AMSTERDAM INTERNATIONAL WATER WEEK

AQUATECH AMSTERDAM

Preparing the Future: Strategic Asset Management

Weren de Vet

Alex Roling

November 3, 2015

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TECHNOLOGIES

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Modular potable water treatment as response to a changing environment

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WML : Facts & Figures

Province of Limburg, the Netherlands

Population 1,1 million

525 000 households; 15 000 companies

Water supply: 72 Mm^3 per year

22 sources (GW, SW, RBF); 19 WTP (4 Softening)

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Dealing with an uncertain future

- **Demographic change;**
- **Environmental pollution;**
- **Climate change;**
- **State of the art technologies.**

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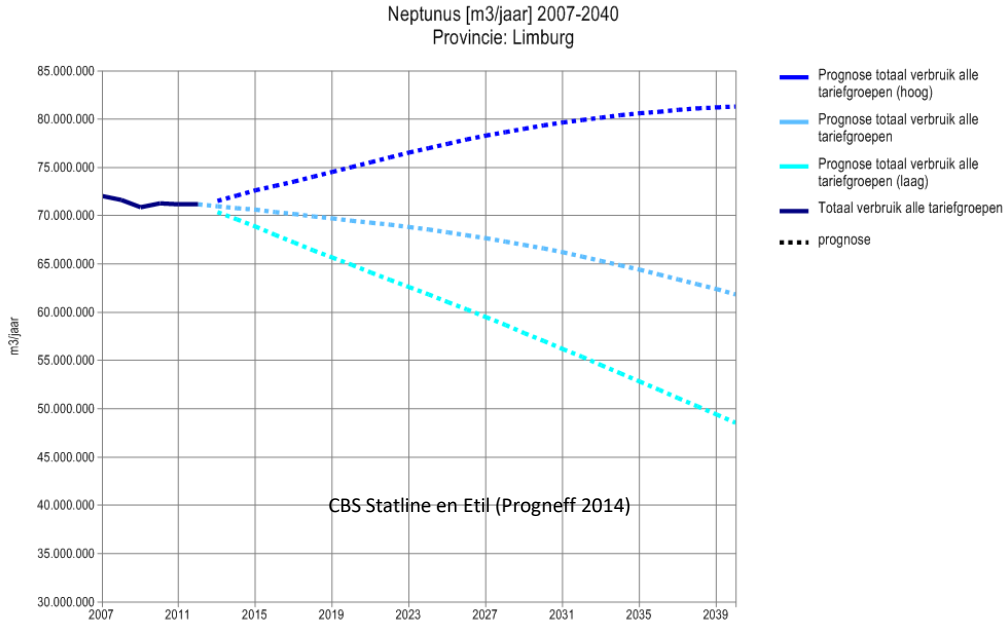
Water demand



Bronnen: ABF Research, Waterleiding Maatschappij Limburg

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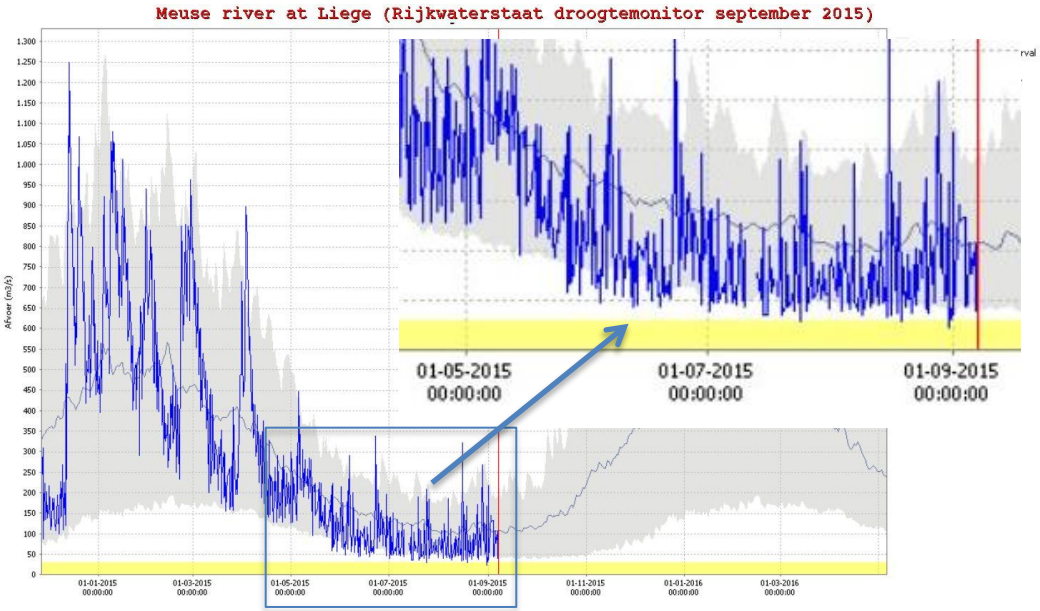
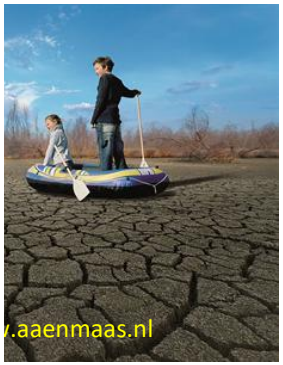
Pollution peaks aggravated by climate change





