

Pond Operations Save Money by Automating Oxygen Measurement and Aerator Control

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Oxygen management critical to fish farm success

Many variables compete for the fish farmer's attention. From rising feed prices and energy costs, to managing risks and maintaining equipment, fish farmers juggle a host of factors in an attempt to increase profitability.

Fish farmers have very little control over the price they receive for their fish. But farmers can control yield and cost – one way to do this is to automate dissolved oxygen (DO) monitoring and aeration control.

The U.S. Department of Agriculture (USDA) notes that DO monitoring is the most critical water quality parameter in warm water aquaculture. According to the USDA Catfish Genetics Research Annual Report (2005), "Over \$50 million in potential profit are lost annually from the direct effects of low DO." In addition, "\$100 million may be lost from poor growth and food conversion and a variety of environmental and pathogenic diseases directly related to the stresses of poor water quality."

Will automation pay for itself?

An increase in net return on investment is a primary motive for fish farmers who want to increase their productivity (Hargreaves, et al. 2003). Automated water quality monitoring and control systems have the potential to increase production and profit (Fortune, et al. 2007).

"For our 44-pond (320-acre) fish farm, we drove two hours in the evening and two hours in the morning to turn aerators on and off," said Joey Lowery of Lowery Aqua Farms, Inc. in Amagon, Arkansas. "Over a 24-hour period we made at least seven trips (30 mi/trip) to manually check DO levels and control aerators. Since automating aeration control, we've reduced fuel



Wireless monitoring buoy measures oxygen. Relays power on aerators as needed.

consumption and wear-and-tear on farm vehicles. This will save me a lot in the long run considering that a truck costs \$20,000, lasts about two years, and the trade-in value is minimal. You also have to overrun aerators in order to stay ahead of oxygen depletion given the time it takes to monitor a farm manually. Automation allows you to check DO where you need to and not waste time and energy.

"With variable spring weather, we'd run aerators for insurance," Lowery explained. "We increase feed rates in the spring. As the weather warms up, pond dynamics change as a result of heavy feeding, and oxygen levels can deteriorate rapidly. A farmer can lose a lot of fish when DO levels aren't being checked as frequently as in the summer. Automated monitoring helps to reduce these losses."

“Since automating several ponds on my farm, I’ve seen a 100 percent change in what we’ve had to deal with,” Lowery said. “We don’t have to worry about missing oxygen crashes before the night shift starts working. In-Situ® Inc.’s system probably saved me two ponds of fish this year because aerators turned on automatically at 7 p.m. The night shift didn’t start working until 8 p.m., and it would have been too late by the time we checked the ponds. You usually don’t have trouble at that time of the day, but it can happen.”

Lowery installed 44 buoys with In-Situ Inc.’s Rugged Dissolved Oxygen (RDO®) PRO sensors in May 2009. The savings Lowery has forecasted look promising – 32% reduction on energy costs, 31% reduction on repairing and maintaining aerators, 29% reduction in labor costs, and 57% reduction in vehicle trips for night-time DO checks and manual aerator control.

Breakthrough technology minimizes maintenance, optimizes DO control

“A pond monitoring system is only as good as the probe,” said Rick Fernandez, Assistant Farm Manager at the Silver Streak Bass Company in Danevang, Texas. “Of all the monitoring systems we’ve tried, the weak point has been the DO probe. Fifty percent of the time that we were spending on maintenance was dedicated to maintaining and calibrating membrane-style DO sensors.

“All 110 ponds on our farm have buoys that use the RDO PRO sensor,” Fernandez continued. “The RDO sensors do not flood, do not need membranes and filling solution, and do not require frequent calibration.”

Unlike membrane-style DO sensors, the RDO PRO sensor significantly reduces maintenance and calibration requirements. The RDO sensor uses optical technology instead of an electrochemical method.

Fish farmers can deploy a buoy with the RDO PRO sensor for an entire season, spanning months, without recalibration. Electrochemical sensors require recalibration and maintenance every two weeks, at a minimum.

In June 2009, Nature’s Catch in Clarksdale, Mississippi switched all 102 buoys on the farm from galvanic sensors to RDO PRO sensors.



Harvesting hybrid striped bass at Silver Streak Bass Company in Danevang, Texas.

“With galvanic sensors it was like throwing a dart at a spinning dart board in a dark closet,” Rapert said. “The galvanic sensors always drift out of calibration, and the calibration only lasts for about a week.”

Time is another factor working against fish farmers. If farmers are manually checking DO levels in each pond, they must move quickly in case a pond needs emergency aeration. Most handheld DO probes require warm-up time and take at least 30 seconds to equilibrate. By using a wireless buoy with an RDO PRO sensor, no warm-up time is required. The RDO sensor is always ready to check DO levels at user-specified time intervals. By automating both DO monitoring and aeration control, farmers can reduce DO-checking rounds and supplemental aeration.

Resources

1. Fortune, S. and T. Tietjen. 2007. Comparison of Automated versus Manual Monitoring of Levels of Dissolved Oxygen in Aquaculture Ponds. 37th Annual Mississippi Water Resources Conference.
2. Hargreaves, J.A. and S. Tucker. 2003. Defining loading limits of static ponds for catfish aquaculture. *Aquaculture Engineering*. Vol. 28, pp. 47-63.
3. USDA. 2005. *Catfish Genetics Research 2005 Annual Report*. http://www.ars.usda.gov/research/projects/projects.htm?ACCN_NO=409162&showpars=true&fy=2005



For more information, contact In-Situ Inc.

221 East Lincoln Avenue, Fort Collins, CO 80524
1-800-446-7488 (toll-free in U.S. & Canada)
1-970-498-1500 (international & domestic)
www.in-situ.com

02/11; 500