

Biological treatment of grey water: comparison of three systems

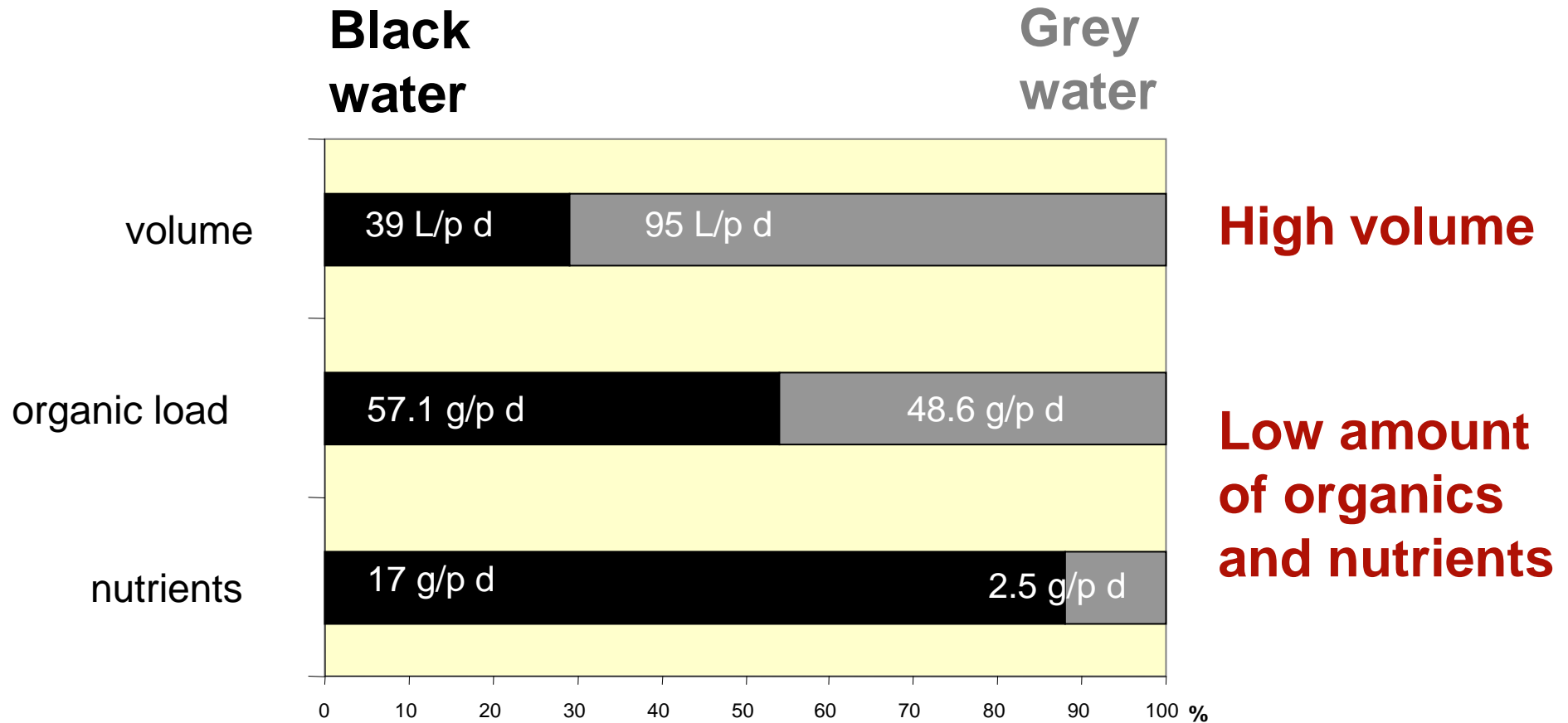
Lucía Hernández Leal

G. Zeeman, H. Temmink, A. Marques, C. Buisman

