



Waterfabriek Wilp

The Wilp Water Refinery

physical/chemical SWTP

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Why

- Circular
- No biological oxidation: “destruction” of substances
- Removal of Micropollutants/pharmaceutical residues, micro plastics
- Production of “customized” water

SWTP of the Future

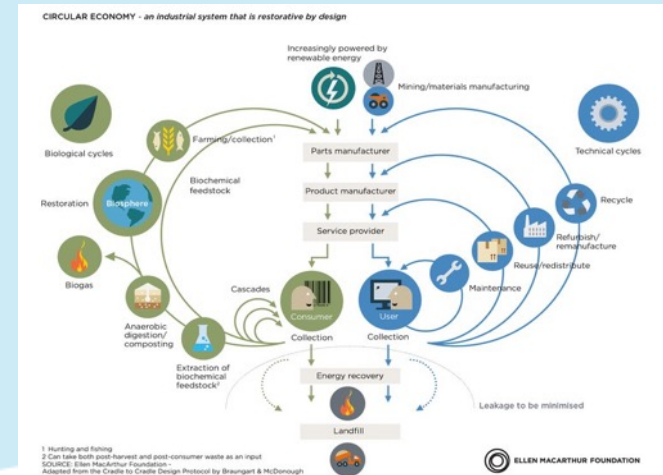
boosting

Circular Economy

and solving

Draught problems

stowa



This is how it works: complete physical-chemical process concept



1. Screening and Sand Recovery



Aims:

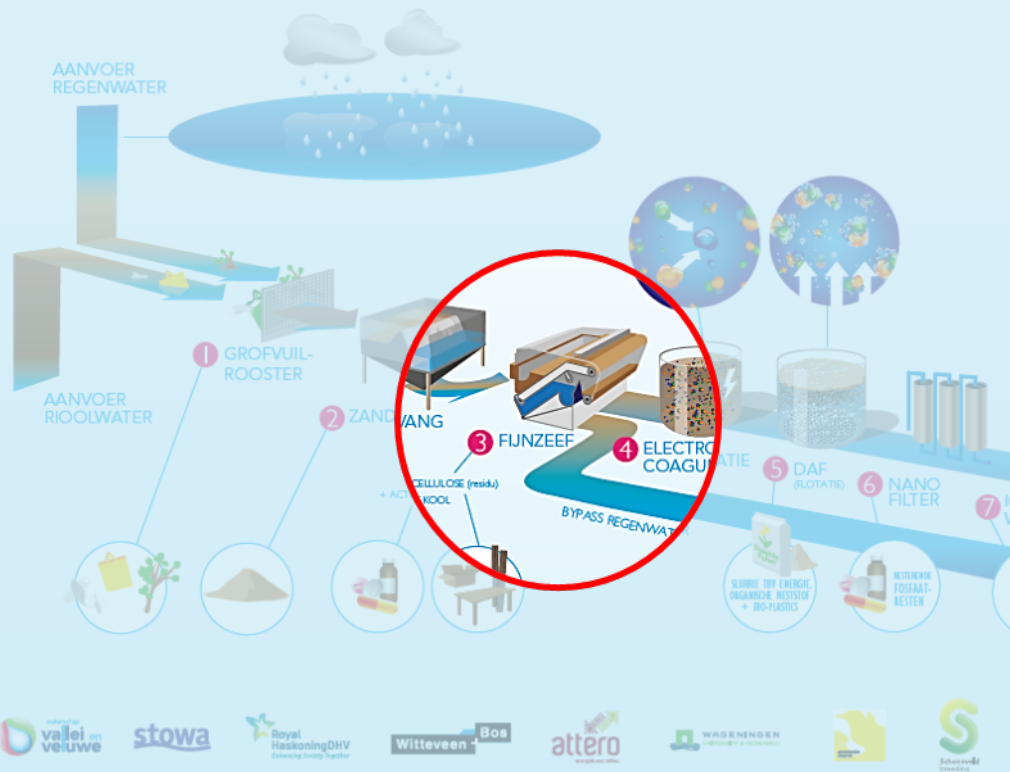
- protection of installations
- grid and sand removal

