

# MARINE HARVEST DALSFJORD

## RAS for Salmon | Case Study

**Commissioned: 2010/2012**

**Challenge:**

Design and build of two separate low footprint RAS-plants, outdoor and indoor.

**Solution:**

Kaldnes® RAS, comprising of Hydrotech™ drumfilters, Kaldnes® MBBR, centralized CO<sub>2</sub> degasser and circulation pumps. The plant is fully monitored and controlled by Veolia's own control system - VA Operatör.



**Design capacity:**

**Maximal feeding:**  
3.000 + 2.000 kg pr. day

**Fish tank volume:**  
2.850 + 1.400 m<sup>3</sup>

**Operational data:**  
CO<sub>2</sub> out of fish tank: 12-13 mg/l  
NH<sub>4</sub>-N + NH<sub>3</sub>-N: 0,6 mg/l  
NO<sub>2</sub>-N: < 0,16 mg/l  
Nitrogen saturation: < 101 %

**Marine Harvest Dalsfjord**

Marine Harvests location at Dalsfjord near Volda in Møre og Romsdal, Norway, produces salmon smolt. Krüger Kaldnes has between 2009 and 2012 planned and delivered two plants to Dalsfjord for the production of more than 4 million salmon smolts per year. On-growing 1 and on-growing 2 each has its own separate water treatment system (RAS1 and RAS2), where fish from the start feeding is introduced into on-growing 1, before being transferred to on-growing 2, from which it is introduced to the sea.



**Main components**

The water treatment plants, Kaldnes® RAS, consists of four main components:

► **Mechanical cleaning**  
Hydrotech™ drumfilters remove particular matter like excess feed and fish feces from the water.

► **Biological treatment**  
Dissolved waste products are decomposed by bacteria and micro-organisms in a two-stage Kaldnes® MBBR (moving bed bio-reactor).

► **Gas-stripping**  
Carbon dioxide from the fish respiration is removed in the centralized CO<sub>2</sub>-degasser.

► **Automation**  
The plants are monitored and controlled by Veolia's own control system - VA Operator.



## Foot print

Both Kaldnes® RAS plants have a very small foot print.

► RAS1 has a capacity of 3.000 kg per day feeding, with a total hydraulic capacity of 4.275 m<sup>3</sup>/hour. It is an extremely compact plant with a foot print of less than 200 m<sup>2</sup> including deepshaft oxygen cones.

► RAS2 has a capacity of 2.000 kg per day feeding, with a total hydraulic capacity of 2.400 m<sup>3</sup>/hour and a foot print of less than 250 m<sup>2</sup>.



