

# AERATION IN FISH FARMING A105

## APPLICATION NOTE

### Aeration in fish farming

Our Norwegian distributor, [Flow-Teknikk](#), assisted a customer involved in the oxygenation of salmon in open sea fish farming cages with an aeration solution containing **automated** and **remotely controlled** air flow controllers.

#### Aeration: supply of oxygen to water

Fish farming inside the Norwegian fjords is characterised by less circulation of water and warmer temperatures. Fjords protect the fish farms from excessive wave movements, but also provide ideal conditions for unwanted fish lice. To prevent fish lice and other diseases on these farms, aeration into the fish cages is essential. **Aeration**, also called **oxygenation**, is the **supply of oxygen to water**. This can be done with air flow controller.



#### Application requirements

The aeration into the fish cages needs to be **automated** and **remotely controlled** from one computer. This control function is not just for on/off setting, but should be able to fine-tune the air flow for optimal aeration.

#### Important topics

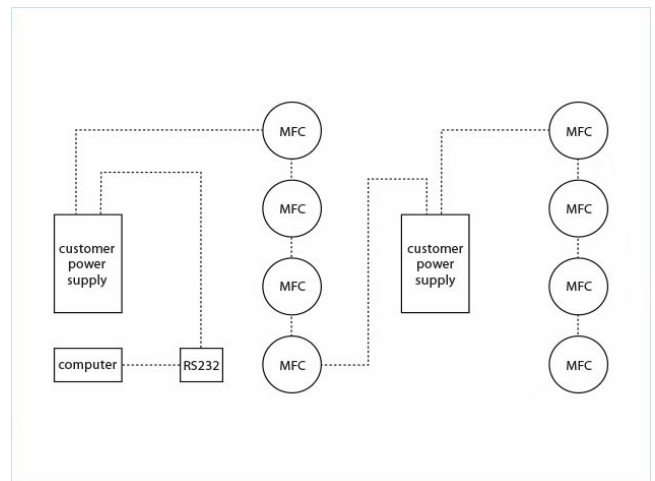
- Automation and remote control
- Economic, robust solution

#### Air flow controllers for aeration

##### Process solution

A set of multiple Bronkhorst MASS-STREAM™ [D-6371](#) mass flow controllers is applied for the aeration, with one device for each fish cage. Each [air flow controller](#) supplies air in a range between 250 and 600 liters per minute. The air comes from a compressor and enters the flow instrument at a pressure of 6 bars.

The flow controllers are remotely controlled from a custom made human machine interface (HMI) on the customer's computer, using a PLC and the Modbus communication protocol. This computer is located in a command centre on land, and signals are sent via a mobile 4G network to a feeding raft in the sea between the fjords close to the cages. The compressor is located in the belly of the feeding raft, and the cabinet with the air flow controllers is on deck. The remote control from the command centre allows stopping aeration when they feed the fish, meaning that the people who control the feeding can also control aeration. This is a big step forward. Normally, they don't want to use aeration at the same time as they are feeding.



Flow scheme

Prior to the Bronkhorst solution, the fish farmer used variable area flow meters (VA meters) in combination with manual needle valves at the site. To comply with the **automation** and **remotely** control requests of the customers, the pilot setup was executed with **FLOW-BUS** communication protocol. To be able to customise temperature and pressure reading, the final setup was executed with **Modbus**. Due to the digital electronics on the **MASS-STREAM** devices, it was possible to upgrade the firmware with Modbus.

An important reason for the customer to use the **MASS-STREAM** flow controllers is their good price-performance ratio. As the company needed multiple instruments for this application, this was an important aspect. Moreover, the integrated display on each of the devices allows to locally override the remote settings, if needed. On top of that, the robust design with **direct through-flow measurement** based on the **Constant Temperature Anemometer (CTA)** principle is favourable in the demanding Norwegian surroundings.

Fish lice in a fishing farm can have a devastating effect for a farming company. As fish lice treatment is very expensive and time consuming, preventing the occurrence of fish lice by means as aeration is extremely cost reducing.

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## Recommended Products



### MASS-STREAM D-6371/004BI MFC

- Min. flow 2...100 l/min
- Max. flow 20...1000 l/min
- Pressure rating up to 10 bar
- Rugged sensor and housing (IP65)
- Optional integrated TFT display



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