Products:

- screening material
- clean sand



2. Fine Sieving (350 μm)



WATERFABRIEK WILP



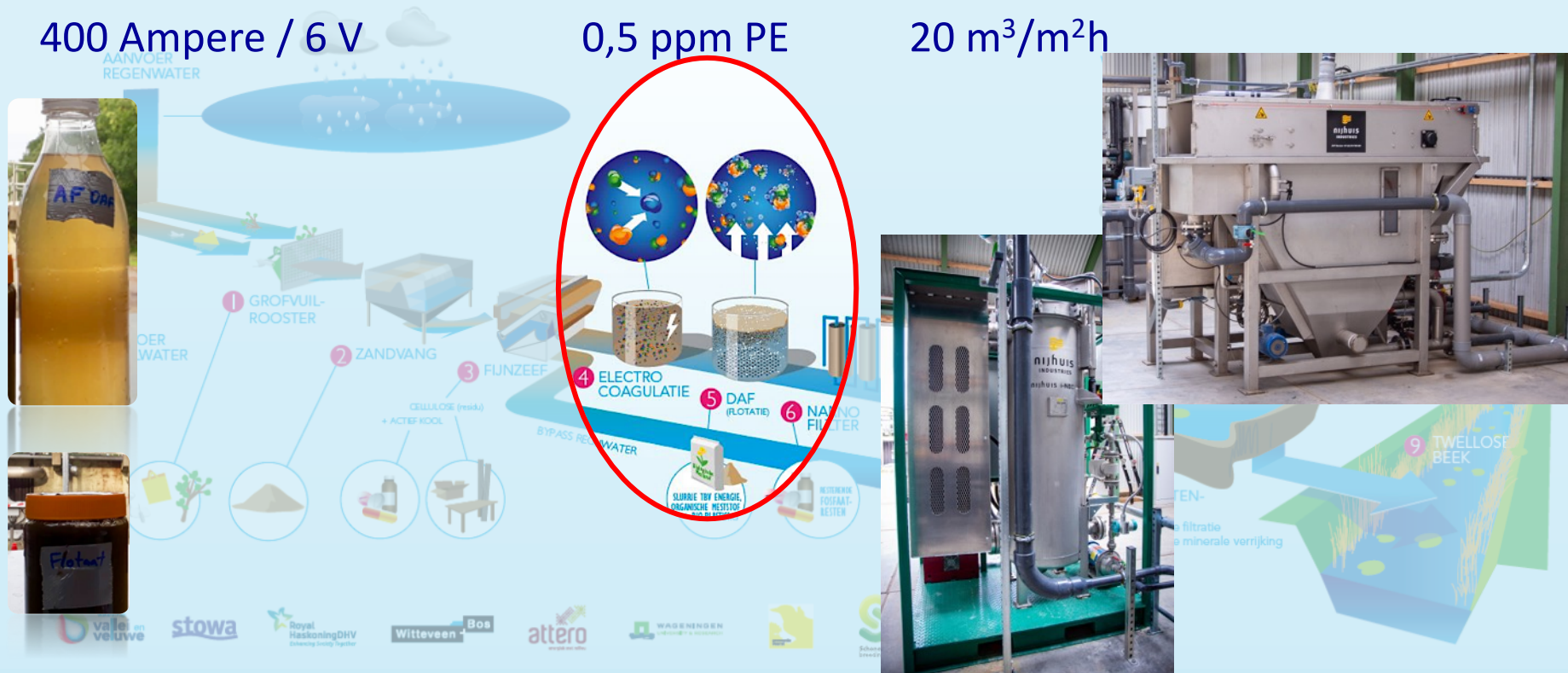
- Aims:** - protection of installations
- Product:** - production of cellulose (for upcycling into bio-composite, green activated carbon, bio char)

