

Effectively Monitoring Hydrogen Peroxide as a Delousing Agent in Salmon Farms

The industrial farming of plants and animals for human consumption is nothing new, although generally this is done on land (agriculture). Aquaculture is the equivalent to agriculture in terms of growing animals and plants for food, but farmed from water sources. Salmon farming has grown in popularity over the years, from the coasts of Norway and Scotland to as far away as New Zealand, Chile, and Alaska. The process of growing salmon is contained either in a net or pond, and is controlled from egg to market. An unfortunate side effect of holding such a large volume of fish in a contained area is the proliferation of salmon lice (*Lepeophtheirus salmonis*), which must be killed off (delousing) for a healthy population of fish to survive. The parasites attach to and feed off of the salmon, causing anemia and even death. The lice can spread quickly during the grading and harvesting processes because of the large disturbances caused.

One of the salmon delousing treatments available is hydrogen peroxide (H_2O_2). A diluted bath of H_2O_2 is prepared in which the fish are introduced for up to 20 minutes, and this removes the attached parasites, which can then be filtered from the water. The benefits of using H_2O_2 are numerous – it is easy to purchase, it is a non-medicinal treatment, and it rapidly degrades into water and oxygen as byproducts. Challenges remain regarding the efficiency of dosing, mixing, and the distribution of H_2O_2 in the salmon treatment tank to prevent overdosing, which 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 2045TI Process Analyzers can monitor the concentration of H_2O_2 and be used to control the dose rate accurately into the salmon treatment tank, ensuring that the delousing process runs within specification. These analyzers are currently in use at several salmon farms.



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

Application: The H_2O_2 concentration is measured titrimetrically with cerium(IV) using a Pt-ring electrode and reference electrode (Ag/AgCl/KCl) to determine the endpoint with dynamic endpoint titration (DET). The analysis frequency is typically less than 2 minutes, ensuring timely control of the H_2O_2 concentration in the bath.

Typical Range: 0–2500 mg/L hydrogen peroxide (H_2O_2)

Remarks: Other applications are available for this industry like: alkalinity, calcium, water hardness, free fatty acids in fish oil, iron, phosphate, and many more.