s::can
Intelligent. Optical. Online.

Happy Fish! Multiple spectro::lysers are monitoring the water quality in recirculating aquaculture systems in Finland

Surface Water Monitoring

The water quality of fish tanks is monitored online with s::can systems in a laboratory scale recirculating aquaculture system research facility at Laukaa. Harmful NO_2 is detected immediately and counter measures, to protect the fish, can be taken.

Natural Resources Institute Finland (Luke)

Parameters monitored:

- NO_2
- NO_3
- O_2
- TSS
- Turbidity
- TOC
- pH
- UV254
- Temperature

Facts & Figures

Company:
Natural Resources Institute Finland (Luke)

Location:
Laukaa, Finland

Application:
Surface Water Monitoring

s::can Partner:
Luode Consulting

Key Products installed:
UV spectro::lyser, oxi::lyser, pH::lyser, con::cube

Background

The Natural Resources Institute Finland (Luke) researches recirculating aquaculture systems (RAS), their water quality and the possibilities to improve it. Additionally it offers tools for industries to improve their profitability. Recirculating aquaculture is a fish farming method in which water is circulated by pumping it from fish tanks into cleaning units and back. The method helps to save water, since the new water accounts for only between 1% and 2% of the volume of circulating water. In recirculating aquaculture, the technology used for cleaning the water can also significantly reduce the nutrient load.

Challenge

An experimental research and learning environment is in operation at the Laukaa fish farm. It assists in the trialing of technical solutions in fish farming development and examining the biological limits that are important to fish culture. Instruments that monitor water quality on-line may also be used to develop recirculating feeds, thereby modernizing production. Water quality is crucial in RAS. Key process in water cleaning is nitrification, where different bacteria convert ammonia, excreted by fish, into nitrite and furthermore into nitrate. Ammonia and nitrite are extremely toxic to the fish and detection of nitrite is important when wanting to prevent most harmful effects.

s::can's solution

In Laukaa, different water treatment methods can be studied in 10 individual RAS units. Every unit has its individual s::can online water quality monitoring system. In total 10 spectro::lysers, 10 con::cubes, 10 oxi::lysers and 10 ph:lysers are installed and allow the accurate comparison of each unit.
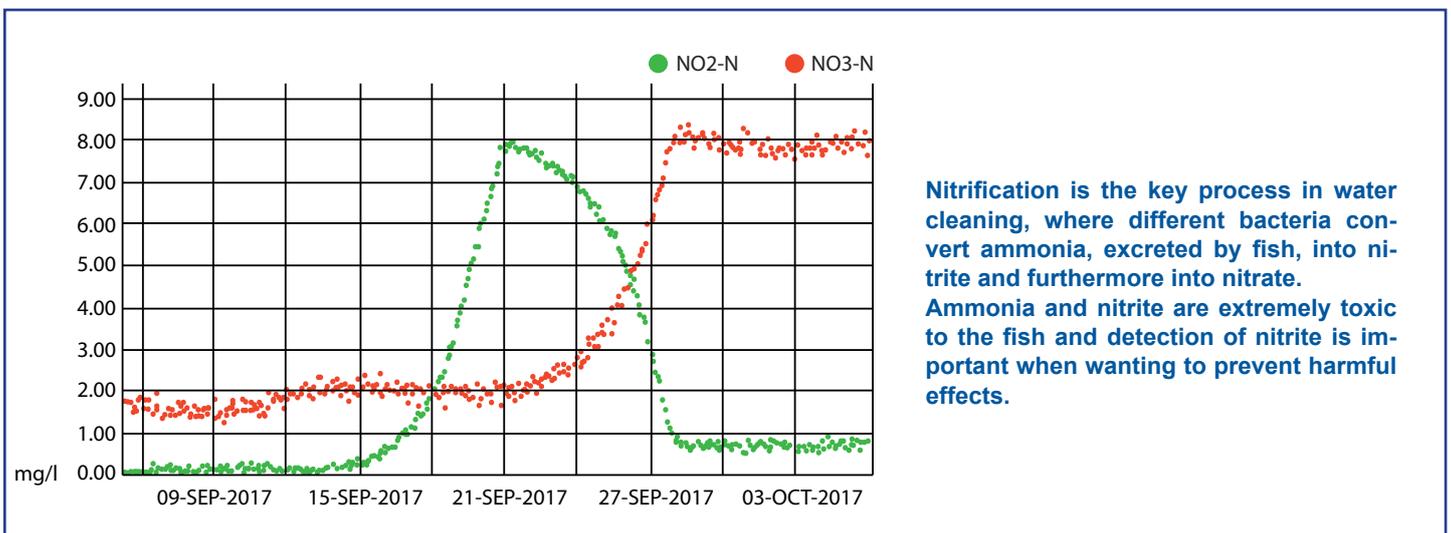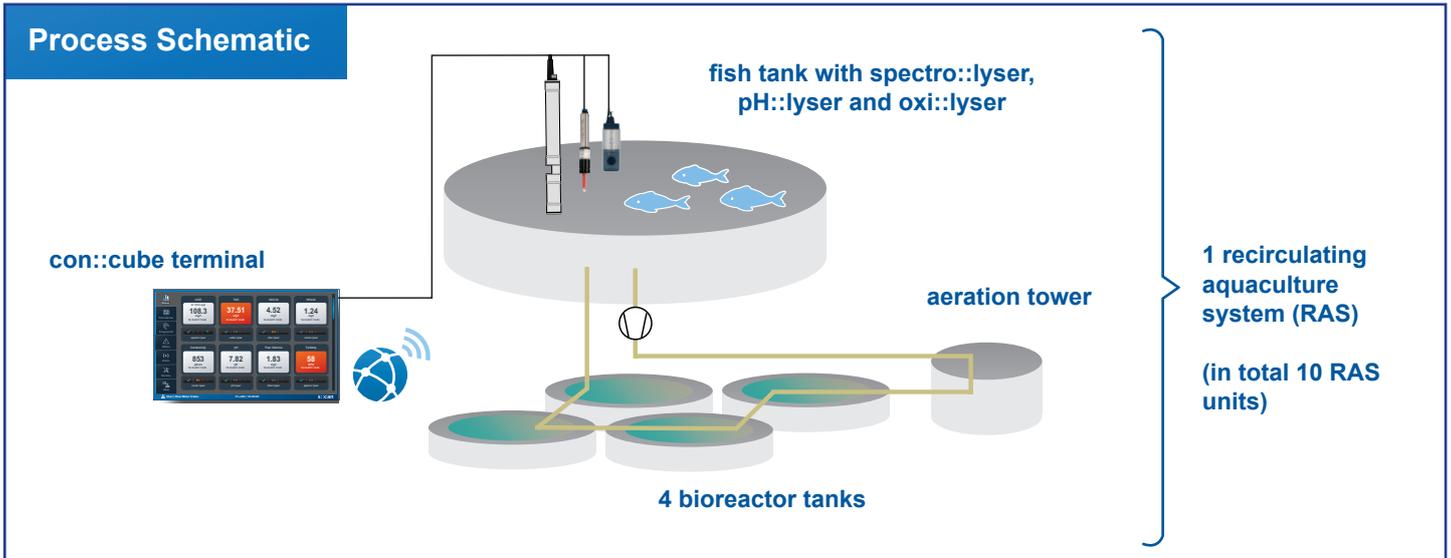