3. Electro Coagulation – Flocculation - Dissolved Air Flotation

400 Ampere / 6 V

0,5 ppm PE

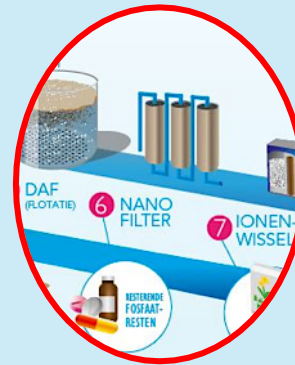
20 m³/m²h



- Aims:**
- coagulation + flocculation and floc separation as pre-treatment for nanofiltration
 - precipitation of phosphorous, metals and complex organics
- Products:**
- organic concentrate for fatty acids and bio-flocculants, bioplastics + phosphate precipitate

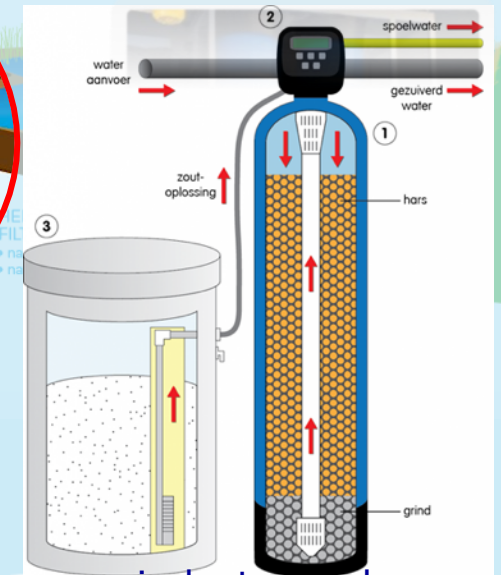
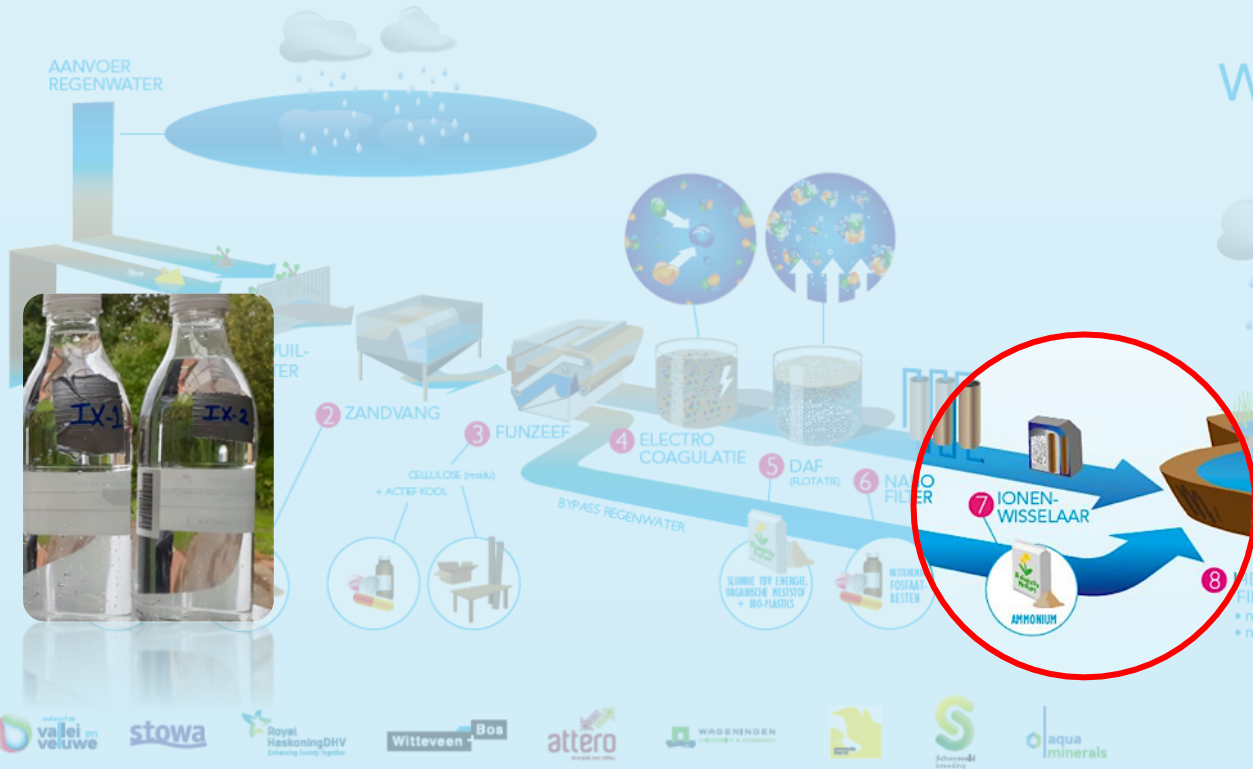
4. Nanofiltration (400 Dalton)