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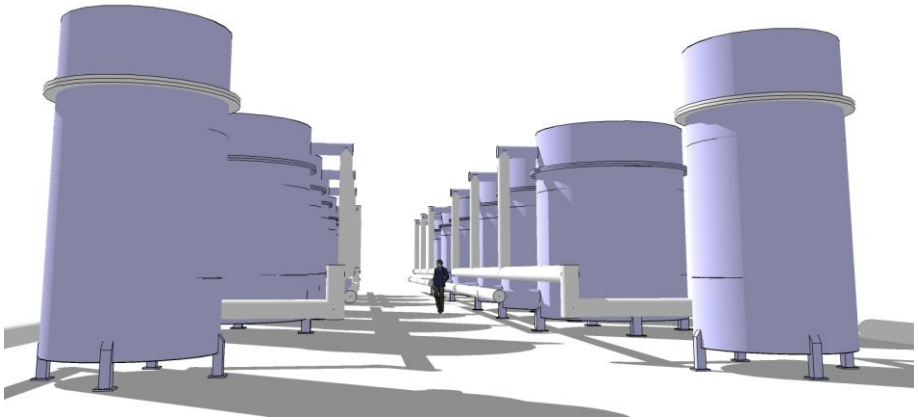
The solution:
Modular Treatment Concept (MTC)

- **Standardized, modular treatment;**
- **Uniformity and flexibility (adaptability);**



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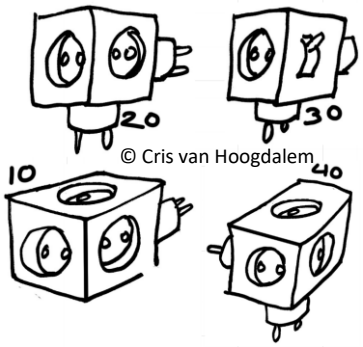
Development MTC



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- Categorisation of source waters;
- Standardisation of treatment steps;
- Standardisation of module size;
- Standardisation of plant layout.

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Source quality WML

	Hyg. risc	Hard/ soft	inorg. comp.	Methane	Antrop. comp.	(An-)aerobic/ Nitrate	WTP
1	(+)	++	-	-	(+)	+	3
2	-	+	+	-	-	-	3
3	-	-	+	-	-	(-)	5
4	-	- -	++	-	-	-	1
5	-	+/-	+/++	+	+/-	-	5
6	+	+	+/-	-	+	+	2

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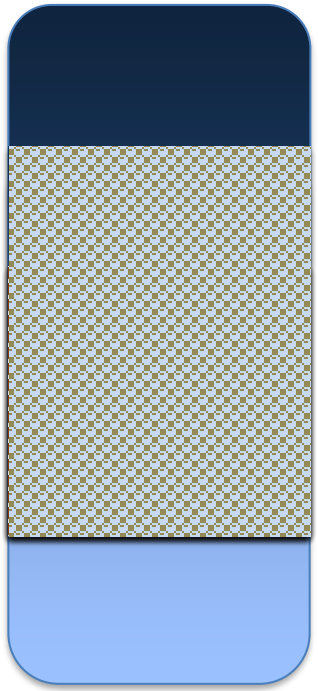
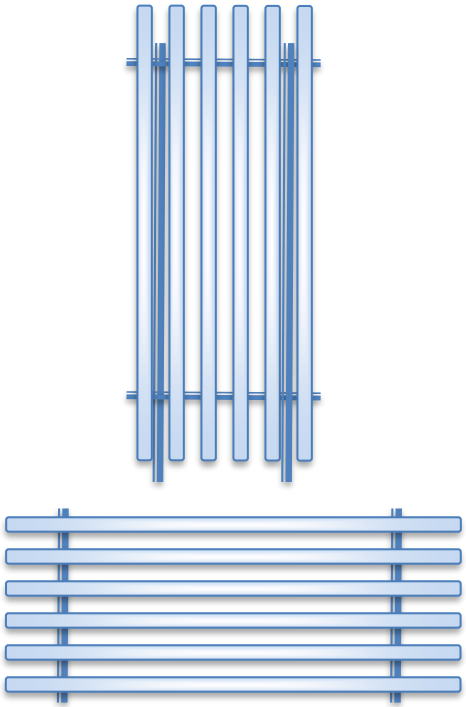
[1] Stuyfzand, P.J. 1996. Salinization of drinking water in the Netherlands: anamnesis, diagnosis and remediation. SGU Rapporter och Meddelander 87, Proc. 14th SWIM, 17-21 June 1996, Malmö, Geol. Survey Sweden, Uppsala, 168-177.