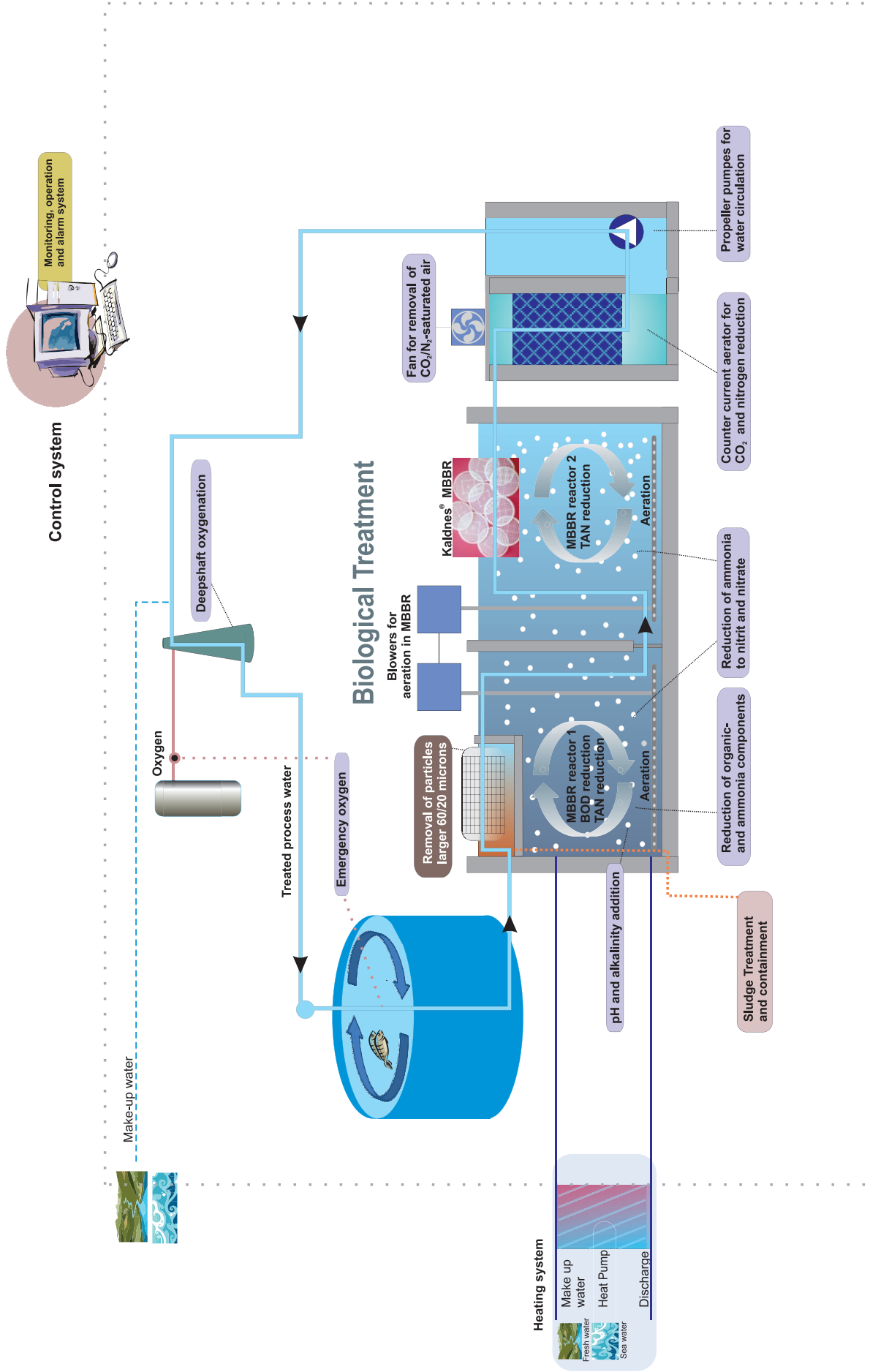
## Key parameters

Parameter	RAS 1	RAS 2
Total fish tank volume	2.850 m <sup>3</sup>	1.400 m <sup>3</sup>
Maximum biomass	142.500 kg	70.000 kg
Maximum feeding	3.000 kg/day	2.000 kg/day
Dilution water	300 l/kg feed	300 l/kg feed

Table: Basis of design.

