

Delivering Oxygen for Improved Fish Health

Praxair Pure Oxygen Systems Improves Dissolved Oxygen Levels

Whether you are growing fry or harvesting full grown fish, oxygen is vital to their health and well-being. Ensuring you have the right levels of oxygen in the water, also known as dissolved oxygen (DO), is critical to the success of your operation.

Controls DO Levels For:

- Improved fish health
- Increased feed rate conversion
- Avoidance of gas bubble disease (nitrogen super saturation)
- Reduced prevalence of disease
- Mitigation of parasitic outbreaks (e.g. sea lice)
- Higher weights/yields



Oxygen versus Traditional Aeration

Direct oxygenation systems have far reaching benefits over conventional air-based aeration systems. While conventional systems have limited oxygenation rates, Praxair's direct oxygenation systems optimize gas/liquid mass transfer principles. As Praxair's systems deliver 100% oxygen instead of just the 21% found in air, there is the added benefit of lower power consumption compared to conventional systems.

DO Concentration and effects on salmonids

(other than embryonic and larva)

Level of Effect	D.O. (ppm)
No production impairment	8
Slight production impairment	6
Moderate production impairment	5
Severe production impairment	4
Limit to avoid acute mortality	3

Source: USEPA

Better Oxygen Control, Improved Productivity

With precise oxygen level monitoring and delivery, Praxair's system can maintain desired oxygen levels by adjusting oxygen delivery relative to demand. Customers have reported increased population density per pond resulting in a greater yield per

existing square foot – all without capital intensive investment.

The Difference Lies in the Technology

Through years of experience, Praxair has developed a variety of technologies to maintain appropriate DO levels.

Hydrox DMT™

A patented process utilized across hatcheries, Praxair's Hydrox systems can be used to oxygenate centralized tank operations or individual tanks. With engineered systems for both freshwater and seawater, the Hydrox system delivers the right amount of oxygen based on the volume of water, fish size, biomass and temperature for your operation.



By super oxygenating a side stream that is then reintroduced to the tank, Hydrox DMT is a highly effective and energy efficient system. DO levels are monitored and maintained, promoting fish health and viability.



Features

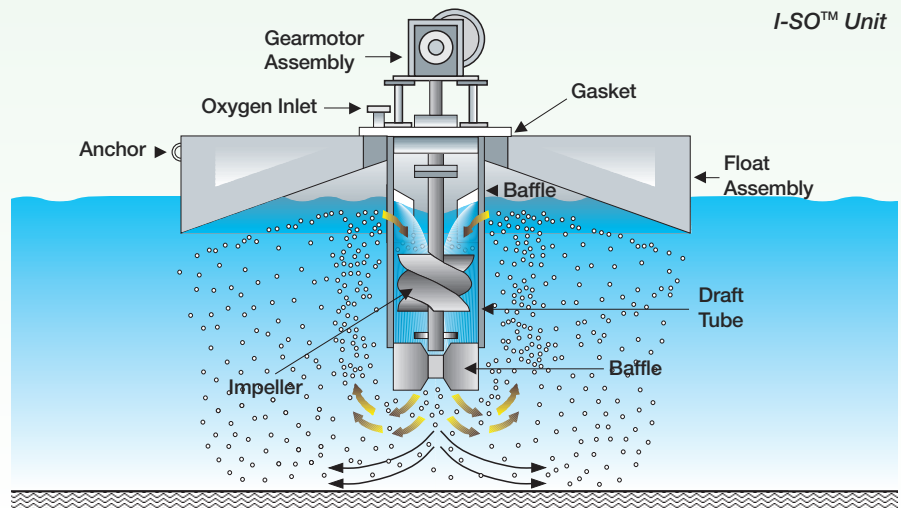
- Control systems manage oxygen injection to meet desired DO levels
- Once-through or recirculating system set-up
- Aeration system can support multiple tanks
- Suitable for fresh and salt water

Benefits

- Improves growth rates and survival rates
- Oxygen delivery adjusts to system demand
- Reduces the risk of nitrogen supersaturation
- Low capital investment

I-SO™

Praxair's I-SO technology uses a proprietary oxygen injection system that provides high levels of mass transfer, ensuring that oxygen is effectively mixed into the water. The unique design offers minimal turbulence, high efficiency and low power consumption. This is especially important when holding cages are located in sheltered coves where there is little water exchange.