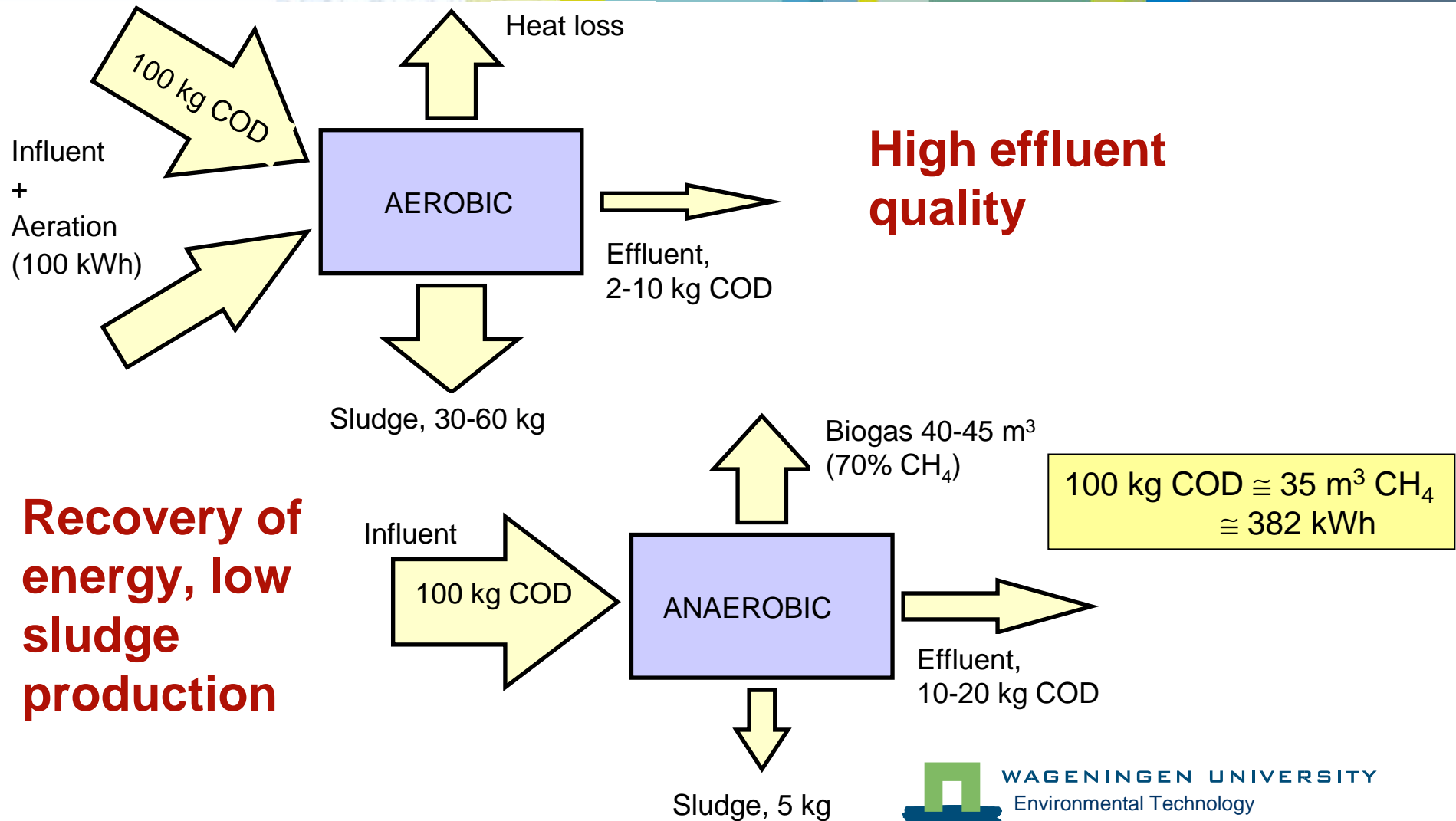


combining scientific excellence with commercial relevance

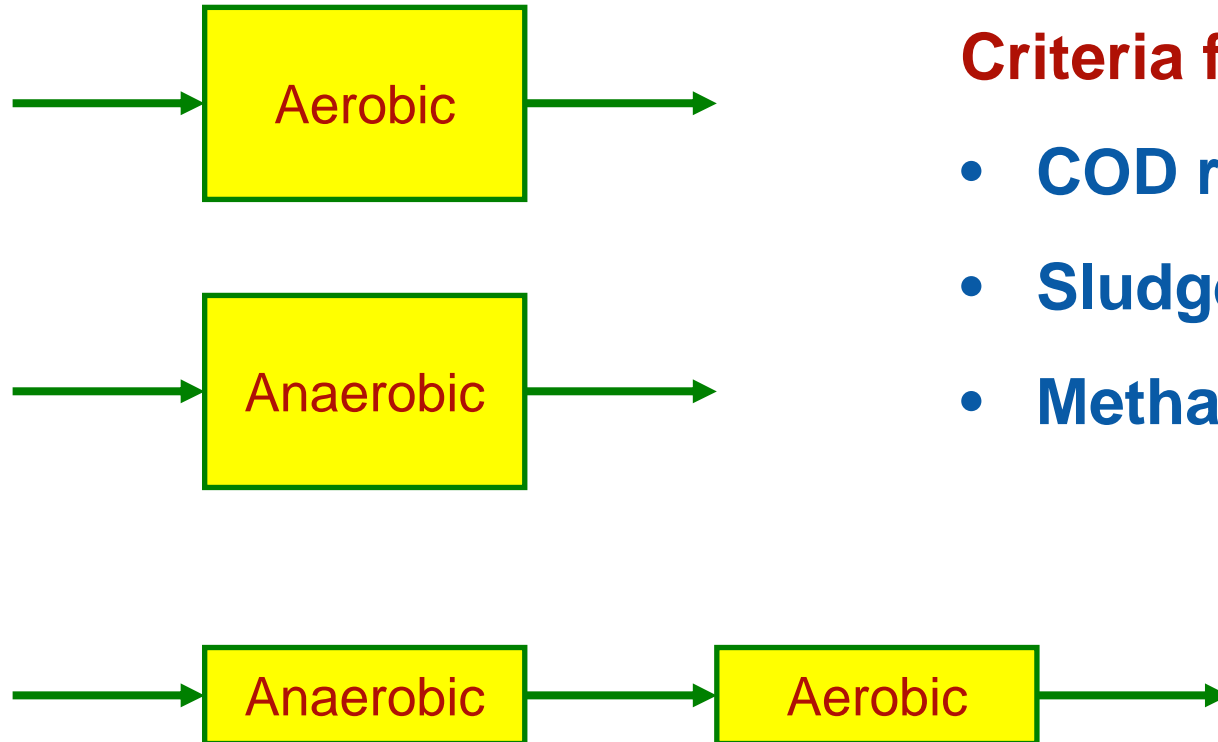
Grey water has a great potential for reuse



