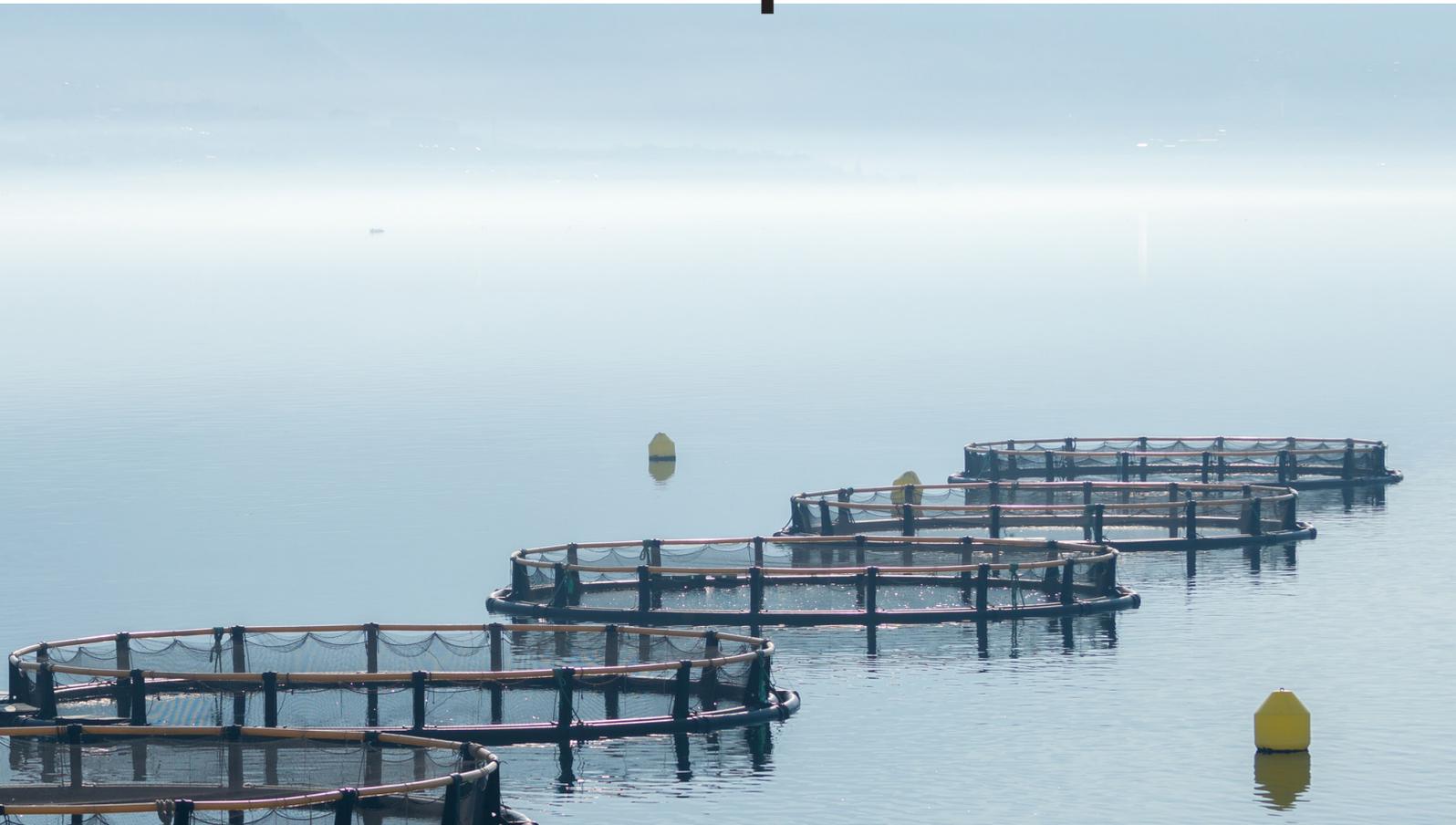


Fisheries & Aquaculture



Dependable online, inline, and atline solutions for aquaculture optimization.

