

# Marine Harvest Dalsfjord | NORWAY

## Fish Farming

### The Client

**Commissioned:** 2010/2012

**Customer:** Marine Harvest Dalsfjord



### Key figures

**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 43  
NO<sub>2</sub><sup>-</sup>-N: < 0,16 mg/l  
Nitrogen saturation: < 101 %

### The Client's Needs

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

#### Marine Harvest Dalsfjord

Marine Harvests location at Dalsfjord near Volda-Norway, produces salmon smolt. Between 2009 and 2012 Krüger Kaldnes AS planned and delivered two plants to Dalsfjord for the production of more than 4 million salmon smolts per year. Each product line has its own separate water treatment system (RAS1 and RAS2).

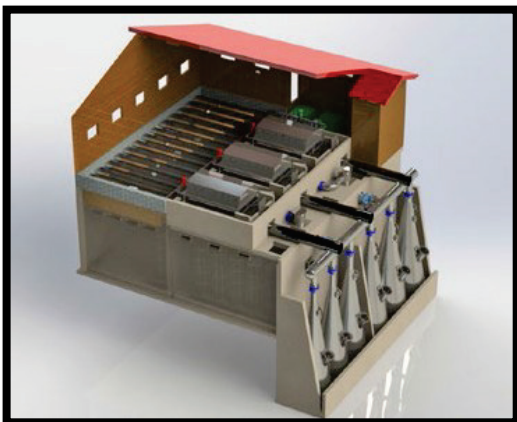
### The Solution

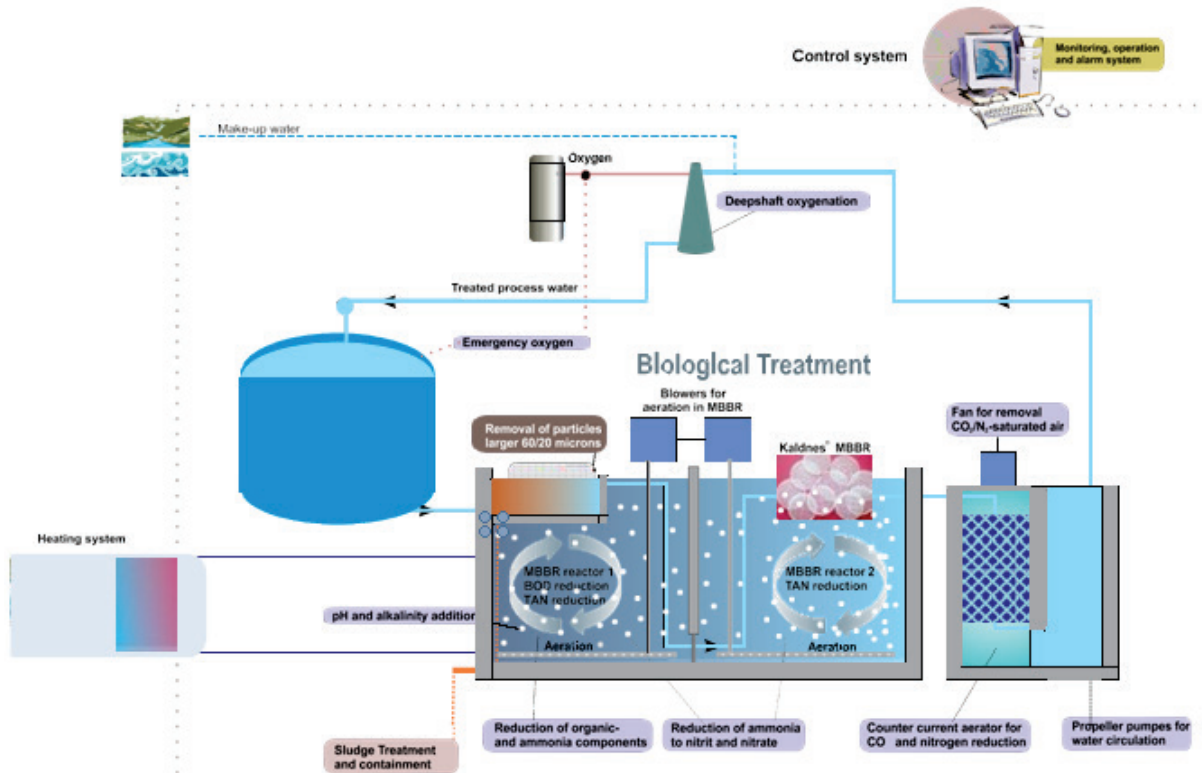
Kaldnes<sup>®</sup> RAS, comprising of Hydrotech<sup>™</sup> drumfilters, AnoxKaldnes<sup>™</sup> MBBR, centralized CO<sub>2</sub>. Degasser and circulation pumps. The two plants are fully managed and monitored via the control program VA operatör.

#### Main components

The water treatment plants, Kaldnes<sup>®</sup> RAS, consists of five main components :

- **Mechanical cleaning**  
Hydrotech<sup>™</sup> 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<sup>®</sup> 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

- RAS 1 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.
- RAS 2 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>.

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	Values
CO <sub>2</sub> out of fish tank	12-13 mg/l
NH <sub>3</sub> -N + NH <sub>2</sub> -N	0,5 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. RAS 2 is an operator-friendly indoor water treatment plant with good access to the equipment in a compact design. Both plants are highly automated.