Biological treatment, why aerobic and why anaerobic



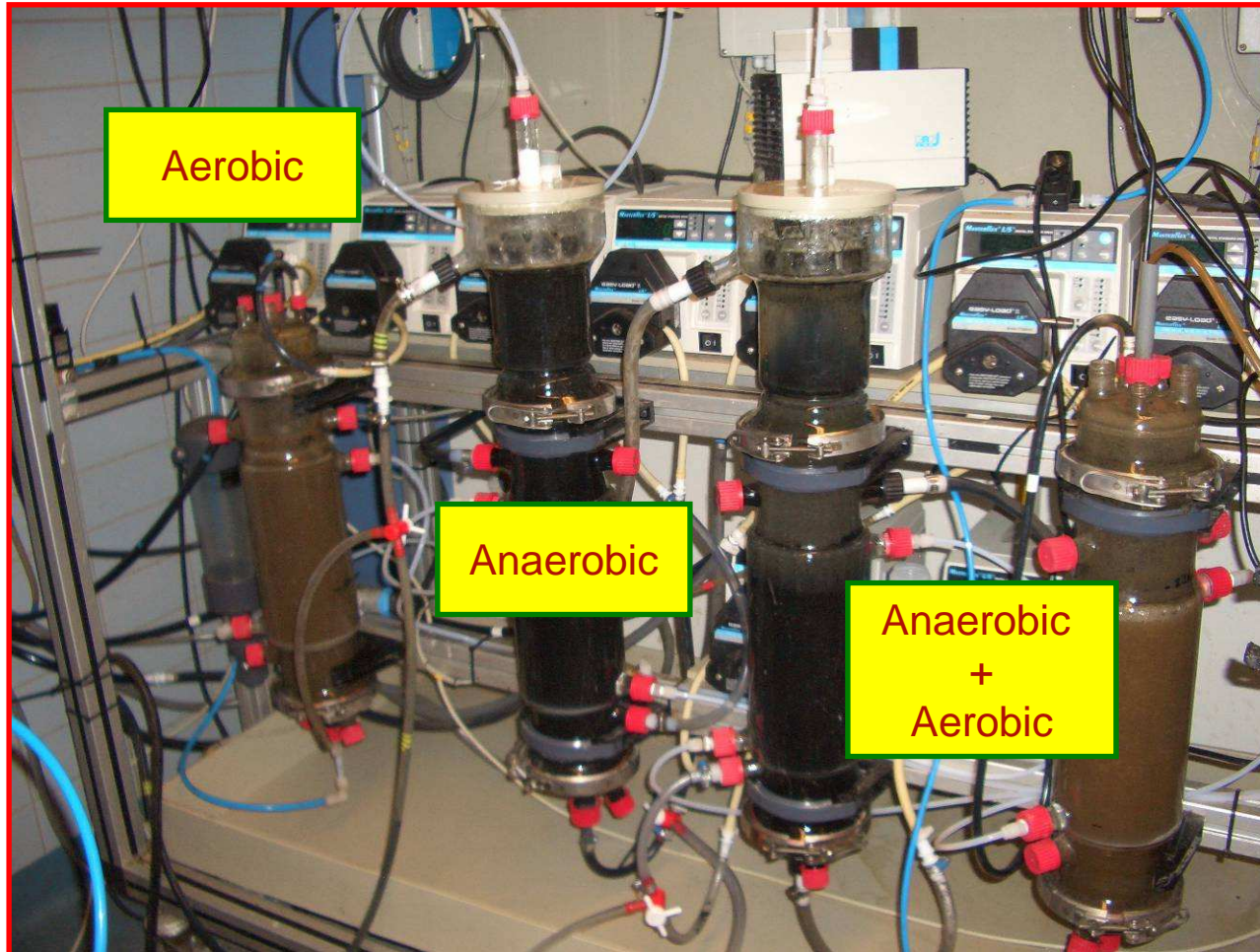
Systems were compared at same total HRT



Criteria for comparison

- COD removal
- Sludge yield
- Methane production

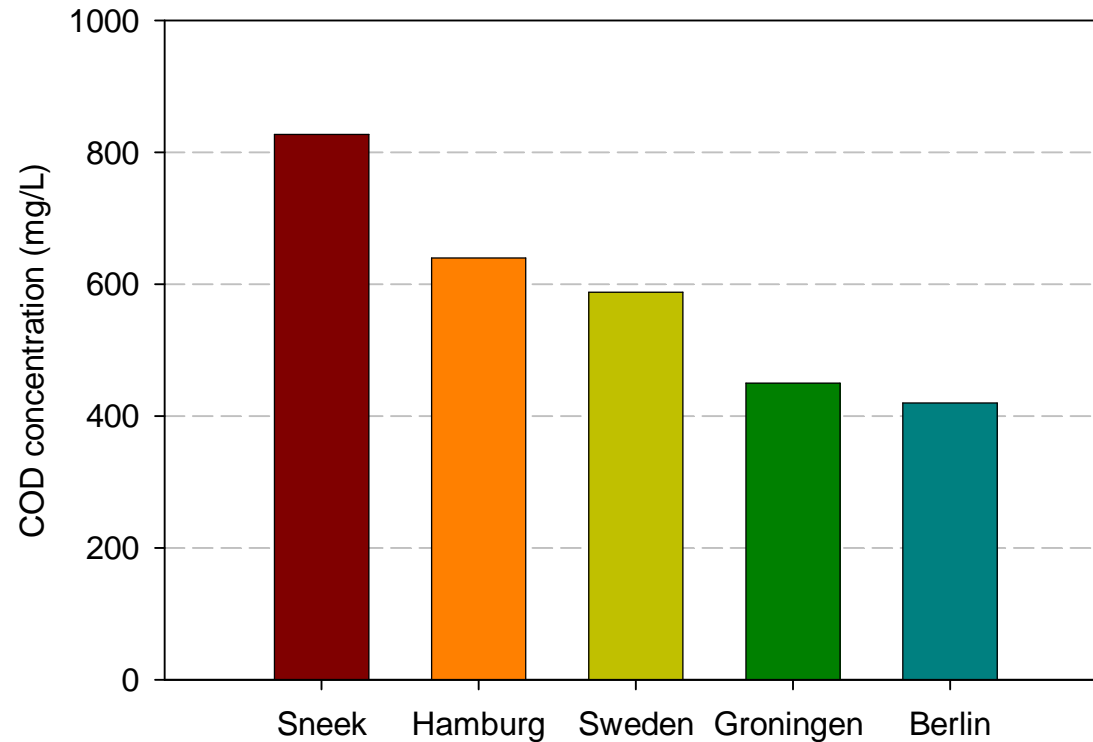
In real life these systems look like this



