Lake and Reservoir Restoration Using the SDOX® System

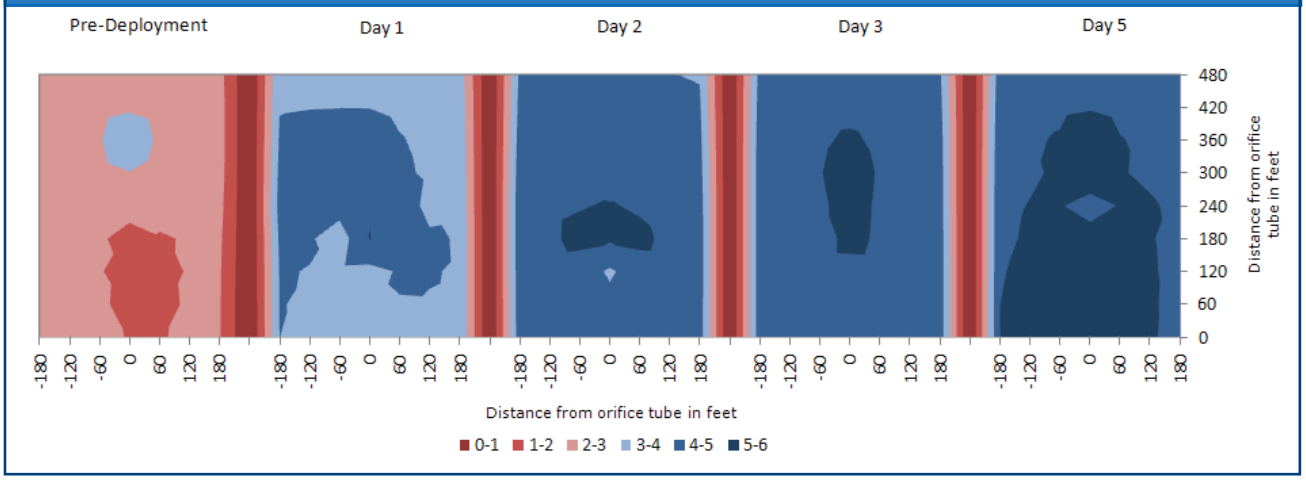
The Supersaturated Dissolved Oxygen Injector (SDOX®) uses a patented and patents pending technology for delivering dissolved oxygen (DO) to water. The benefits of the SDOX® over current technology are lower operating costs, far greater flexibility over where and when dissolved oxygen is delivered to any point in the water body, and precise control of oxygen concentration in a water body even as flow rate and oxygen demand are continually changing.

The benefits of the SDOX® over current oxygenation/aeration technology include:

- Rapid delivery of dissolved oxygen in solution, providing immediate increases in bio-available oxygen;
- The ability to create a plume of oxygenated water in a lake and to deliver oxygen below a thermocline without disruption (since no bubbles are created to cause upward currents);
- Portability options allowing complete flexibility over where and when DO is delivered to the lake/reservoir;
- High delivery efficiency resulting in lower operating costs;
- Precise, continuous control of DO delivery with controlled mixing such that stratification/sedimentation is not disturbed;
- Portability - the system can be trailer mounted and operated with portable generators and liquid oxygen.

The SDOX® injects a side-stream of water supersaturated with oxygen to the water being treated. Unlike similar side-stream systems that increase side-stream DO to 50-60 mg/L, the SDOX® provides 310 mg/L of DO, with automatic delivery rate controls. The supersaturated side-stream is nearly instantaneously mixed with lake water (liquid-to-liquid mixing) to prevent any gas from leaving the water in the form of bubbles.