4 basic processes

Filter-/IEX/gas exchange/fluidized bed unit (open/pressure)

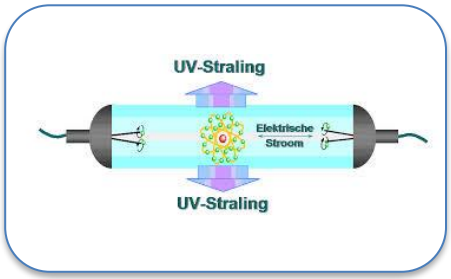


Membrane unit



Fluidised bed unit

UV-/AOP unit



WTP: large scale & uncertain: Fixed base with flexible skin

			Fixed base		Flexible skin
Cat*	Mm³/j Actual capacity	Mm³/j Expected capacity 2040	Mm³/j Min prgn 2040	Mm³/j Max prgn 2025	Mm³/j
1	**14,5**	13,1	**10,2**	14,5	**4,3**
1	**7,5**	6,8	**5,3**	7,5	**2,2**
1	0,9	0,9	0,7	1,0	0,2
2	2,0	1,5	1,2	1,8	0,8
2	2,0	1,8	1,4	2,0	0,6
2	2,0	2,0	1,6	2,4	0,4
2					
3	0,9	0,9	0,7	1,0	0,2
3	3,1	3,2	2,5	3,8	0,6
3	2,5	2,3	1,8	2,5	0,7
3	**4,5**	4,5	**3,5**	4,5	**1,0**
3	4,8	5,4	4,2	6,0	0,6
4	0,9	0,9	0,7	1,0	0,2
5	2,0				
5	2,0	1,8	1,4	2,0	0,6
5	**4,5**	4,5	**3,5**	5,0	**1,0**
5	2,3	2,3	1,8	2,3	0,5
5	2,3	2,3	1,8	2,5	0,5
6	**14,5**	16,7	**13,1**	20,0	**1,4**
6	2,5	2,3	1,8	2,7	0,7

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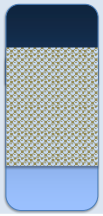
Main processes: 2 standard modules

Modular size: 50 m^3/h (AVG)

Application	Capacity AVG-MAX	Characteristics AVG-MAX	Surface area m^2	
Standard reactor module				
Floc(king) de-ironing Surface processes C.O./particle removal Special (marble, act. carbon, greensand, exp. clay etc.) Submerged/trickling Up-downflow Pressure/open	50-100 m^3/h	Filtration rate 5-10 m/h	10	
Highly loaded reactor module				
Tower gas exchange Highly loaded de-ironing filter	200-400 m^3/h 50-100 m^3/h	Surface load 50-100 $m^3/m^2 \bullet h$ Filtration rate 12,5-25 m/h	4	