Grey water from a DeSaR demonstration project in Sneek



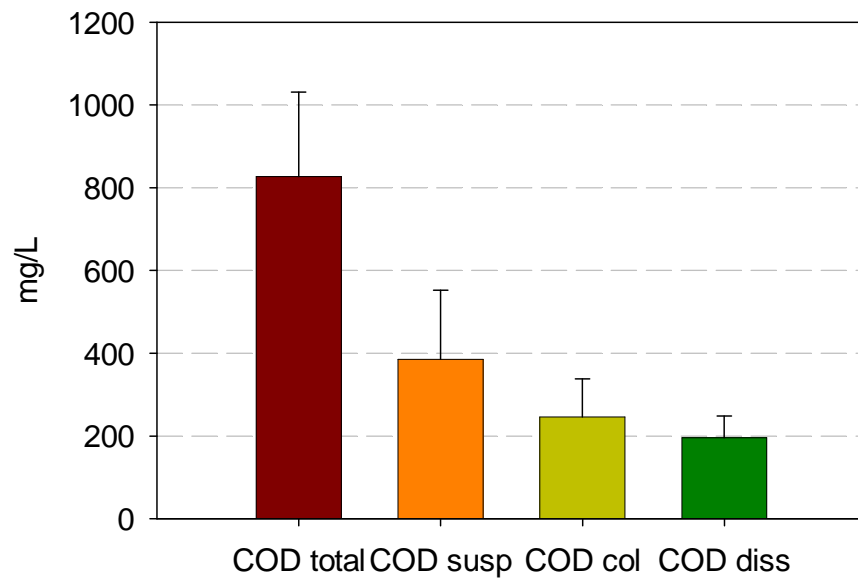
Higher COD concentrations in Sneek than similar sites



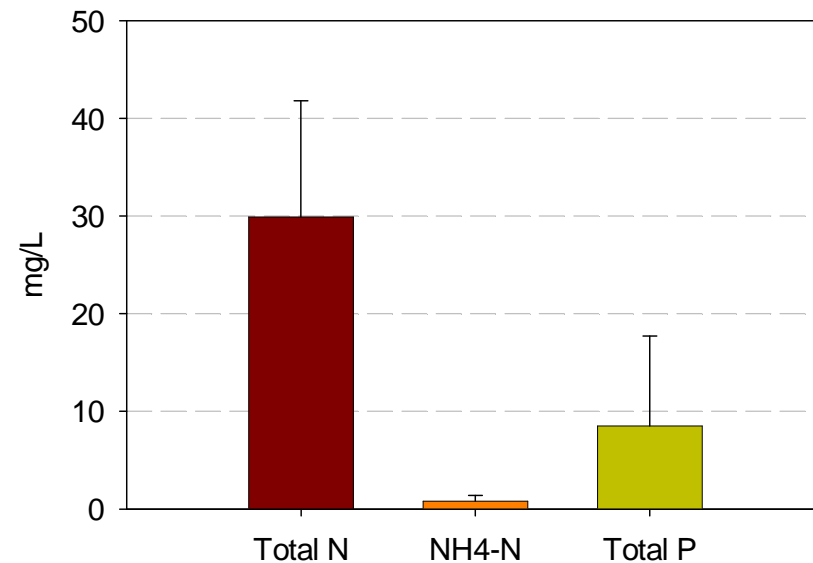
**Grey water production here is 60-70 L/pd,
compared to the average 90 L/pd**

