

How BioOx[®] creates a clean air zone

February 2020

Creating a clean air zone

BioOx® Air Cleaning Systems combine the fundamental sciences of:

- Convection
- Molecular charge attraction
- Bio-oxidation

to capture and destroy airborne pollutants without limitations to type or size. This is how the Clean Air Zone is created.

Convection is the process by which a fan is used to move large particulates, which account for approximately 10% of industrial airborne pollutants.

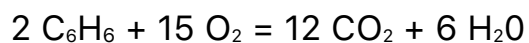
Molecular charge attraction occurs when grounded, neutral air is used as an attractor for the 90% of airborne pollutants that are not affected by convection. These airborne pollutants consist of ultrafine particulates, volatile organic compounds (VOCs), hazardous air pollutants (HAPs), and others. This grounded air zone is not ionic and is not electrostatic, and therefore, produces no harmful byproducts. All charged particles are captured in this neutral zone and become entrenched in the bioreactor.

Example of a grounded air zone, which attracts electrically charged particles.



Bio-oxidation happens when the airborne pollutants that enter the system are broken down and destroyed. Our patented BioOx® Air Cleaning Systems, along with our proprietary BioOx® Media, control the combination of water, oxygen and enzymes to achieve a superior oxidative process that can be as much as 12 times greater than natural oxidation. The process is all natural and results in cleaner air, without any harmful by-products.

An example of benzene oxidation using the BioOx® Air Cleaning System is:



Simply put, the use of BioOx® Air Cleaning Systems allows various facilities to improve indoor air quality by recycling the air inside the facility. In turn, the need to bring in air from outside is reduced, greatly reducing energy consumption and costs.

As illustrated below, by lowering the air turnover rate inside the facility, significant improvements in overall environmental sustainability and significant reductions in operating costs are realized.

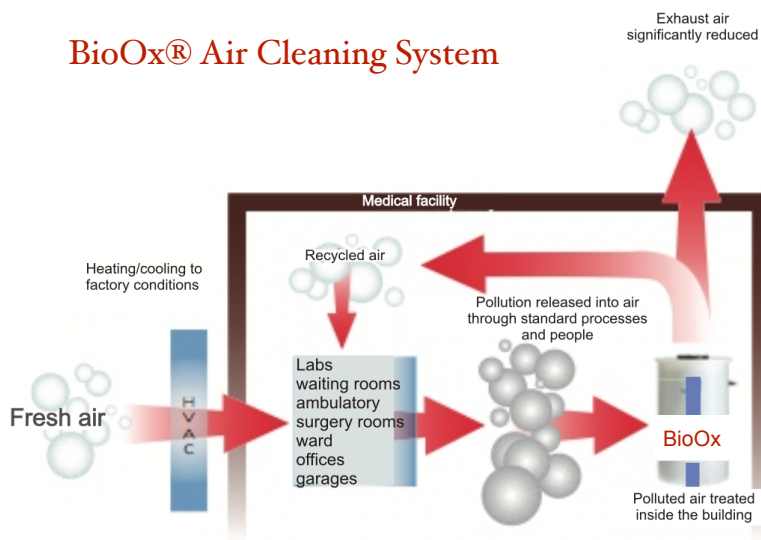
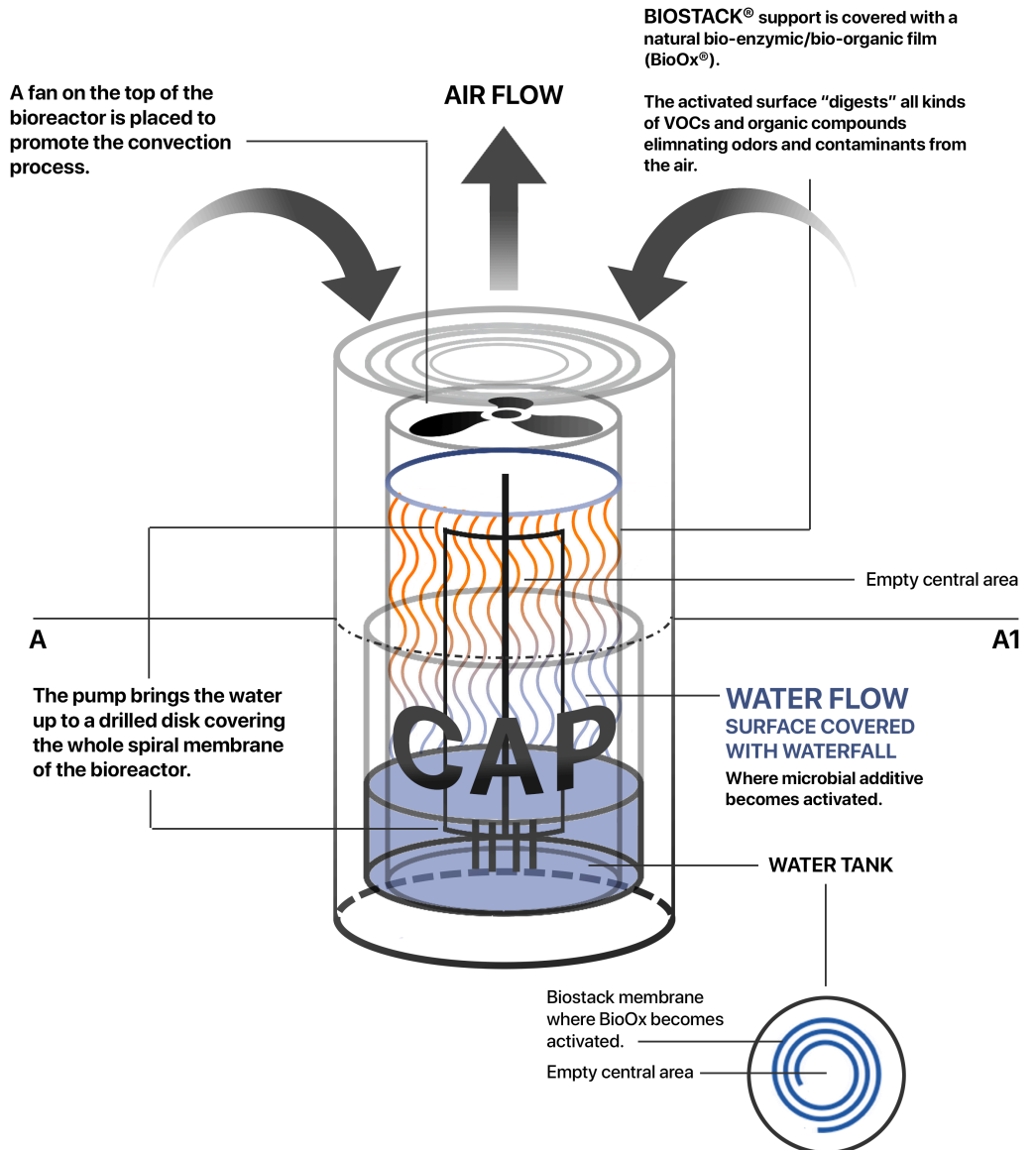