Forecast: farmed fish to overtake wild caught by 2030

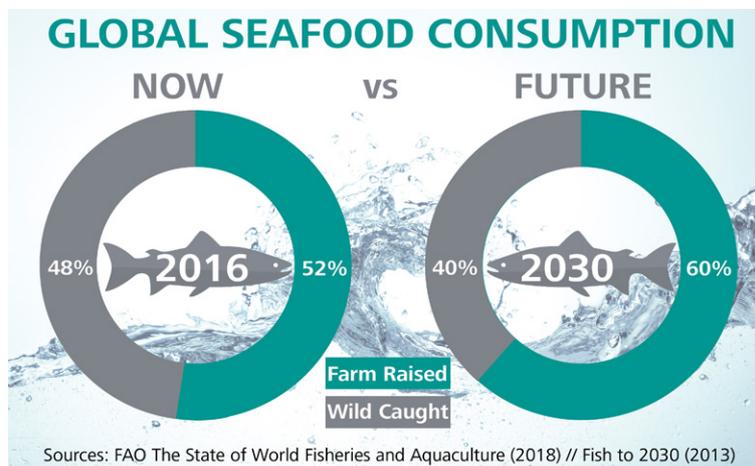
02

Fish is well-known as a healthy source of animal protein, high in unsaturated fats and other essential nutrients. In 2015, 17% of worldwide animal protein intake came from fish (UN, *The State of World Fisheries and Aquaculture 2018*). According to the UN, the current world population is expected to increase to 9.7 billion by 2050 ("*World Population Prospects 2019: Highlights*").

With the ever-growing population comes the challenge of global food security. Aquaculture has already gained a foothold in many coastal communities, and farm raised

fish sales are on the rise. This has turned aquaculture into a major part of the export economy in some countries.

It is expected that global seafood consumption from farm raised sources will increase significantly in the coming years. Therefore administering sustainable practices in the burgeoning aquaculture industry is key to alleviate pressure on wild fish stocks and reduce other environmental impacts.



Adherence to strict environmental and health standards is important as a food producer. Animal health, hygiene, and especially water use are important factors to consider in aquaculture. Disease and sickness can spread easily between the animals, and due to the nature of these floating aquatic farms, the outbreaks can spread to wild populations as well.

Medical treatments and additional nutrients must be regulated to protect the other wildlife. Ensuring correct dosage of these as well as monitoring the water quality and waste is essential for compliance with government standards.



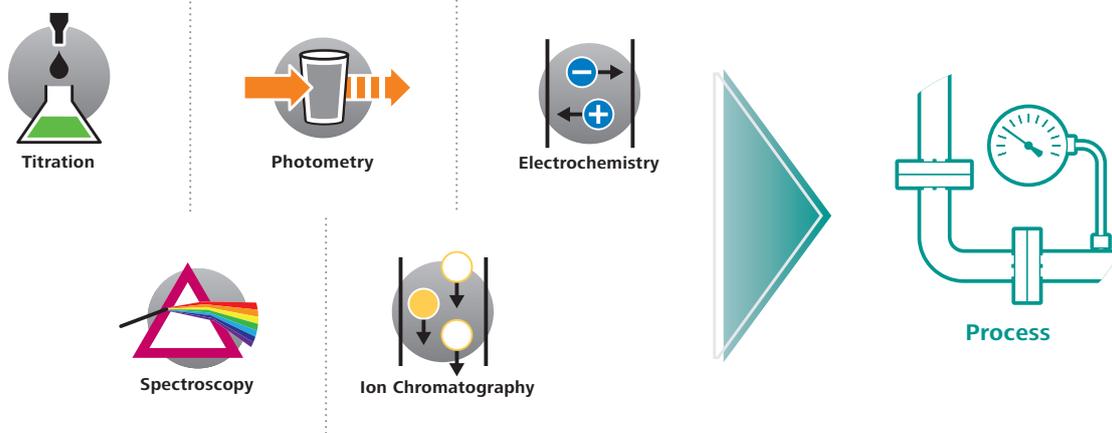
Lower costs with online analyzers

Implementing a process analyzer will lower the costs of running a fish farm by accurately monitoring the water for medications, nutrients, and waste levels—optimizing the processes which keep your fish healthy and growing.

Metrohm Process Analytics offers several analytical techniques in many different analyzer configurations for any need: titration, photometry, ion chromatography, NIR spectroscopy, and ion-selective measurements.

Our online process analyzers and custom sample preconditioning systems are manufactured in the Netherlands and supported by our local service engineers worldwide.

