

Bank filtration + Nanofiltration

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Approach

Bank filtration as natural pre-treatment for capillary nanofiltration. Water from a well gallery (anoxic/suboxic) of the drinking water works Tiefwerder Berlin will be treated decentralized in a pilot unit.

Aims

Targeted pollutant removal at specific wells

- SO_4^{2-}
- EDTA
- Micropollutants

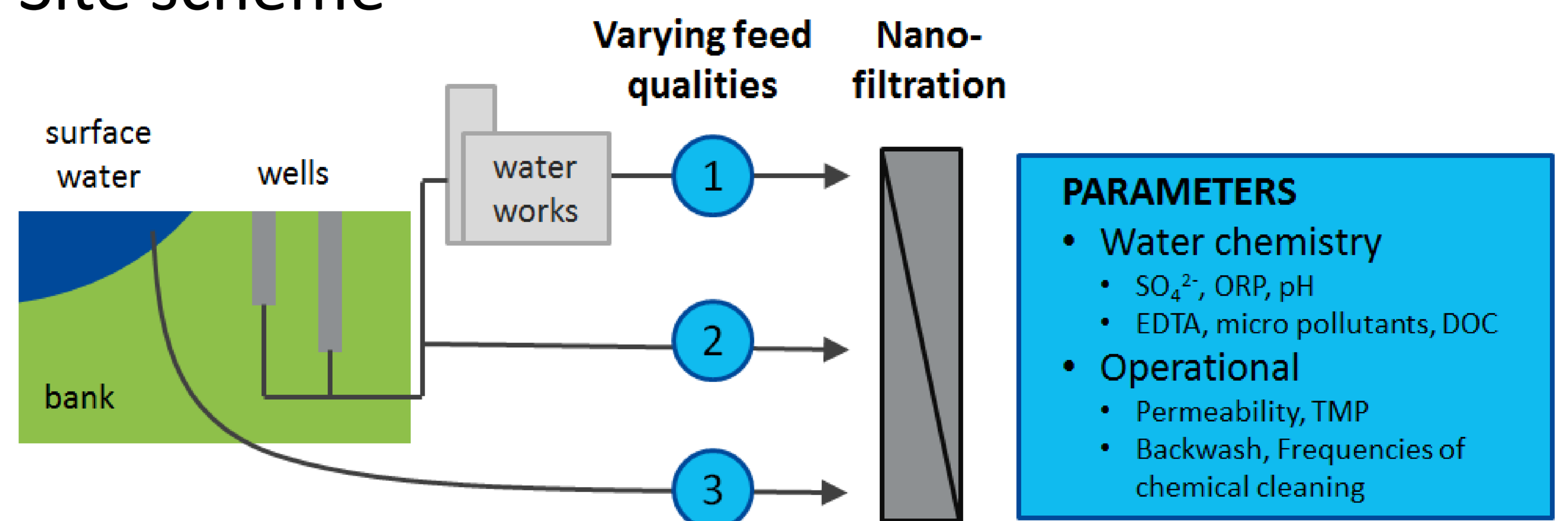
Compare different feed water qualities

- Redox potential
- Fe(II) & Mn(II) concentration
- TOC/ DOC, biopolymers
- Scaling & fouling propensity

Demonstrate potential economic benefits

- Long-term process stability
- Impact of treated volumes
- Pumping efforts
- Membrane cleaning & replacement

Site scheme



Estimated water characteristics & scaling/ fouling potentials

		Fe(II) & Mn(II)	redox state	scaling potential	fouling potential
1	finished drinking water	very low	oxic	low	low
2	groundwater / shallow bank filtrate	high / medium	anoxic / suboxic	medium / high	low
3	surface water	low	oxic	low	high

Bank filtration

Removal of

- TOC/ DOC
- Biopolymers (reduction of membrane fouling)
- Micropollutants (depending on compound & travel time)
- Algae, particles & pathogens

Advantages

- Robust system with low risk of failure

Disadvantages

- Dissolution of iron & manganese
- No SO_4^{2-} removal

Capillary nanofiltration

Removal of

- SO_4^{2-} , hardness
- TOC/ DOC
- Micropollutants (depending on size & charge)
- Pathogens

Advantages

- Durable process operation because of backwash and other cleaning options

Disadvantages

- Scaling potential by iron & manganese
- Energy demand

First results

Feed water	Drinking water		Well water	
	Concentration feed	Retention [%]	Concentration feed	Retention [%]
DOC	± 3.8 mg/L	73 - 100	± 4.7 mg/L	86 - 100
Sulphate	± 149 mg/L	61 - 87	± 133 mg/L	69 - 73
UV-Absorption	± 8.7 m ⁻¹	75 - 100	± 11.6 m ⁻¹	90 - 100
Ca	± 129 mg/L	39 - 77	± 115.7 mg/L	41 - 43
Mg	± 10.7 mg/L	51 - 86	± 11.5 mg/L	52 - 53
Hardness	± 20.5 °dH	40 - 78	± 18.8 °dH	42 - 44
Fe (total)	< LOQ		± 1.8 mg/L	50 - 62
Mn (total)	< LOQ		± 0.5 mg/L	43 - 53
EDTA	± 10.5 µg/L	76 - 100	± 11.7 µg/L	82 - 100

