



ECO₂[®]

Superoxygenation System

Competitive Advantages



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ECO₂ Superoxygenation – Competitive Advantages

Oxygen is considered a relatively insoluble gas and thus requires properly designed equipment to achieve high oxygen transfer efficiencies. A force main by itself is not suited as an oxygen transfer device, due to periods of low flow where oxygen bubbles cannot be held in suspension to fully dissolve. To prevent air locking of pumps and pipes, an efficient side-stream oxygenation system is required to add a sufficient amount of oxygen to the process. ECO₂ is the market leader in Superoxygenation for Odor and Corrosion Control and our systems distinguish themselves through robust design and smart controls.

Listed below are some of the operational benefits that should be considered when comparing the ECO₂ Superoxygenation system to other alternative technologies.

1. ECO₂ Patented Flow Paced Oxygen Feed Controls - Consistent Results

The ECO₂ system has automated, PLC driven controls. The controls monitor the force main flow and calculate an HRT. Using this calculated HRT, the PLC pre-calculates the oxygen demand and administers the correct amount of oxygen needed to ensure aerobic conditions through the force main discharge. By pacing the oxygen addition with the flow, the results are consistent. Through system monitoring and analysis, parameters can be set that will anticipate changes in the HRT due to diurnal fluctuations. This will allow the tail end of high flow periods to be dosed appropriately for the following periods of low flow and extended HRTs.

A system that relies on H₂S, DO or ORP feedback signals for DO adjustments is **reacting** to “out of range” alarms, resulting in less consistent results. (IF a reliable signal can be received; it is commonly known that continuous sensors that are submerged in wastewater require a significant amount of maintenance to provide accurate results in the long term.) Adjusting DO dosing in this way results in periods of insufficient DO introduction to the force main, which is typically too late to maintain effective odor and corrosion control.

The ECO₂ Superoxygenation system, in contrast, **predicts** the required amount of oxygen. This preventative control mechanism is proprietary to the ECO₂ technology.



2. No Small Openings – Reliable System Operation and Solids Handling

The presence of solids, rags and strings make wastewater difficult to treat if there are any nozzles or orifices less than four inches in diameter. ECO₂ systems have a minimum pipe size of four inches in diameter. ECO₂ systems don't plug or foul due to the presence of solids, rags or stringy material in the wastewater. ECO₂ systems incorporate standard wastewater pumps that are designed to handle the various solid materials that are often contained in wastewater.

Alternative systems with smaller openings require special chopper or grinder pumps, which add horsepower to the system and require additional maintenance. Chopper and grinder pumps are designed to break up material to pass through the pump; however, they do not keep the material from rewinding and clogging small nozzles or orifices downstream. The risk for clogging of openings less than four inches is only a matter of time in raw wastewater systems. Clogging of systems, as well as additional maintenance for additional grinder pumps, results in more down-time and an overall less reliable odor control system.

3. No Pressure Differential - Low Horse Power and Strain on System

The ECO₂ system operates under relatively low pressure, taking advantage of the operating pressure of the force main, rather than pressurizing the system. A system that is not pressurized requires significantly less horsepower and is easier to control and regulate.

A pressurized system, on the other hand, puts a significant amount of stress and vibration on its components, and breakages of air valves, shaft couplers and flex couplings have been reported. Time required for repair and replacement of these integral parts results in time without odor control.

Venturi injection systems require the operators to maintain a certain pressure differential across the venturi, which requires additional instrumentation, oversight and maintenance.

The low pressure ECO₂ system minimizes wear and tear on its few components, making it a much more reliable system with a lower HP pump.



4. No Bubbles - Prevent Accumulation of Pure O₂ in the Sewer Headspace

Effervescence is the loss of oxygen due to oxygen gas coming out of solution after it has been dissolved. This typically occurs when oxygen is dissolved above the oxygen saturation level of the liquid and a rapid change in pressure occurs. It can be minimized by sufficient mixing/ dilution, but a force main may not always guarantee perfect mixing conditions during times of low flows. The potential for effervescence and off-gassing exists with systems that pressurize much above the saturation level.

Oxygen that effervesces, or has not been dissolved in the first place, as is the case with venturi injectors or the addition of microbubbles, can cause the buildup of gaseous oxygen in the force main. Gaseous O₂ in a force main is problematic due to increased head on pumps and potential air binding.

