Enhancing NOM removal

Gao Li
Jink Gude

11 May 2007

TU Delft
Delft University of Technology

List of the content

1. Last presentation
2. Ion exchange
3. Water quality analyzed
4. Ion exchange solution with micro sieve
5. The next step

1. Last presentation

Possible solutions for NOM-removal

1. Oxidation of NOM with Ozone
2. Enhanced coagulation
3. Membrane filtration
4. Ion-exchange

1. Last presentation

Possible solutions for NOM-removal

Oxidation of NOM with Ozone

+	-
Good for overall water quality	Algae bloom
Easy implementation	No complete removal
	Cost

1. Last presentation

Possible solutions for NOM-removal

Enhanced coagulation

+	-
Low cost solution	DOC vs PO_4 removal
Easy implementation	No complete removal

TU Delft

1. Last presentation

Possible solutions for NOM-removal

Membrane filtration

+	-
High reliability	Cost
Complete removal	

1. Last presentation

Possible solutions for NOM-removal

Ion-exchange

+	-
Good implementation	Cost
High reliability	
Good removal	

1. Last presentation

Solution

Ion-exchange

2. Ion exchange

Ion-exchange

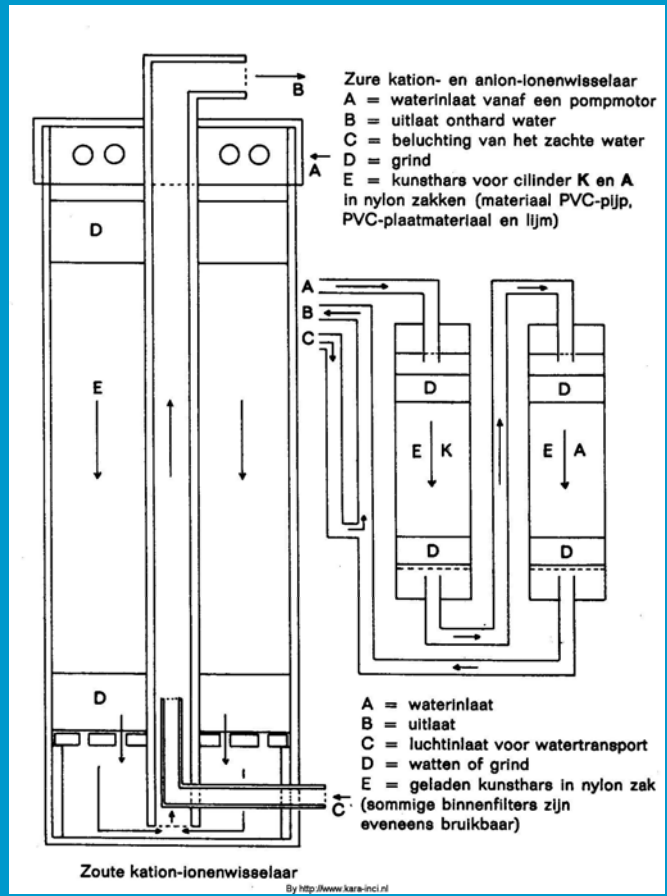
IEX → flow under gravity

Water must have low SS concentration

FIX → fluidized

Water can be more turbid

NOM is replaced by Cl^- in both cases



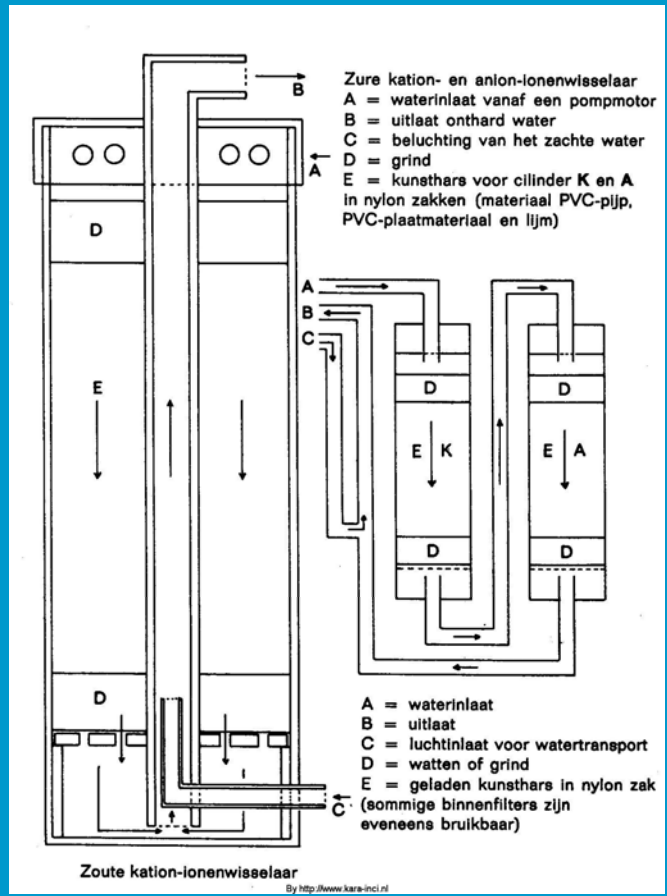
2. Ion exchange

Ion-exchange

IEX

The ion-exchange raisins are more efficient in water with low turbidity and SS concentration

So: if possible IEX must be placed after the lake

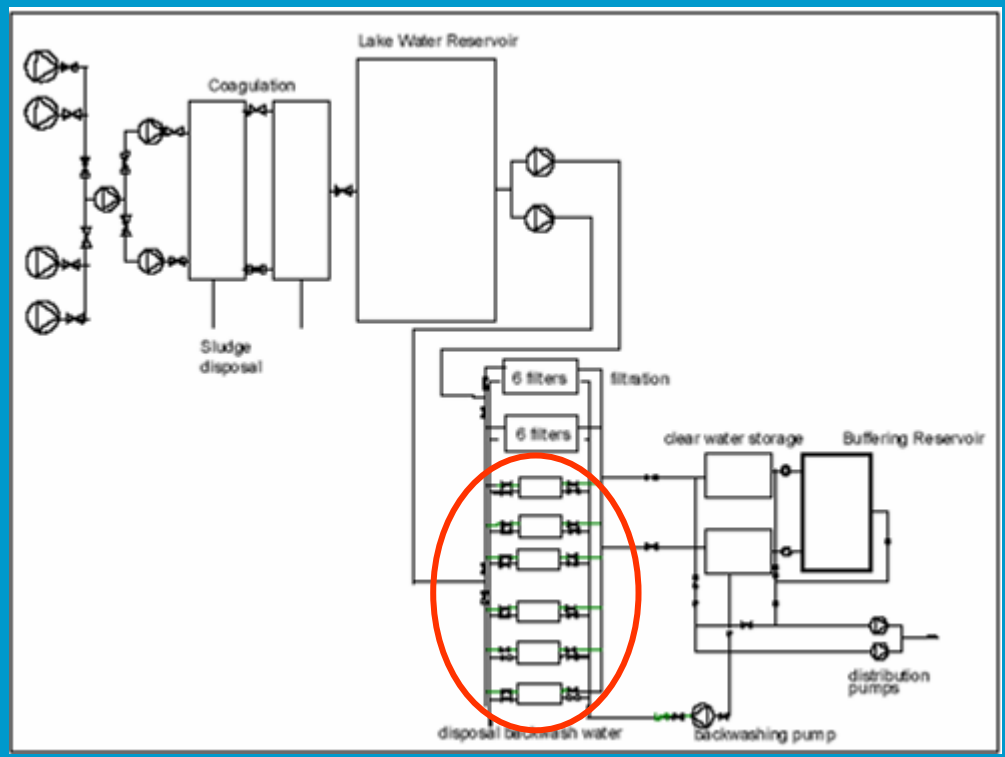


3. Water quality analyzed

	Suspended solids	DOC	UV extinction	pH
	mg/l	mg/l	ext/m	
Raw water	**15**	**11**	**30**	**7,5**
Removal eff coagulation	50%	37%	33%	
After coagulation	**7,5**	**7**	**20**	**7,1**
Removal eff lake	90%	8%	25%	
After Lake	**< 1,0**	**6,5**	**15**	**7,6**
Removal eff RSF	0%	0%	0%	
After rapid sand fitration	**< 1,0**	**6,5**	**15**	**7,4**
Removal eff Post-T	[-]	70%	70%	
After Post treatment	**< 1,0**	**2**	**4,4**	**8,6**