concentrate recycle to EC-DAF



- Aims:**
- removal of TSS, COD, flocs, colloids, $\text{NO}_3\text{-N}$, N_{org} , P_{og} , P_{total}
 - removal of di-valent ions (and larger)
 - removal of micropollutants and microplastics
- Product:**
- high quality water with ammonia and mono valent salts

5. Ion Exchange (2x)



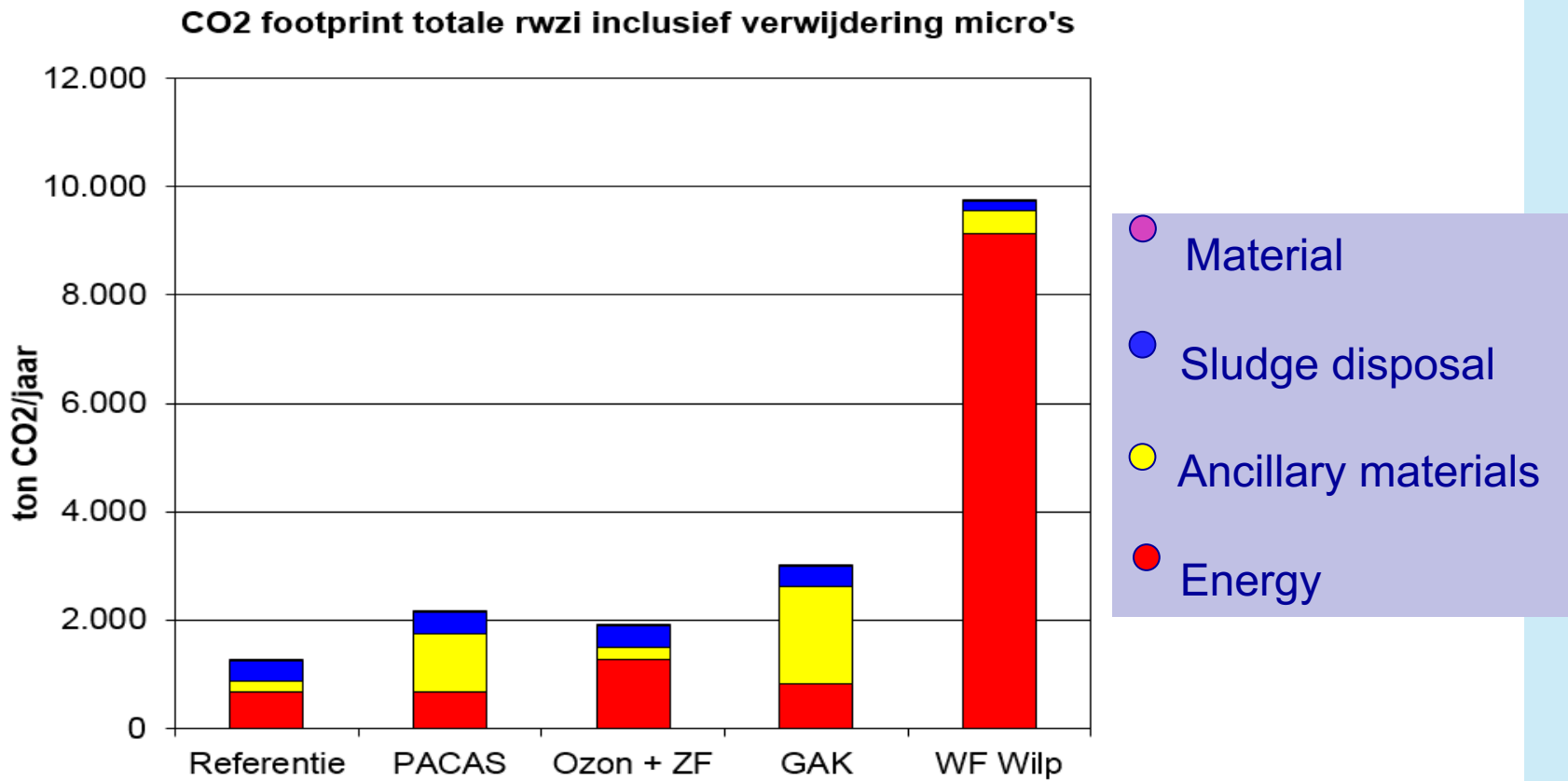
- Aims:**
- removal of mono valent hardness
 - removal of ammonium to < 1 mg/L
- Product:**
- ammonium concentrate (5 g/L NH_4SO_4)
 - high quality water: customized for irrigation, green houses, industry and process water