Un-dissolved oxygen is not bio-available for bacteria to prevent the formation of H₂S and is therefore both a safety and an operational liability.

ECO₂ operates near or below the pressure in the force main thereby preventing the potential for effervescence. The end user does not have to worry about the risks associated with effervescence/ O₂ bubbles in the system.

5. 95% Oxygen Transfer Efficiency - Efficient Use of Oxygen

The oxygen transfer efficiency is determined by the dissolution technology. Many injector nozzles or venturis have an oxygen transfer efficiency of 20-60%. The ECO₂ Superoxygenation technology has the highest oxygen transfer efficiency on the market. Every ECO₂ system is tested for its transfer efficiency at start-up and is guaranteed to be greater than 90% efficient. The average transfer efficiency that has been documented across all of ECO₂'s systems – in water and wastewater applications – is 95%.

Oxygen that is un-dissolved in the force main is not available to microorganisms as an oxygen source and is therefore wasted.

Systems with lower transfer efficiencies need to make up for it in size. They will also require a larger oxygen generator to dissolve the same amount of oxygen.



6. Existing Customer Satisfaction

ECO₂ has over 15 years of experience in the design, installation, and long-term operation of Superoxygenation systems for odor and corrosion control. Due to our thorough understanding of the application of oxygen in wastewater, we can determine if an application is a good technical fit for Superoxygenation technology based on our initial due diligence. Pilot systems are not necessary for the application of oxygen in wastewater. ECO₂ backs every proposal with a performance guarantee. A big part of our success can be attributed to the fact that we do not pursue projects that do not lend themselves to the application of oxygen. Even though this has cost us projects in the past, it has built trust with existing and potential clients as well as the engineering community.

Today ECO₂ can claim a 100% success rate for all installations and great relationships with all of our existing clients. As a small company with a niche product, we are especially proud of our repeat customers as we feel this is the best form of approval. Five cities were fortunate enough to have several sites be applicable for the ECO₂ technology and have bought two or more systems, often with a couple of years of operating history in-between (Laguna Beach, CA, Moulton Niguel WD, CA, Knoxville, TN, Columbia, TN, Fishers, IN, Scottsdale, AZ).

We're happy to share our installation list with you and have you talk to any of our clients.



Advantages Over Other Side-Stream Oxygenation Systems

Construction

- ⇒ Sturdy, stainless steel construction (20+ years service life)
- ⇒ No moving parts, except for sidestream pump (minimal standard maintenance)
- ⇒ Hollow Cone - No internal mixers or baffles, self-cleaning device (no clogging, no maintenance)
- ⇒ Large diameter inlet pipe – No nozzles that are prone to clogging (no maintenance)
- ⇒ No venturis or special injectors for oxygen addition (no clogging, no maintenance)

Operation

- ⇒ ECO₂ has a proven track record of 95% oxygen transfer efficiency on average – a rate unmatched in the market place (no waste of oxygen, smallest possible O₂ generator)
- ⇒ No bubbles going into the forcemain (no air locking of pipes or pumps)
- ⇒ No pressurization of cone (low energy consumption)
- ⇒ No pressure differential to maintain (no additional instrumentation, easy maintenance)
- ⇒ No nozzles or venturis (no clogging, no maintenance, no replacement parts)
- ⇒ No grinder pump required upstream of SuperOxygenation System (less maintenance & lower electricity costs)
- ⇒ No pure oxygen headspace (no hazardous conditions)
- ⇒ No ozone (no hazardous conditions for O&M Personnel)
- ⇒ No special injection process required at discharge – simple manifold will suffice

Advantage of Low Pressure ECO₂ System

- ⇒ Vessel is not under high pressure
- ⇒ Pump only has to overcome head loss of 12ft (extremely energy efficient)
- ⇒ Oxygen Generation Equipment can be used without oxygen compressor (lower capital cost, lower operating cost, less maintenance, more reliable system)

ECO₂ Experience

- ⇒ ECO₂ has over 90 installations throughout the U.S.
- ⇒ All systems run flawlessly on fresh water as well as dirty wastewater
- ⇒ The oldest systems have been in operation since the early 1990s
- ⇒ Longest running wastewater systems: since 2003 (same equipment still in operation!)
- ⇒ All systems run automatically with minimal maintenance, satisfying their owners' expectations.