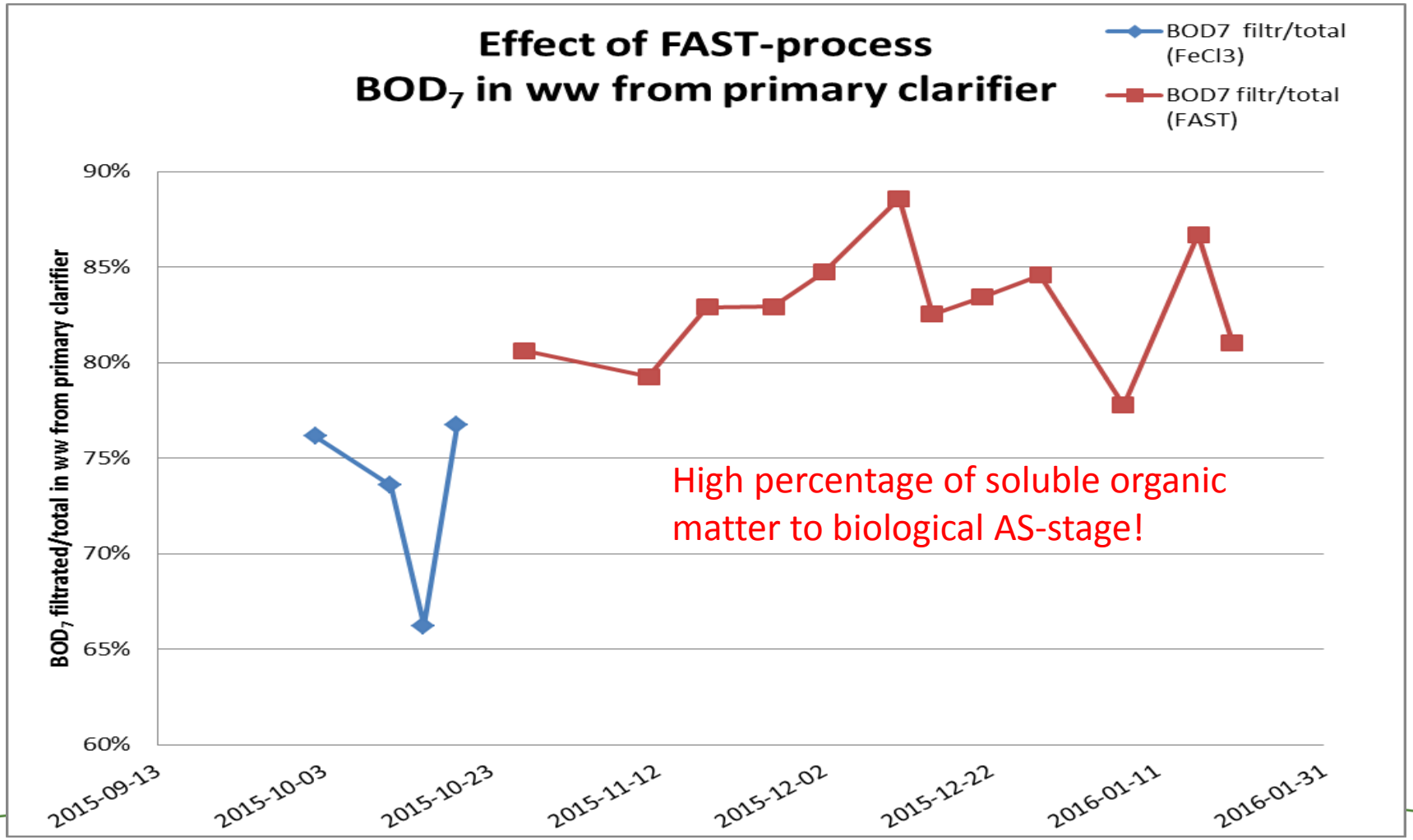
2. FAST-process at Kalmar WWTP



2. FAST-process

Metal salt (Me)	**eg. Ekoflock 54**	**20 - 80 ml/m³**
+		
Low molecular polymer (LM)	eg. Zetag 7125	1 - 4 ml/m³
+		
High molecular polymer (HM)	eg. Magnafloc 919	0,1 - 0,2 g/ m³