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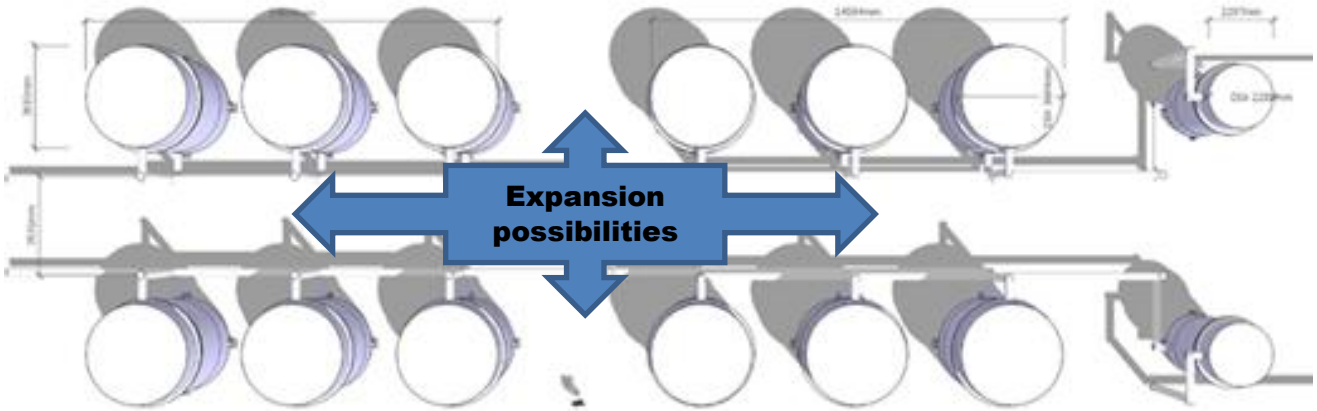
Expansion / reduction of capacity and/or process steps



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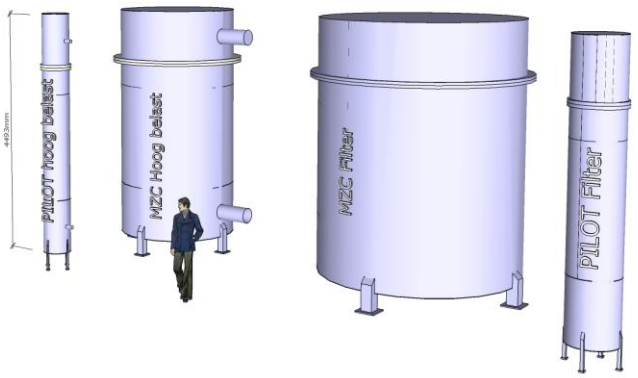
State of affairs

Pilot scale 5%: 2016;



- Design reactor top /bottom;
- Tests in flexibility, adaptability, easy in maintenance;
- Modular renovation of a full-scale WTP in 2017-2018?

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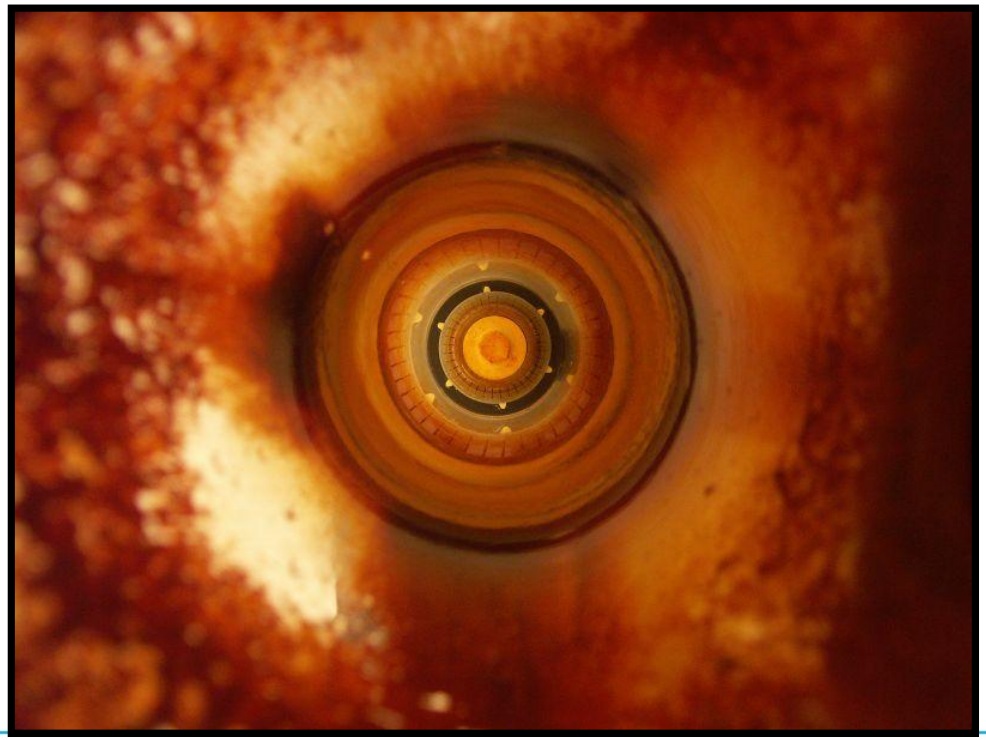
Questions?



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