Benefits

- Provides DO needed for fish health and viability
- Low maintenance costs and long equipment life
- Adjusts O₂ delivery to actual demand
- Low power cost
- No down time for installation
- Easy to operate and control

Features

- High oxygen transfer efficiency
- Suitable for harsh sea conditions
- Flexible design
- Low turbulence
- Easy installation
- Automated process controls

Seawater Oxygenator

Praxair scientists and engineers have developed a cost effective, compact, in-line seawater oxygenation system to maintain necessary DO levels in open water holding tanks. Sophisticated control systems accommodate for seawater turnover associated with waste and CO₂ removal.

Benefits

- Low energy consumption and power requirements
- Long equipment life and reliability
- High oxygen utilization
- Automated system for easy control and continual system feedback
- Flexible design
- Compact footprint
- Low capital cost

Features

- Low pressure drop system – 0.01 to 0.04 bar (atm)
- Seawater compatible materials
- High oxygen transfer efficiency
- Integrated system controls
- Multiple sizes /capacities



Praxair System	Technology	Suitable For:
Hydrox DMT	<ul style="list-style-type: none"> ■ Re-introduction of a supersaturated side stream 	<ul style="list-style-type: none"> ■ Hatcheries, fisheries and ponds ■ Fresh and seawater
Seawater Oxygenator	<ul style="list-style-type: none"> ■ In-line system dispersing oxygen microbubbles ■ Rapid mixing with low pressure drop 	<ul style="list-style-type: none"> ■ Near shore saltwater tanks
ISO	<ul style="list-style-type: none"> ■ Proprietary oxygen injection and mixing 	<ul style="list-style-type: none"> ■ Near shore and off shore installations ■ Fresh and seawater

Oxygen Supply Systems

As a fully integrated supplier of oxygen, Praxair can provide the right sized supply system. We deliver reliable performance in a cost competitive package:

- Packaged gases and cylinders
- Bulk, small bulk and microbulk liquid gases
- Pipelines
- On-site supply plants

Along with our full range of gas supply, Praxair offers support services including:

- Equipment services – piping and equipment installation, maintenance, repair and related needs
- Site management services – total site management including on-site cylinder management
- Productivity Services – dedicated to helping customers

increase productivity, improve quality, reduce costs and comply with safety and environmental regulations

- Praxair Customer Care Center – 24/7 resource dedicated to developing the supply and service options needed to meet your goals. A toll-free call to **1-800-PRAXAIR** puts the resources of Praxair's organization at your service.

Safety and Reliability You Can Count On

Not only can you count on Praxair to deliver quality gases and services, you can count on our commitment to operate safely and reliably every step of the way. We hold ourselves to the goal of zero recordable injuries and zero lost workday cases across our entire business and strive to meet this goal every day.

Our safety initiatives also extend to you, the end user. Through the supply of product information and training, we can provide information you need to use our products safely. This includes:

- Material Safety Data Sheets
- Product literature containing additional safety information
- Praxair specialists available for advice and consultation
- Safe handling videos for oxygen

Contact Praxair Today

Additional information about Praxair's oxygenation systems, as well as all the processing, cryogenic freezing and chilling systems offered by Praxair, is available by calling **1-800-PRAXAIR** or visiting www.praxairfood.com



© Copyright 2016 Praxair Technology, Inc. All rights reserved.

Praxair, the Flowing Airstream designs and Making our planet more productive, are trademarks of Praxair Technology, Inc. is a trademark of Praxair Technology, Inc. Other trademarks used herein are the registered trademarks of their respective owners.

The information contained herein is offered for use by technically qualified personnel at their discretion and risk without warranty of any kind.

02-16

P-40-4194

Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113
USA
www.praxair.com
info@praxair.com

Telephone:
1-877-PRAXAIR (1-877-772-9247)
Fax:
1-800-772-9985
(716) 8792040