Grey water in Sneek has a high COD concentration

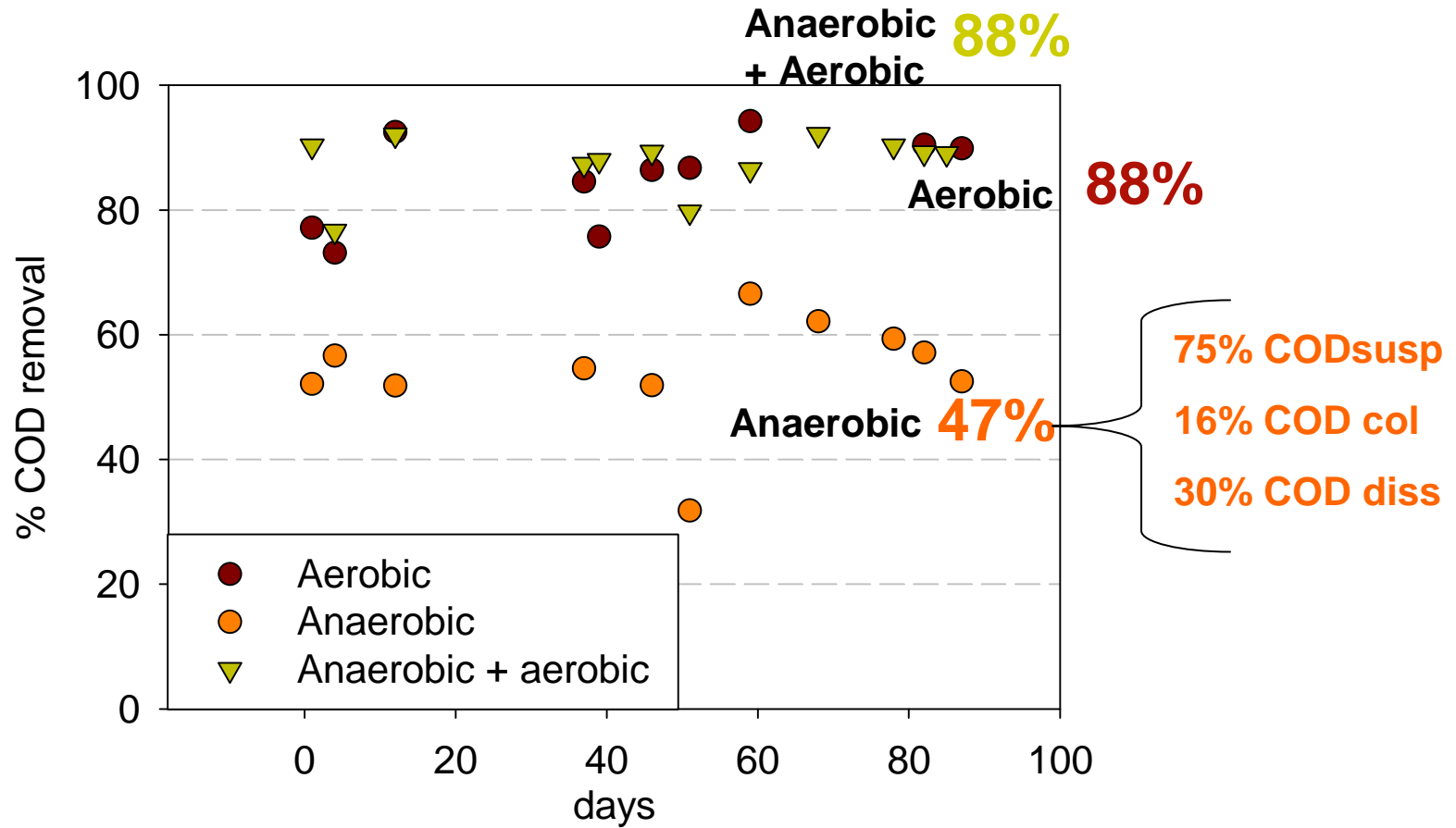
COD concentrations



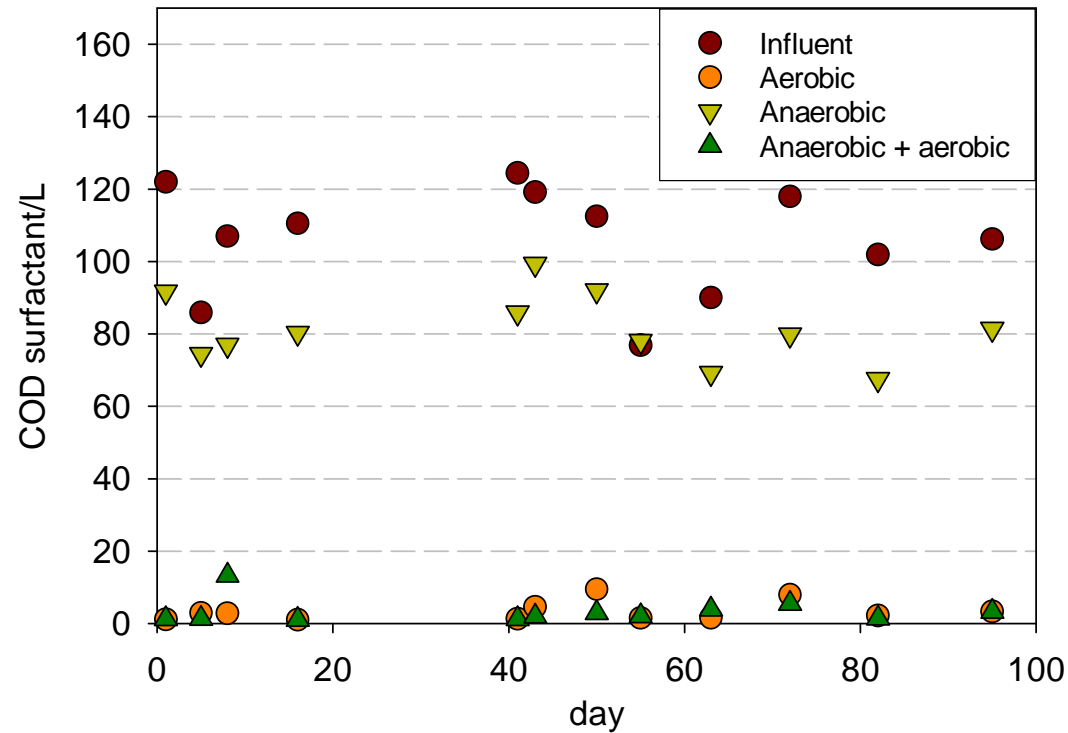
Nutrient concentrations