Benefits

s::can's online water quality monitoring systems are an excellent research tool to constantly monitor the effects of different treatments on water quality and the conditions the fish are experiencing in the 10 tanks. Harmful NO_2 can be detected immediately and counter measures can be taken, therefore the fish are protected from pernicious effects. Additionally it provides an instant outlook of the results compared to traditional laboratory tools.

"**With s::can's online monitoring system, I can check direct effects of different treatments to the water quality in fish tanks. It gives me instant information about the conditions the fish are experiencing. The detection of nitrite can prevent harmful effects on fish.**"

Jani Pulkkinen, Research Scientist

Process Schematic

fish tank with spectro::lyser,
pH::lyser and oxi::lyser

con::cube terminal

aeration tower

1 recirculating
aquaculture
system (RAS)

(in total 10 RAS
units)

4 bioreactor tanks

● NO2-N   ● NO3-N

| mg/l | 09-SEP-2017 | 15-SEP-2017 | 21-SEP-2017 | 27-SEP-2017 | 03-OCT-2017 |

Nitrification is the key process in water cleaning, where different bacteria convert ammonia, excreted by fish, into nitrite and furthermore into nitrate.
Ammonia and nitrite are extremely toxic to the fish and detection of nitrite is important when wanting to prevent harmful effects.

s::can's con::cube is a compact, powerful and versatile terminal for data acquisition and station control. Integrating the newest processor technology, con::cube's very flexible options for interfacing to SCADA or any central database systems makes it perfect for station control. Up to 64 channels/parameters can be displayed.

The s::can spectro::lyser™ is a fully submersible UV spectrophotometer which measures light absorbance between 220 – 380 nm. s::can's specialized proprietary algorithms analyze and decompose the spectral data to provide measurements for many important wastewater parameters including: nitrate, nitrite, COD, BOD, TSS, and dissolved H_2S. There are no moving parts in contact with the water and no reagents are used.

The pH::lyser is a multi-parameter probe that measures the pH value and temperature directly in the water. The pH::lyser uses the temperature to correct the result of the pH measurement online. The non-porous, solid-state reference electrode ensures excellent pH readings and a long lifetime of the electrode especially in harsh environments.