CIE4485
Wastewater Treatment

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Guestlecture

3. Sieving the wastewater
Sieving the wastewater

Recovery of cellulose

15 November 2011

Content

Introduction

Full scale sieve installation wwtp Blaricum

- Project Blaricum
- Removal and degradation of cellulose fibers
- What to do with the recovered fibres?
- Results 2011

Conclusion
- Wastewater consists of many components.
- Toilet paper is a large fraction of the suspended solids.
- Wastewater consists of many components.
- Toilet paper is a large fraction of the suspended solids.

- No literature about degradation of toilet paper?
- Recover toilet paper out of the influent?

- Why sieves? Many alternatives like DAF, flocculation, membranes, lamella etc.
Some references, no biology

- Ørsta, Vartdal
- Tromsø, Hamna
- Tromsø, Breivika
- Namsos Tiendeholmen
- Alesund, Flñnes
- Ålesund, Skutvika

Sieving the wastewater
No biology, only mechanical treatment!

Tomasjord RA Tromsø.
500 l/sec- 45 000 PE-
1,800 m³/h
Process description

Sieving the wastewater

Inlet

Outlet

Air doctor

High pressure flushing

Air cleaning
Why is it so interesting?
Footprint
Sieving 25% ds versus primary sludge 5% ds
Removing inert COD?

Conventional Primary Treatment

Sieve

Secondary Treatment (Biology)

Secondary Treatment (Biology)

Sludge production
Energy
Sludge handling
Sludge transport

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Conclusion
Research location WWTP Blaricum
2008 – 2009
Waternet, Stowa, TU-Delft

Project WWTP Blaricum, January 2011

Sieving the wastewater

Sieving the wastewater
**Goal research wwtp Blaricum**

1. Improvement in costs & energy
2. Alternative for pre settler?
3. Effects on biological process & sludge treatment
4. Processing of the sieving material
5. Model the biological proces
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Paper-mâché, Salsnes
Sieving the wastewater

**Primary sludge**

60x 60x

**Activated sludge**

60x
**Digested sludge**
Same results different wwtp’s, 20 or 30 days retention time

**Fibers recovered from surplus sludge**
Mass balance sludge wwtp, Winter

Degradation cellulose
Winter 10%, Summer 50%

Influent
180 kg COD
100 kg SS including
30 kg cellulose

Out Surplus sludge
(0.4 x COD = kgds)
appr 72 kg ds
•18 kg ashes (24%)
•27 kg sludge
•27 kg cellulose

Effluent
2 kg COD
0 kg cellulose

In
25% degrad total surplus.
•Sludge (20% / 0%)
•Cellulose (48% / 70%)

Out
54 kg ds total
•18 kg ashes
•22 / 28 kg sludge
•14 / 8 kg cellulose (26%)

AT 20 d

Digester Mesophilic
20 d

Measuring cellulose fibres
wastewater characterisation and
modelling studies

In influent, sieving material, primary sludge, activated sludge, digested sludge

In modelling of activated sludge (ASM models) slowly degradable and inert COD is used. A considerable part of the inert COD will consist of toilet paper.

Updegraff (1969)
Thermografic analyses
Near Infrared Light (NIR)
Image analyses

Movie
Sieving the wastewater
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Dimensioning of WWTP in m3/m2/h

Blaricum 200 – 60 m3/m2.h
Sieving the wastewater

Removal efficiency sieve

Sieve rate 50 – 100 m³/m².h

- SS average 50%
- CZV average 35%

Sieve rate 100 – 200 m³/m².h

- SS average nb
- CZV average 25%

€ Pay back period?

Experiences Salsnes SS removal

- Hamna
- Eid
- Orkdal
- Breivika
- Tiendeholmen
- Guldholmstr
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- Processing of the sieving material

Conclusion
**Sieving material**

- >70% cellulose fibre (toilet paper)

**Paper industry**

- Possible to produce paper again
- total volume NL: 5% total paper
- Imago/hygiène 'no go'
Isolation material houses

- Smell and contaminants

Bioplastic lactic acid

- Possible
- Smell, microbes and image problems
Sieving the wastewater

Roads

- Roads: afdruipters
- Water percentage and contaminants

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Conclusion
Conclusions

• Promising technology
• At wwtp Blaricum cost effective?
• Reduced aeration energy?
• Removal efficiency comparable to pre settling tank?
• Reuse options for the sieving material promising

• Surplus sludge production with sieve? (removal of inert COD)
• Degradation % in digester?