03





04

Hydrogen peroxide

Reduce Risk with Online Process Analysis

Every minute counts

Performing manual sampling followed by laboratory analysis can take up precious time. Inefficient and cumbersome analytical methods can also miss significant events such as overdosing of reagents, or allow the process to be out-of-specification until the next measurement is taken, whenever that may be. When it comes to true process optimization tactics, every minute counts.

In the process of growing salmon, delousing treatments using hydrogen peroxide (H_2O_2) is used to prevent the proliferation of salmon lice (parasites which attach and kill the salmon). However, there are some challenges regarding the efficiency of dosing, mixing, and the distribution of H_2O_2 in the salmon treatment tank to prevent overdosing, which can lead to **higher operational cost** and death of the fishes.

Advantages of online process analysis

Metrohm Applikon, with the brand of Metrohm Process Analytics instruments, is able to offer several application solutions for the Fishery and Aquaculture industry.

Process analyzers from Metrohm are designed to offer fast, reliable, accurate measurements in a rugged housing, 24/7 to ensure processes are always running within specifications. Online analysis with industrial process analyzers lessens the need for highly-skilled technical employees and saves time by automating measurements directly at the sample point. Reducing manual sampling **lowers costs** and **increases the safety** of plant operations.

With subsidiaries located worldwide, you can rest easy knowing we can support you locally, wherever you are.



Applications

Process Application Notes for the Fisheries & Aquaculture Industry

- Effectively Monitoring Hydrogen Peroxide as a Delousing Agent in Salmon Farms [AN-PAN-1031](#)



Delousing with Hydrogen Peroxide

Fish are introduced to dilute baths of hydrogen peroxide (H_2O_2) for up to 20 minutes for delousing. This removes the attached parasites, which can then be filtered from the water. However overdosing can cause oxidative stress in the fish, the bleaching of skin/scales, and death. Therefore, a quick analysis and response time is needed. The Metrohm Process Analytics 2035 and 2060 Process Analyzers are suitable to perform this measurement online.

- Monitor H_2O_2 in a typical range of 0–2500 mg/L
- Accurately control dose rate into treatment tank
- Improve fish welfare, lower overhead costs, lessen environmental burden by measuring online



2035 Process Analyzer for potentiometric titration measurements



2060 Process Analyzer



Fish cages in Velfjorden, Brønnøy, Norway. (Thomas Bjørkan)

Applications

06

Process Application Notes for the Fisheries & Aquaculture Industry

- Ortho- and total phosphate phosphorus analysis online according to DIN EN ISO 6878:2004-09. [AN-PAN-1039](#)



Monitoring nutrient loads

Farmed fish require many essential fats, amino acids, and other nutritional elements to grow. However, many of these nutrients also feed other organisms in the water. In higher concentrations, limiting nutrients such as phosphate enable proliferation of toxic algal blooms, significantly diminishing water quality for the fish.

The 2035 TP Analyzer is configured with an integrated cuvette digester to measure both ortho- and total phosphate phosphorus around the clock.

2035 TP offered in 3 measurement ranges:

- Low TP (0–150 µg/L)
- Standard TP (0–5 mg/L),
- High TP (0–100 mg/L).



The 2035 Process Analyzer from Metrohm Process Analytics, configured to monitor both ortho- and total phosphate-phosphorus, with a photometer along with a compact digestion cuvette.



Applications

Process Application Notes for the Fisheries & Aquaculture Industry

- Wastewater Treatment Plants: Nitrogen Removal. Simultaneous analysis of Ammonia, Nitrate and Nitrite. [AN-PAN-1009](#) 

Water quality

Continuous online measurement of waste products such as ammonia is especially important for the water quality in the fish pens and surrounding environment.

The 202X process analyzer series provides a reliable and easy-to-maintain 24/7 operation.

- Titration or photometric measurements in up to 2 sample streams
- Online pH-measurement with automatic cleaning and calibration
- Highly sensitive photometric measurement, typically in the low $\mu\text{g/L}$
- Compact footprint for tight industrial spaces



2029 Process Analyzer configured for water analysis



2026 Process Analyzer configured for water analysis

Water analysis parameters measured by 202X Process Analyzer

- Alkalinity
- Aluminium
- Ammonium / Ammonia
- Calcium, Magnesium
- Chlorine
- Chromium
- Cyanide
- Iron
- Hardness
- Copper
- Manganese
- Nickel
- Nitrate
- Nitrite
- pH-value
- p/m-value
- Phenol
- Phosphate
- Silicate
- Zinc
- and many more.

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