COD removal in aerobic reactors is much higher

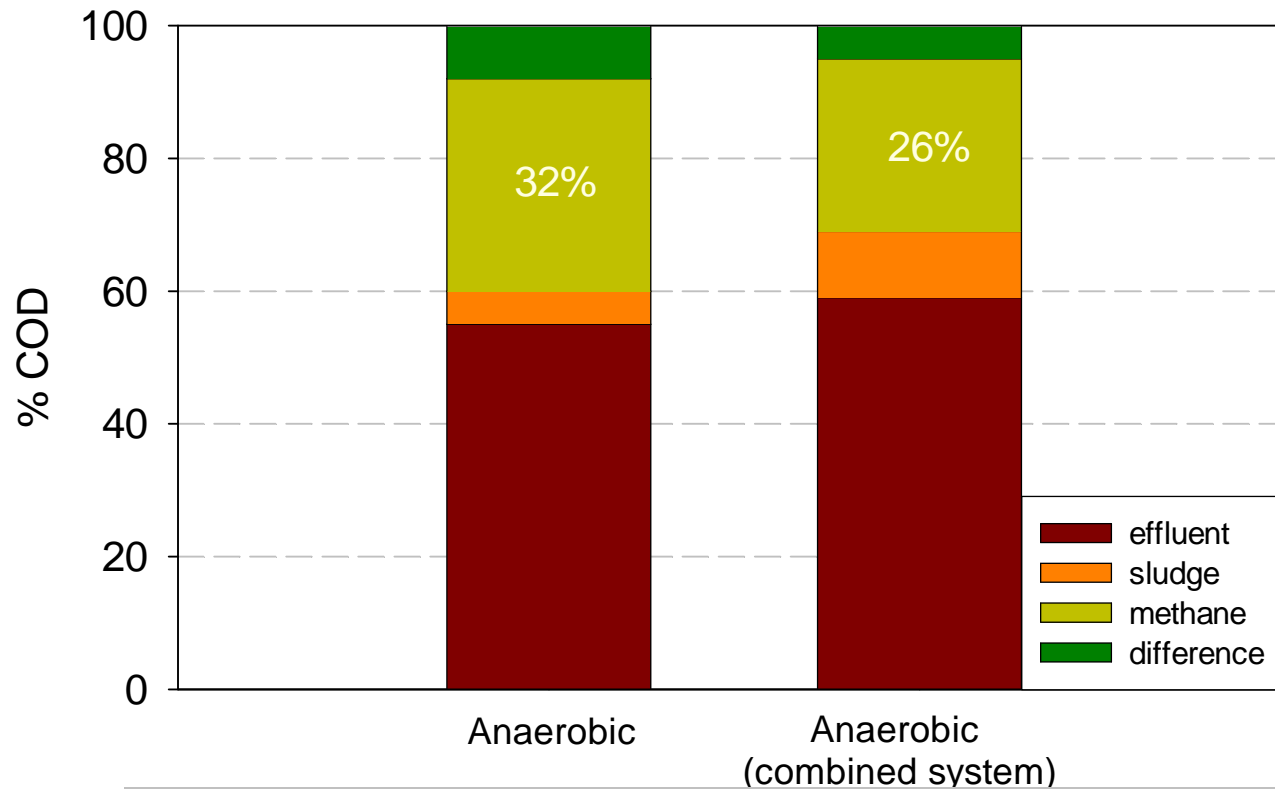


Anionic surfactants represent 15% of the COD in grey water...