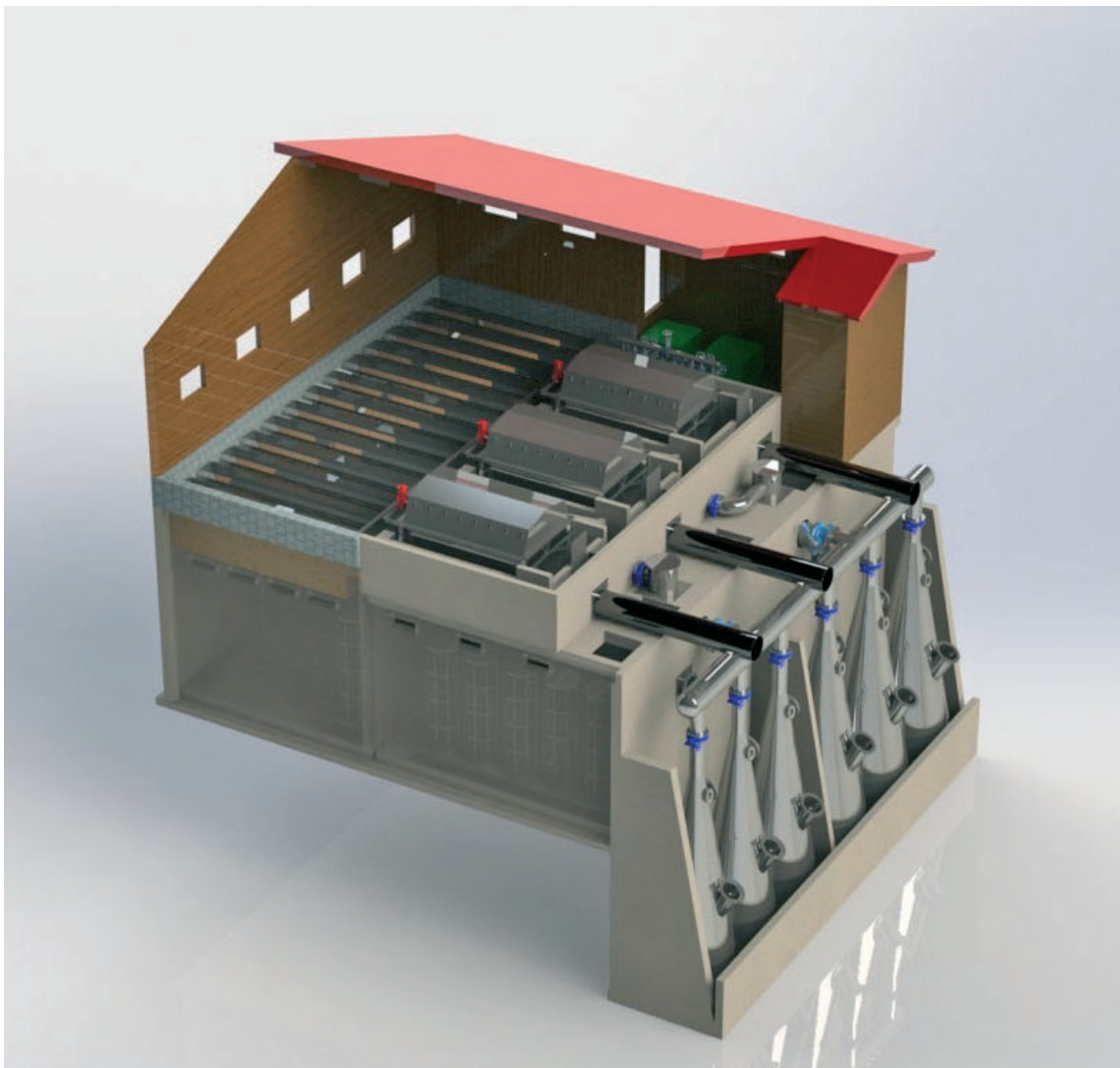
Parameter	Test results
CO <sub>2</sub> out of fish tank	12-13 mg/l
NH <sub>4</sub> -N + NH <sub>3</sub> -N	0,6 mg/l
NO <sub>2</sub> -N	< 0,16 mg/l
Nitrogen saturation	< 101 %

Table: Water quality at 900 kg/day feeding and 45-60 kg/m<sup>3</sup> biomass.



Facing the challenge of very limited available area, RAS1 was designed as an extremely compact plant. Less than 200 m<sup>2</sup> is used to treat 2.850 m<sup>3</sup> water. Kaldnes® RAS is located in a separate building, while the fish tanks are placed outside.

RAS2 is an operator-friendly indoor water treatment plant with good access to the equipment, well arranged and with compact design. The plants are characterized by extended use of automation and by material of high quality.



### **Krüger Kaldnes**

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