INTAKE

CtrlAQUA

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Effects of seawater quality on treatment of intake water for use in closed-containment aquaculture systems

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Background to the project



CtrlAQUA

- Treatment efficiency and influence of seawater quality
 - Pilot-scale treatment system tested at

Nofima, Sunndalsøra

Ozone, mechanical filter, UV and AOP



Experimental setup

- Two "types" of intake water:
 - Raw seawater @ 40 m depth from Tingvollfjorden (Low TSS)
 - Raw seawater mixed with sludge from the research station (High TSS)
- 6 tests, each including 6 runs





Experimental setup and sampling

Seawater tank

A

Ozone

B

Drum filter

C

40 µm mesh 300 µm mesh UV or AOP

Low UV dose, 40 mJ/cm²

High UV dose, 60 mJ/cm²

Low TSS, 3 mg/L High TSS, 29 mg/L





Low ozone doze, 300-350 mV

High ozone dose, 400-500 mV







Response variables

- 1. Effect on different water quality parameters
 - TSS, turbidity, UVT and total organic carbon
- 2. Disinfection efficiency
 - Measured as reduction in colony forming units (CFU)
- 3. Formation of total residual oxidants
 - Measured as TRO



Description of seawater

		Raw seawater	Seawater mixed with particles		
		TSS low (test 1-3)	TSS high (test 4-6)		
Analysis	Unit	Average values ± St.dev.	Average values ± St.dev.		
рН		8.11 ± 0.02	8.14 ± 0.03		
Temperature	°C	13.1 ± 0.2	10.9 ± 1.4		
O ₂	mg/L	8.2 ± 0.7	8.9 ± 0.9		
Salinity	%	31.9 ± 0.3	30.4 ± 1.1		
тос	ppm C	1.2 ± 0.4	2.5 ± 1.1		
TSS	mg/L	3.0 ± 2.4	29.4 ± 16.0		
UVT	%	96.7 ± 0.4	86.7 ± 6.0		
Turbidity	NTU	0.24 ± 0.1	2.5 ± 1.6		



1. Effect on different water quality parameters



Ozonation (300-350 mV and 400-500 mV)







Mechanical filtration

TSS (high)











2. Disinfection efficiency



Ozonation (300-350 mV and 400-500 mV)





UV (40 and 60 mJ/cm²) AOP (40 mJ/cm²) w/wo pre-filtration





3. Formation of total residual oxidants (TRO)





Formation of total residual oxidants (TRO, as mg Cl₂/L)





TRO (mg Cl_2/L) as a function of ozone dose





Relationship between ORP and TRO (as mgCl₂/L)







Use of ozone in RAS





Summary

- Both low and high ozone dose (300-350 and 400-500 mV) improved the water quality (UVT, Turbidity, TSS, TOC) under high TSS conditions
- Low and high ozone dose reduced CFU
 - Low dose: 21% (low TSS) & 48% (high TSS)
 - High dose: 67% (low TSS) & 82% (high TSS)
- UV and AOP reduced amount of bacteria substantially (over 99.9%)





Summary

- Relationship between ORP and TRO significant (very loos)
 - Very important to measure TRO values, not just ORP
- Low and high ozone dose led to increased TRO levels, most apparent under high TSS level and high ozone dose
- AOP did not lead to increase in TRO levels





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AquaOptima AS

- Located in Trondheim, Norway
- Supplier of RAS since 1993

*	Atlantic *	Barramundi *	Tilapia	*	Cobia
	Salmon *	Tiger puffer *	Eel	*	Japanese
*	Halibut	fish *	Sturgeon		flounder
*	Atlantic Cod *	Arctic Char *	Pollock	*	Turbot
*	Seabass *	Rainbow *	Pike Perch	*	Grouper
*	Seabream	trout *	Whitefish	*	Коі

- Recently bought by Kverva
 - > Part of Steinsvik Group, sister company with Aqualine







Thanks for listening