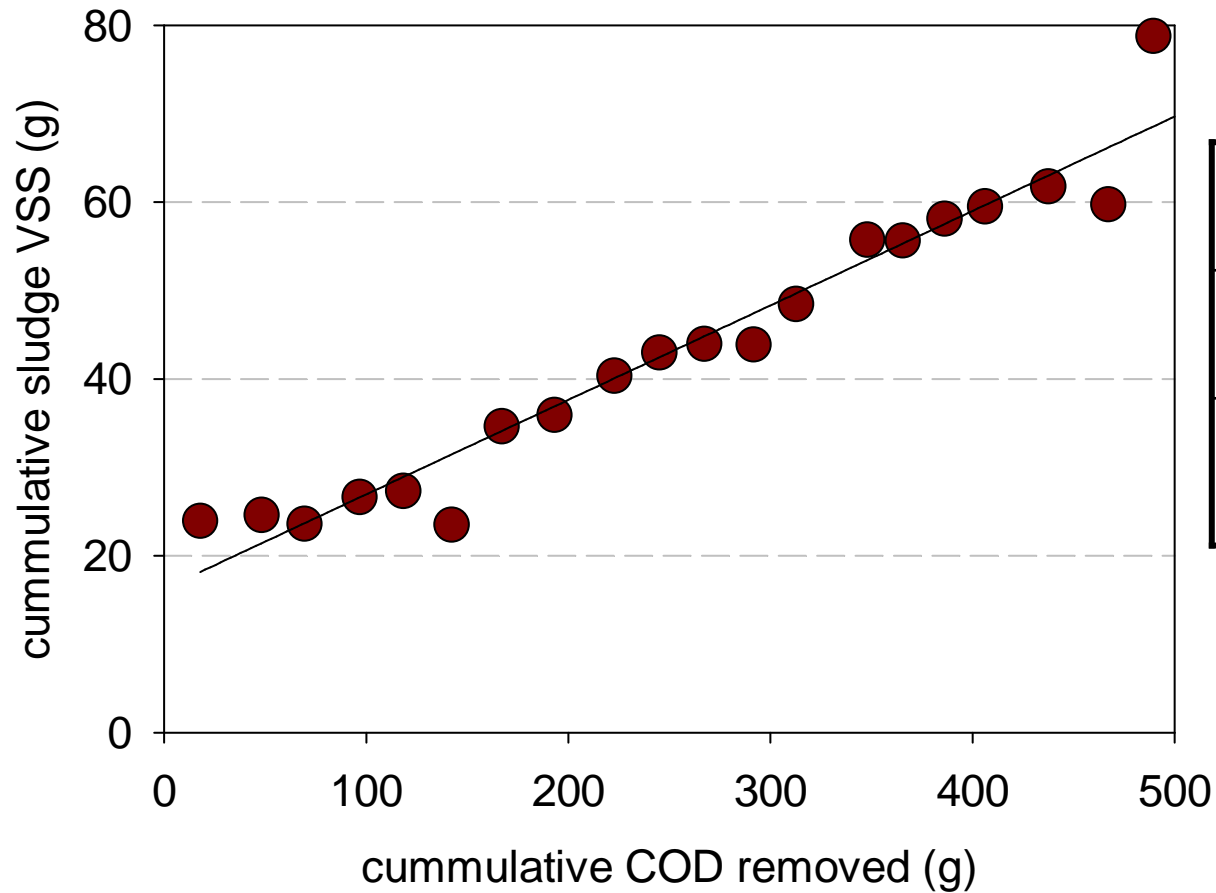
...they are not removed anaerobically and they inhibit the anaerobic process

About 30% of influent COD is transformed into methane



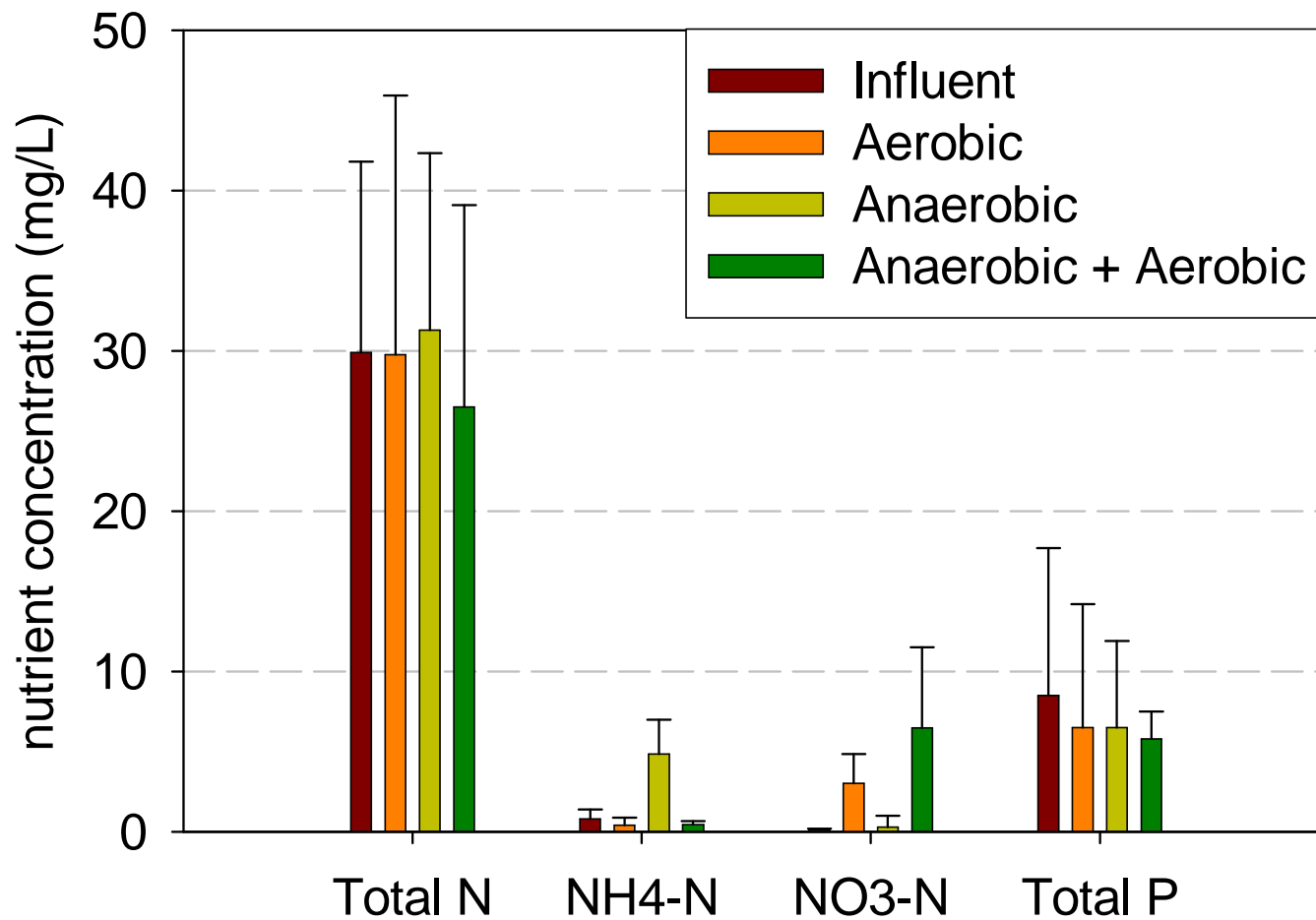
Methane flow	0.76	0.76	0.8	0.80	(NL/d)
Methane production	123	123	71.5	72	(NL/m ³ influent)