TU Delft

3. Water quality analyzed



TU Delft

3. Water quality analyzed

Rapid sand filtration

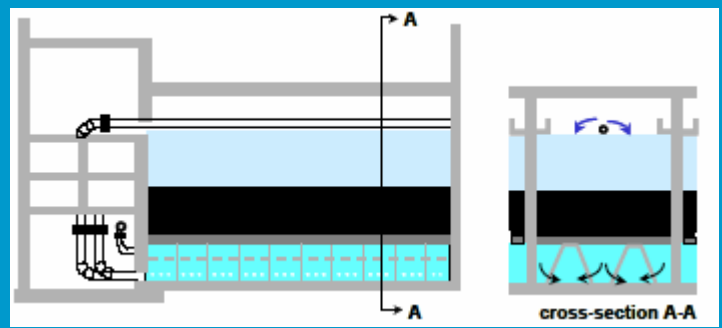
24 filters of 48 square meters

Max filter loading 6 meter / hour

Good condition

Function:

1. Prevents mussel and algae grows in transport pipes to post-treatment
2. Some nitrification



TU Delft

4. Ion exchange solution with micro sieve

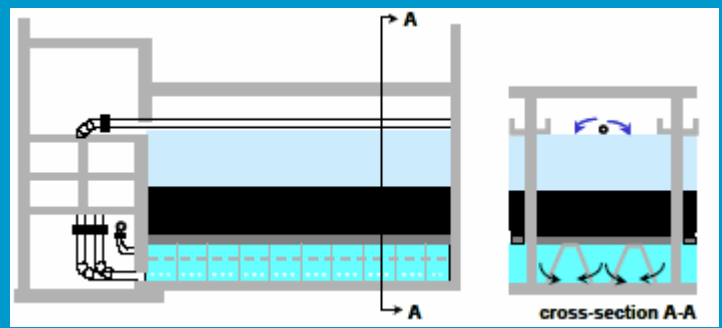
Rapid sand filtration units filled with raisins

Problem:

If you take RSF out of order, u must stop algae and mussel grows.

Solution:

A micro sieve of 0.035 mm will sieve algae and prevent mussels from growing afterwards

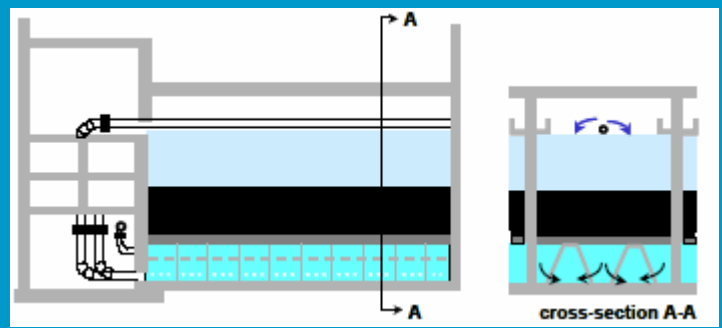


TU Delft

4. Ion exchange solution with micro sieve

Rapid sand filtration units filled with raisins

Effluent lake will be pumped trough a micro sieve to prevent algae and mussel grows in IEX filters and transport pipes.



This will keep runtimes of filters high and keep raisins longer clean.

Also a raisin can be added to switch NH_4^+ ions with Na^+ ions

TU Delft

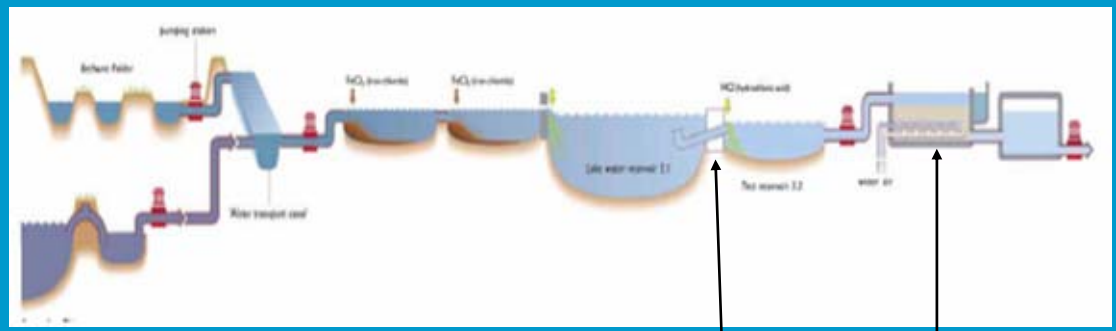
4. Ion exchange solution with micro sieve