2. FAST-process at Kalmar WWTP



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2. FAST-process

1. Optimization of particle reduction
2. Good settling characteristics of produced flocs
3. High TS-content in primary sludge
4. High percentage of soluble organic matter to biological stage
5. Minimum reduction of alkalinity in pre-treatment

3. Sieves for screening

Before: 3 mm step screen:

- Large amount of scrap in primary sludge

⇒ agglomerations of scrap in gravity thickener

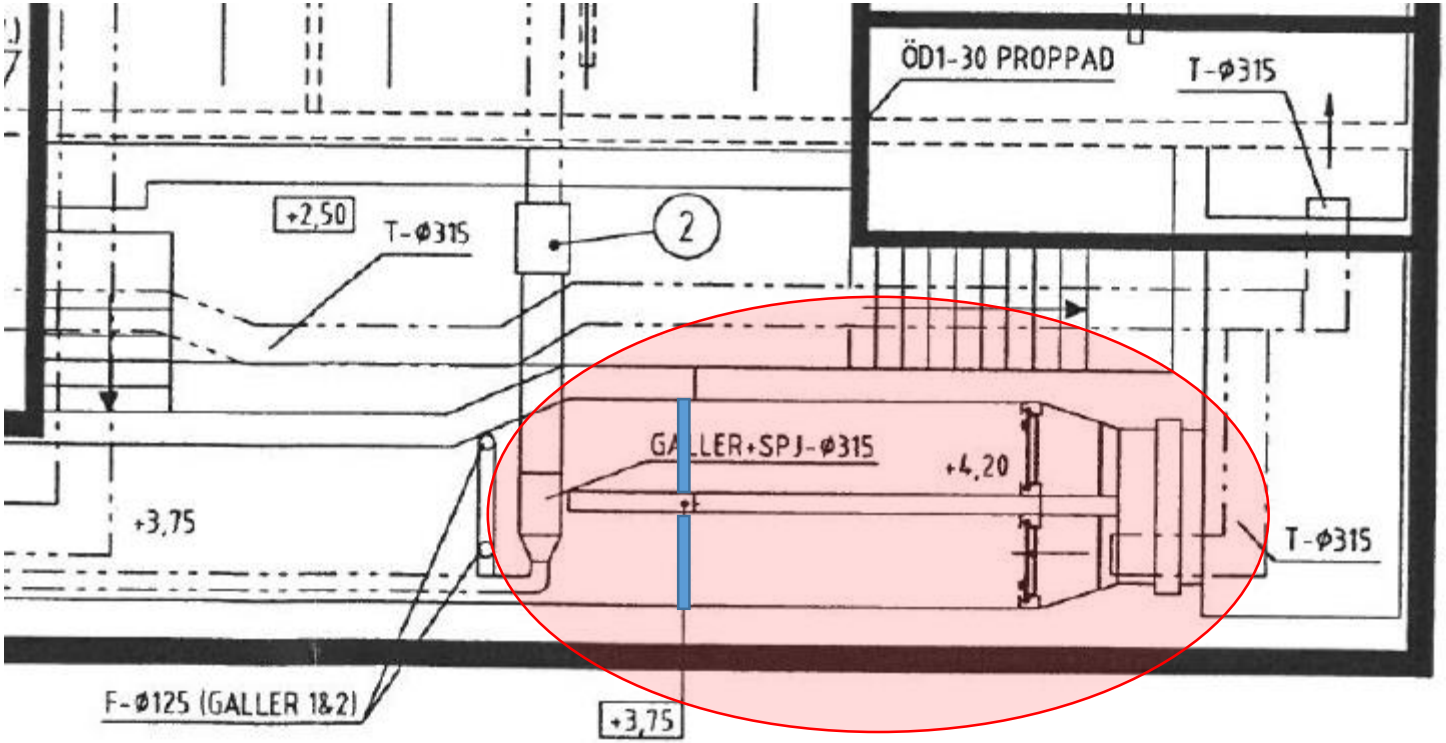
⇒ chokes of sludge floated to the surface and disturb the thickening process