Aerobic grey water treatment yields low amount of sludge



Aerobic	0.11
Anaerobic	0.08
Anaerobic + aerobic	0.19

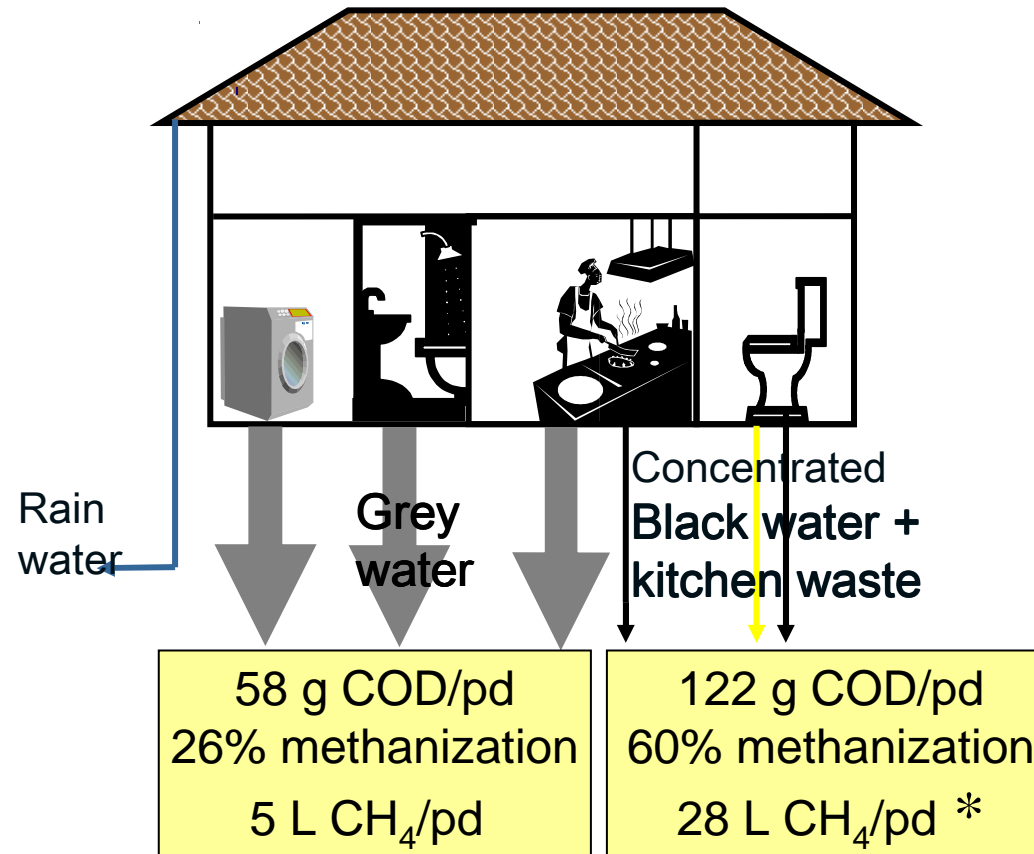
There was a low removal of nutrients



Combined system performs similarly to the aerobic one

	Aerobic	Anaerobic	Anaerobic + aerobic
HRT (h)	11.7	12.5	13.2
COD removal (%)	88	47	88
COD effluent (mg/L)	91	408	100
Yield (g VSS/g COD)	0.11	0.08	0.19
Methane production (NL/m ³)	-	123	72
N removal (%)	24	3	2
P removal (%)	8	8	3

Grey water could increase the methane production by 18%



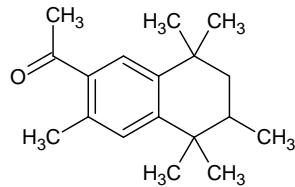
Does this 18% increase justify having an extra reactor?

*Kujawa-Roeleveld et al., 2006

Can a sequence anaerobic + aerobic better remove micropollutants?



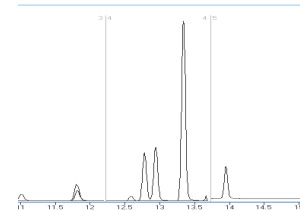
Aerobic treatment is a suitable option for grey water treatment

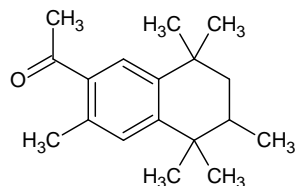


Aerobic treatment achieves 88% COD removal with a low sludge yield of 0.11 g VSS/g COD

Anaerobic treatment achieves 47% removal of COD with a methane production of 123 NL/m³

Anaerobic + Aerobic achieves 88% COD removal, with a methane production of 72 NL/m³.





Thank you for your attention!

**Comments or questions
are welcome!**