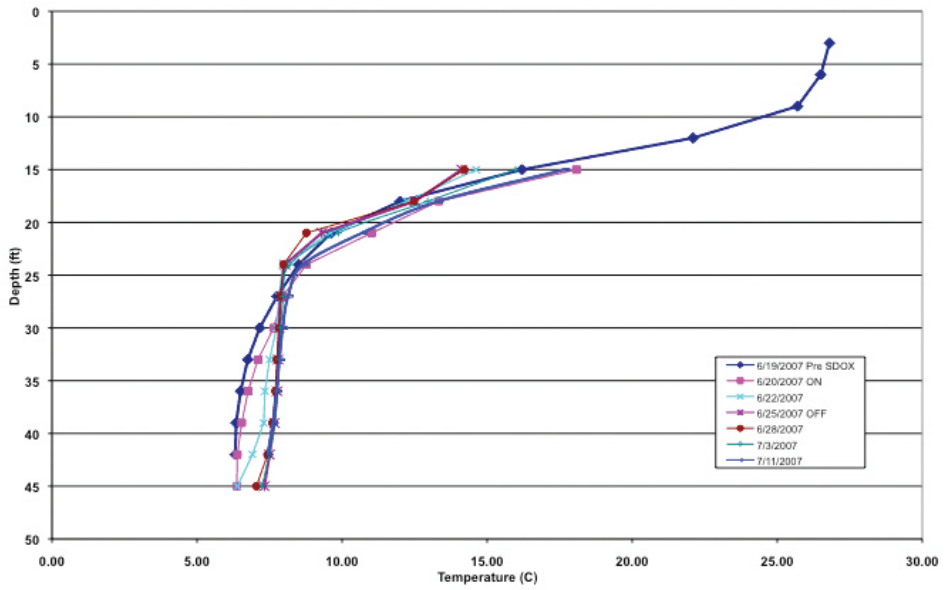
Horizontal oxygen profile of Lake Brittany at a depth of 30 ft before depolyment of the SDOX® and 5 days afterward. The DO was added below the thermocline and did not cause mixing of the strata.



This innovative process results in near 100% efficient utilization of oxygen, even if injected in shallow water (such as tailwaters). In other words, the oxygen gas entering the SDOX® is delivered in dissolved form to the lake; virtually no oxygen is lost to the atmosphere.

Because the SDOX® adds oxygen to lakes at the molecular level, microbes are rapidly able to utilize the oxygen for metabolism, reducing organic contamination of the water column. The oxygen stays in solution and is transported throughout the strata with high conservation, resulting in efficient remediation of low DO zones and protection of sensitive species.

Temperature vs Depth in Lake Brittany, 300 ft from DO injection. The data indicates that the thermocline was left intact during SDOX® injection. Visual evidence from a boat also indicated that no destratification occurred and no bubbles rose to the surface of the lake.



Dissolved oxygen delivery can be focused to narrow strata (hypolimnion) or distributed throughout the water column, depending upon management objectives. The SDOX® system can be applied in a wide range of remediation processes to:

- Enhance in-lake processes to reduce the impact from organic carbon/nutrient loads from the watershed, rivers/streams, hypolimnion, or sediment;
- Enhance microbial metabolism of organic contaminants within the water column for TOC reduction;
- Supplement DO to reduce seasonal stresses on endemic or critical aquatic species due to high temperatures or to high organic loads (eutrophication);
- Provide an oxygen refuge for critical aquatic species during stress periods;
- Enhance sediment oxygen availability, thereby reducing sediment oxygen demand;
- Reduce the impact of eutrophic oxygen demand by supplementing oxygen during critical dark-respiration periods;
- Provide oxygen to dam forebay or tailwaters for protection and enhancement of critical fisheries, especially during stratification where forebay DO is low;
- Provide a rapid redox shift for precipitation of metals.

The source of oxygen for the SDOX® can be liquid oxygen, oxygen generators, or compressed air. The SDOX® is available in several sizes, providing delivery rates up 8 tons of DO per day per unit. SDOX® units can be manually or automatically operated, depending on user requirements. Portable SDOX® units are available that can be operated in response to intermittent, site-specific needs. Variable speed pump drives with high efficiency motors are used so delivery rates can be easily varied from 40% to 100% full capacity without compromising efficiency. The SDOX® internal components are non-fouling and stainless steel to prevent corrosion and can handle solids as large as 1/4 inch.