- Scrap accumulating in SBR-process

⇒ agglomeration of scrap around the decanter with risk for disturbances

⇒ scrap being sucked into the sampling pumps – disturbing sampling process and online measuring instruments

3. Sieves for screening



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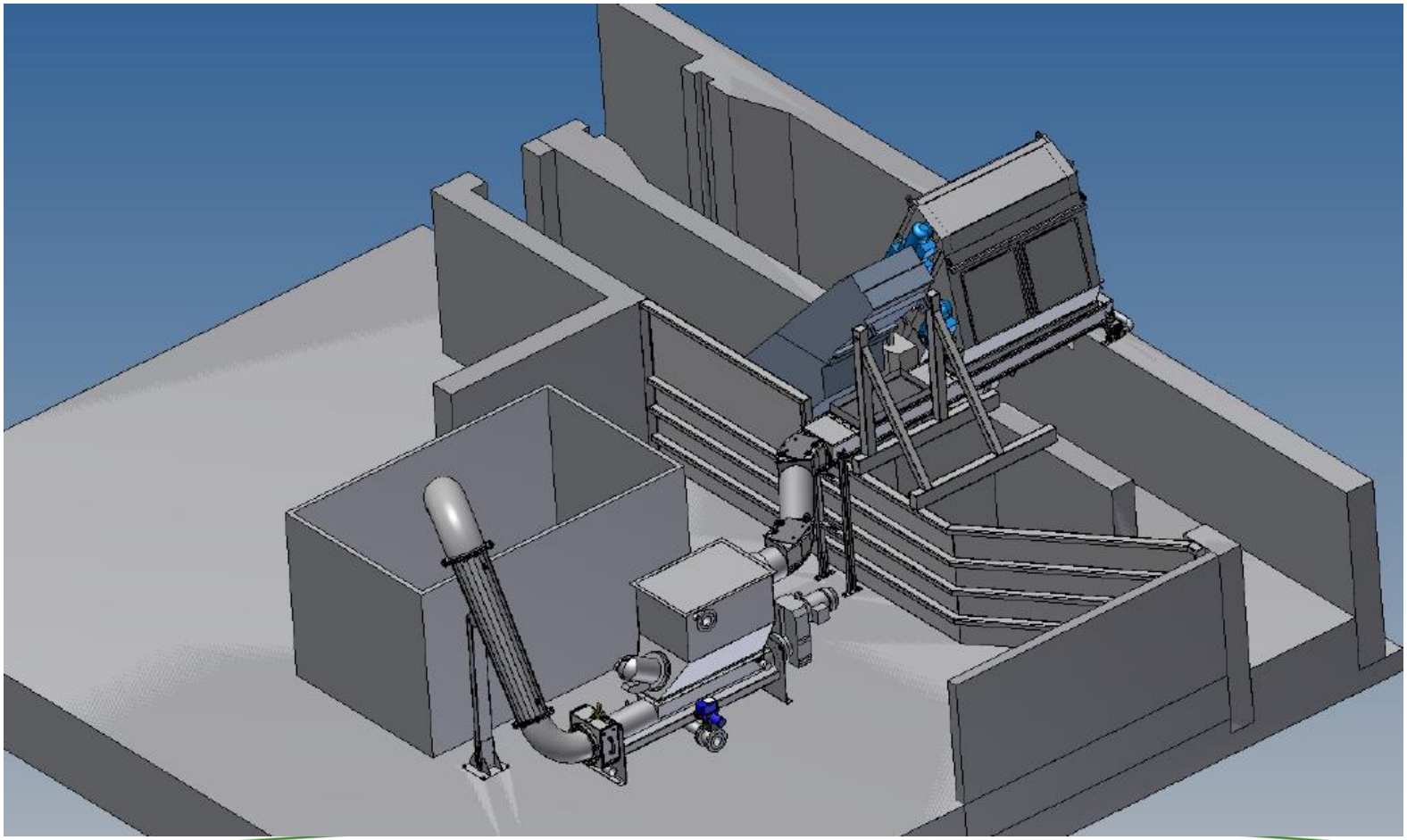
3. Sieves for screening