	Suspended Solids	DOC	UV extinction	pH
	mg/l	mg/l	ext/m	
Raw water	**15**	**11**	**30**	**7,5**
Removal eff coagulation	50%	37%	33%	
After coagulation	**7,5**	**7**	**20**	**7,1**
Removal eff lake	90%	8%	25%	
After Lake	**< 1,0**	**6,5**	**15**	**7,6**
Removal eff IEX	0%	60%	60%	
After Microsieve and IEX	**< 1,0**	**2,4**	**6**	**7,4**
Removal eff Post-T	[-]	70%	70%	
After Post treatment	**< 1,0**	**0,72**	**1,8**	**8,6**

TU Delft

4. Ion exchange solution with micro sieve

Ion-exchange



M.S.

I.E.

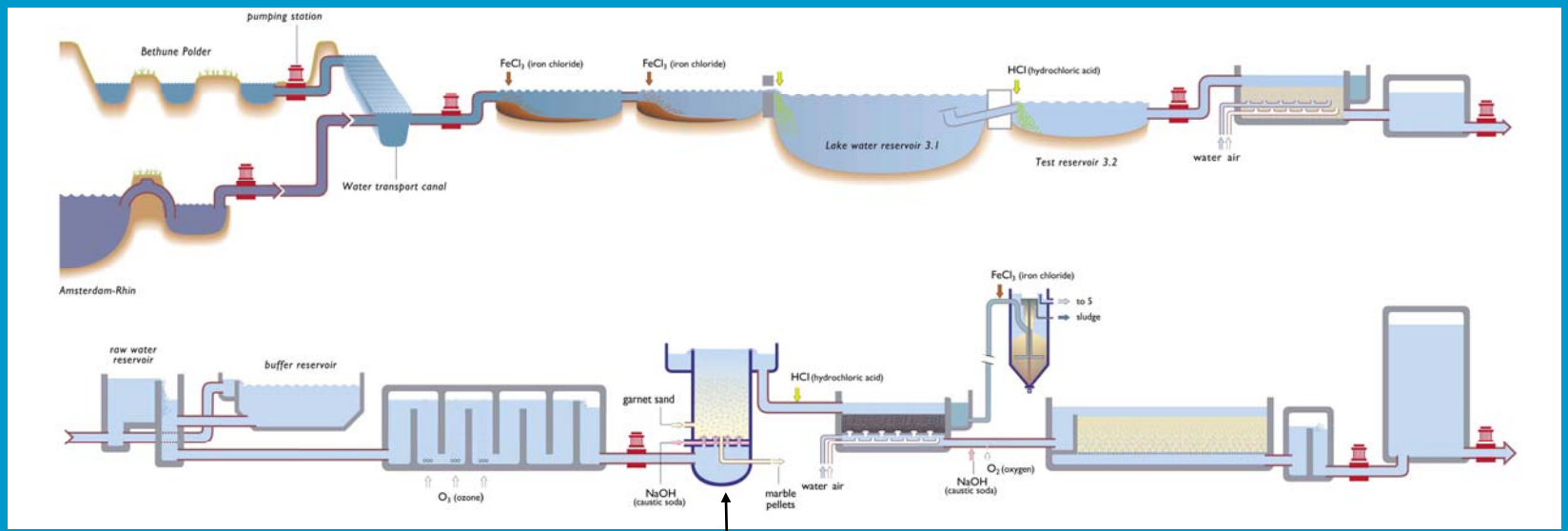
Thank you!

Questions?

TU Delft

3. Applications of the solutions

Lime-Soda Softening Process Modifications for Enhanced NOM Removal



TU Delft