STOWA/I&M program

	Unit	Waterfabriek Wilp
CO2-footprint*	kg CO ₂ /m ³	1,385 1,258 _r
Costs**	€/m ³	1,48
Removal efficiency reference substances I&W	%	>95%
Reduction of ecological risks discharge effluent***	-	Highly significant

Parameter	unit	Effluent requirement	
		WF Wilp	“Normal”
P-total	mg/l	0,15	1
N-total	mg/l	4,8	10
NH4-N	mg/l	1,0	-

CO2 footprint comparison



Preliminary results

Parameter	Feedwater (DWF only)	Product water
TSS	350 mg/L	< 0.5 mg/L
COD	820 mg/L	~ 30 mg/L
BOD	320 mg/L	~ 5 mg/L
Total-Nitrogen	72 mg/L	< 1.0 mg/L
NH4-N	70 mg/L	< 0.5 mg/L
Total-Phosphorous	9.8 mg/L	< 0.15 mg/L
PO4-P	7.5 mg/L	< 0.10 mg/L
pH	7.2	~ 3.0



Preliminary results micropollutants

Guide parameter (LCMS)	Influent µg/l	Effluent WF Wilp µg/l	Removal
1,2,3, -benzotriazool	3.0	< 0.02	93%
Som 4- en 5-methyl-1H benzotriazool	0.70	< 0.01	98%
Carbamazepine	0.35	0.05	85%
Claritromycine	0.11	< 0.01	90%
Diclofenac	0.26	< 0.01	96%
Hydrochloorthiazide	1.4	1.0	28%
Metoprolol	2.4	< 0.02	91%
Propranolol	0.08	< 0.01	87%
Sotalol	0.70	< 0.01	98%
Sulfamethoxazol	0.042	< 0.01	76%
Trimethoprim	0.09	< 0.01	88%



Thank you for your attention!

Frans Visser
Waterschap Vallei en Veluwe

<https://www.youtube.com/watch?v=GTuOKYptRCE&feature=youtu.be#t=0m00s>
<https://www.vallei-veluwe.nl/toptaken/bij-mij-in-de-buurt/in-voorbereiding/waterfabriek-wilp/>



**Dutch Innovation on Micropollutants
Removal from Municipal Wastewater
November 7th 2019 Aquatech Amsterdam**