Measures to be taken:

- Operation of plant without screens during 6 weeks
  - ✓ Influent was led to one primary clarifier
    => as an attempt to catch some of the screens in that tank
  - ✓ The water was then led to the primary clarifiers
- Emptying and cleaning inlet channel
- Breaking down middle wall
- Installation of equipment:
  - ✓ One sieve 6mm punch hole
  - ✓ One washing machine for screens
  - ✓ One old step screen for recirculating streams and high inlet flows

3. Sieves for screening



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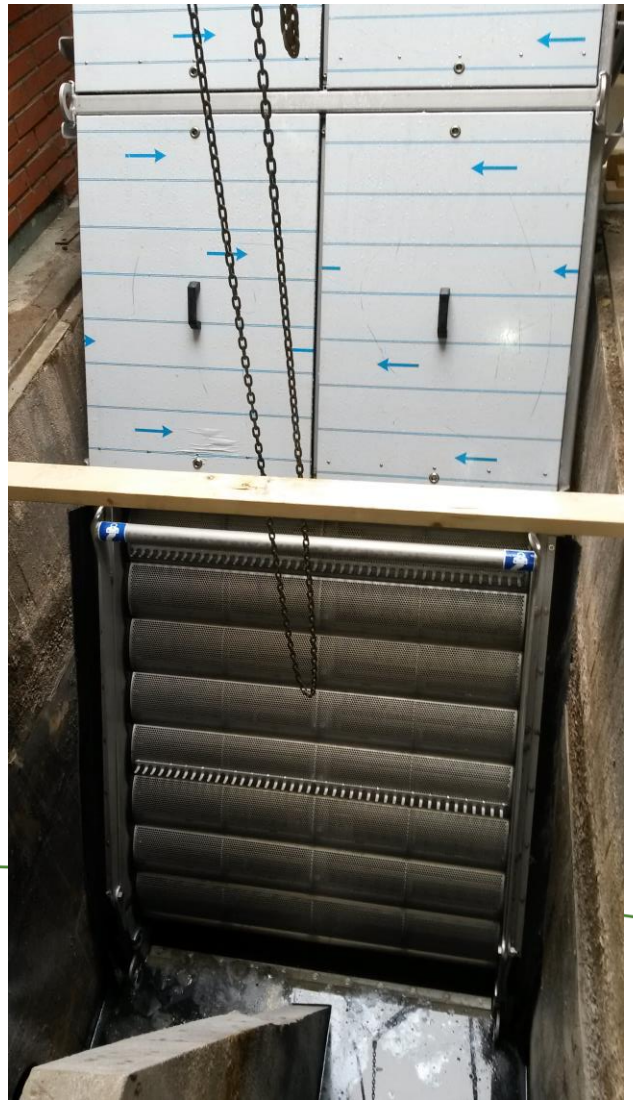

3. Sieves for screening

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3. Sieves for screening

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Results:

- Low organic content in screens
- Higher TS in screens compared to screen press
- Less scrap in primary sludge => better function of gravity thickener
- Less scrap in SBR => better function/less risks

3. Sieves for screening

3. Sieves for screening

3. Sieves for screening

Thank you for your attention!

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