Diagram of BioOx® Air Cleaning Systems

BioOx® Air Cleaning Systems are miniature and portable bioreactors that can be placed anywhere to control odors, capture VOCs and particulates, and maintain a clean air environment.

The BioOx® Media are immobilized on the spiral support membrane (at center). The pump at the bottom brings water up, where it flows down the membrane, keeping the media moist. The fan at top promotes the convection process, beginning the creation of the clean air zone. Once the air pollution is captured, brought into the unit, and digested by the media, the clean air zone expands to cover a bigger and bigger area.



BioOx® Model 85

Air enters the grill, passes through the spacing of the spiral cartridge inside, and exits at the fan.



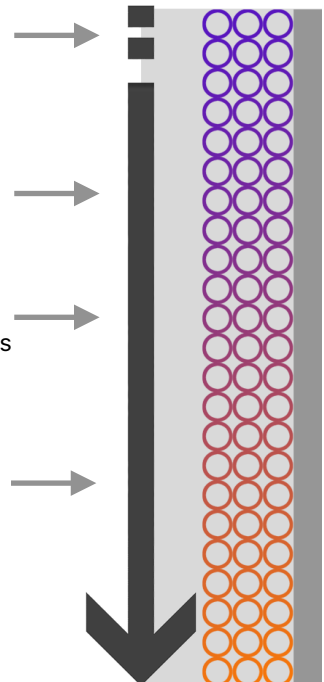
Water is distributed evenly from above the spiral biosupport, exposing contaminants to enzymes and continuously cleaning the sheet. Enzymes begin BioOxidation upon contact with water.

Non-digestible solids such as metal dust and fibers, are washed down to the bottom of the tank—a self-cleaning mechanism.

As water flows into the tank, it captures contaminants by Bernoulli's Principle, in tiny bubbles, into the tank, where enzymes oxidize contaminants.

Electrically charged particles such as ultra fines rush to the biosupport because the biosupport and water are electrically grounded.

Cyclone action due to the spiral curves, natural diffusion, and turbulence cause contaminants to slam into the water and enzymes.



Acknowledgement

Dr. Sam Sofer, PhD, PE, (ssofer@solmedx.com) is President of Air & Water Solutions (NJ) and ReGen Technology LLC (NM), specializing in biological processes and bioreactor design, with applications in medicine, energy, and the environment. He has designed, developed, manufactured in the US, and internationally marketed: the first and only biological air and water cleaners for use indoors; BioOx[®], a natural biological media used in air, water, and soil cleaners; biomedical instruments and test protocols related to boosting the immune system to fight diseases.

Sam has industrial experience as a US chemical plant engineer, and has the following patents: *Method and Spiral Bioreactor for Processing Feedstocks*, U.S. Patent 6,916,630 B2, Jul. 12, 2005; *Immune and Oxygen System Measuring and Drug Screening Method and Apparatus* U.S. and International patents pending, 2012.

He has been Professor and Director, Chemical Engineering and Materials Science, University of Oklahoma; Research Chair Professor of Biotechnology, New Jersey Institute of Technology; with 60 Graduate Research projects supervised; and about 100 publications and books.

PhD, University of Texas at Austin; **Post Doctoral** at Clayton Foundation Biochemical Institute; **Master of Engineering**, Texas A & M University; **Honors BS in Chemical Engineering**, Phi Beta Kappa, University of Utah, including 3.5 years of biochemistry research, College of Medicine.