

Manfred Brugger¹, Svein Forberg Liane²
¹ HydroGroup, Angelestr. 48/50, 88214 Ravensburg, Germany, ² Sweco Norge AS, Veknanvegen 10, 3835 Seljord, Norway

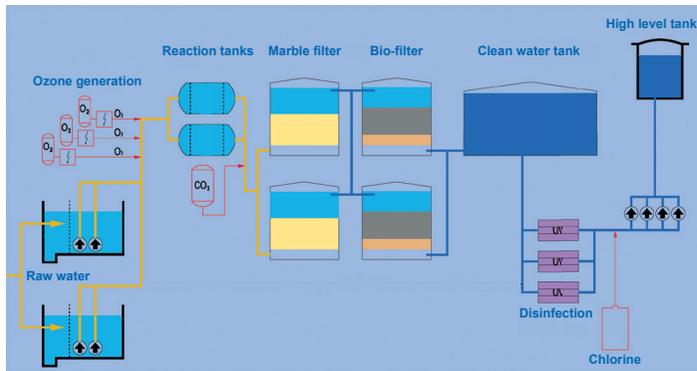
Problem

Treating of surface water to potable water in an amount of up to 680 m³/h for the water supply of the Norwegian municipality Bamble (approx. 12,000 people).

Raw water data

Colour 15-25 mg Pt/L Alkalinity <0,1 mmol/L
 pH 6,3-6,8 UV_{T1} 71-84%
 Bacterial counts (enterococci, coliforms, E-coli, clostridium)

Treatment process



Dimensioning data

Capacity	$Q_{norm} = 480 \text{ m}^3/\text{h}$	$Q_{max} = 680 \text{ m}^3/\text{h}$
Ozone dose at 10% (wt)	$D_{norm} = 3 \text{ g O}_3/\text{m}^3$	$D_{max} = 4,4 \text{ g O}_3/\text{m}^3$
Ozone reaction time	$t_{min} = 10 \text{ min}$	
Filter contact time	Alkaline filter	EBCT _{norm} = 15 min
	Bio-filter	EBCT _{norm} = 30 min
Filter velocity	Alkaline filter	$v_{max} = 15 \text{ m/h}$
	Bio-filter	$v_{max} = 10 \text{ m/h}$
Disinfection with UV	$UV_{Dose} \geq 400 \text{ J/m}^2$	



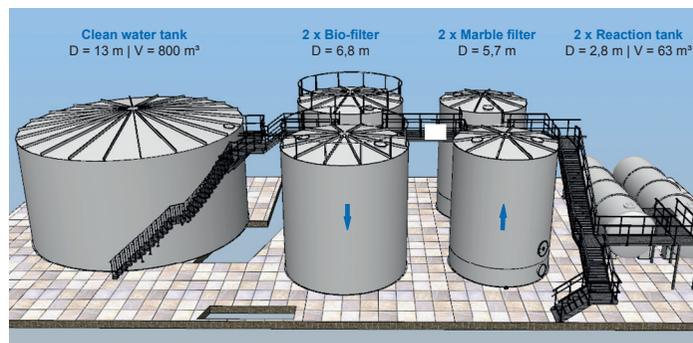
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Solution

- Build up of a new water treatment plant to reduce colour and DOC/TOC, to increase pH and alkalinity and to ensure hygienic safety.
- Installation of an effective plasma ozone production system.
- Installation of low pressure horizontal reaction tanks made of stainless steel 316 Ti with distributor plates inside to achieve a uniform plug flow.
- Adding of carbonic acid to the water after it is discharged from the contact tanks, before marble filters.

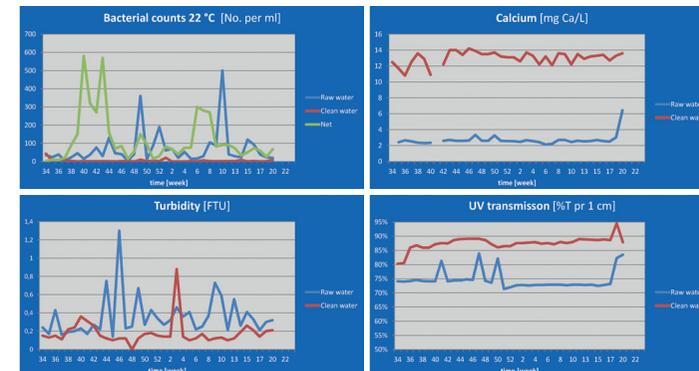


- Manufacturing of all main process equipment (made of stainless steel in Duplex quality), see figure below, because of
 - shorter construction period,
 - easy achievable high standard of design and safety,
 - on-site production of the tanks and the filters inside the building during the severe Norwegian winter.



- In the process hall all system components necessary for the operation can be safely accessed from the operator platform.

Clean water data



Colour 5-7 mg Pt/L
 pH approx. 7,5

Alkalinity approx. 0,5 mmol/L
 UV_{T1} 87-90%

Conclusions

- Ozone biofiltration can be a powerful process for treating surface water to potable water.
- DOC/TOC reduction is limited by the ozone dose and the EBCT in the bio-filters.
- Discolouration is a main task for the ozone biofiltration process.
- Hygienic safety of the treated water is constantly ensured.