A105-GP99 - LUFTZUFUHR IN DER FISCHZUCHT

APPLICATION NOTE A105-GP99

AERATION IN FISH FARMING

Compared to 'real open ocean' aquaculture, fish farming inside the Norwegian fjords is characterised by less circulation of the water and warmer temperatures. Even though the fjords protect the fish farms from excessive wave movements, they also provide ideal conditions for unwanted fish lice and their resulting infections to occur.

To prevent fish lice on these farms, aeration into the fish cages - that is: the supply of tiny air bubbles to the water - is essential. Even lice skirts, another means to prevent lice which close the fish cages with a skirt, necessitate water circulation and air addition. Moreover, it is reported that air flow helps to prevent gill diseases.

A Norwegian manufacturer of air/gas distribution systems, is involved in the air distribution to salmon in open sea fish farming cages and nets. To optimise the aeration, they requested the help of Flow-Teknikk, the Norwegian distributor of Bronkhorst.

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.

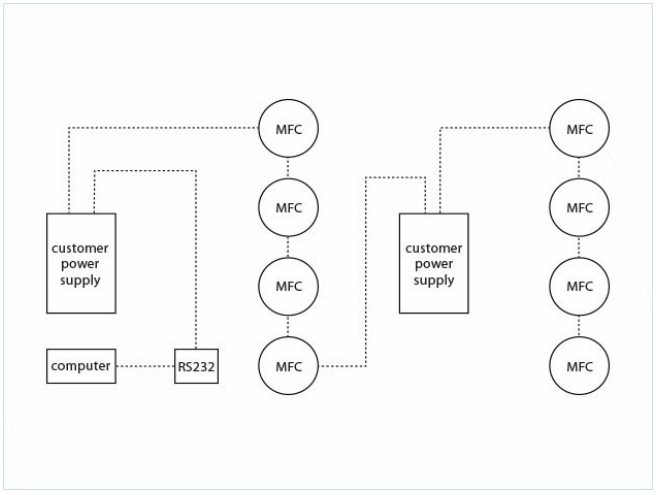
Important topics

- Automation and remote control
- Economic, robust solution

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 mass flow controller supplies air in a range between 250 and 600 liters per minute, where the accuracy of the flow rate is not a major issue for this application. The air comes from a compressor and enters the mass flow controllers at a pressure of 6 bars.

The mass flow controllers are remotely controlled from a custom made human machine interface 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 mass 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 client, the Bronkhorst mass flow controllers were originally ordered with **FLOW-BUS**, and indeed one test-system was delivered with this communication protocol. However, in order to be able to do some customisation including temperature and pressure reading, it was decided to use **Modbus** for the final setup. Due to the digital electronics on the MASS-STREAM devices, it has been 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 needs multiple devices for this application, a relatively low price is attractive, for example by choosing aluminium as body material instead of stainless steel. 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.

Recommended Products

MASS-STREAM D-6371/004BI MFC

Min. Bereich 2…100 ln/min
Max. Bereich 20…1000 ln/min
Druckstufe bis zu 10 bar
Robuster Sensor, IP65 Gehäuse
Option: integriertes TFT-Display

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