



# ozonix®

## Technology Overview





# OZONIX<sup>®</sup>

## Chemical-Free Bacteria & Corrosion Control

Many water recycling processes use chemicals - chemicals that are costly and harmful to the environment. Ecosphere's patented **Ozonix<sup>®</sup>** water treatment technology offers customers a chemical-free alternative to high-volume water treatment and disinfection for a diverse range of applications ranging from the oil & natural gas industry and mining to agriculture and municipal wastewater treatment.



Through an innovative combination of ozone, cavitation and electrochemical processes, Ecosphere's patented **Ozonix<sup>®</sup>** technology has been proven highly effective in numerous water treatment and recycling applications around the United States.



# Benefits & Capabilities

## Chemical-Free

With **Ozonix®** there is no need for chemical biocides. Bacteria tests and dynamic tube blocking tests have established that water processed through **Ozonix®** shows complete destruction of bacteria cell walls and scale-inhibition effects.

## High-Volume

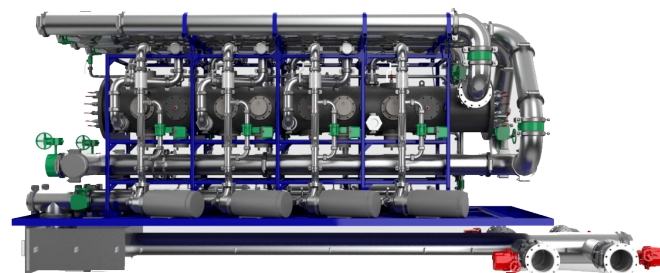
A single **Ozonix®** advanced oxidation system can process up to 3,300 gallons per minute—treating water to a level that is suitable for re-use. Systems can be scaled up and down to meet endless treatment objectives.

## Self-Contained

**Ozonix®** products are mobile, self-contained and fully transportable—they go wherever you need them, require minimal mobilization time and are self-sustaining.

## Highly Effective

Ecosphere's patented **Ozonix®** technology produces highly reactive, bacteria-killing hydroxyl radicals. Hydroxyl radicals are important to water disinfection because they have a high oxidation potential of 2.80 V. This is much higher than the most common disinfectants, Ozone (2.07 V) and Chlorine (1.36 V).



## Industry-Proven

Ecosphere's **Ozonix®** technology is the only patented Advanced Oxidation Process (AOP) proven to provide high-volume, chemical-free water treatment and recycling services to major oil and gas exploration and production companies during high-volume hydraulic fracturing operations around the United States. Ozonix® has enabled oil and gas customers to treat, recycle and reuse over **5+ billion gallons** of water on more than **1200+ oil and natural gas wells**, protecting **\$5+ billion** worth of well assets, and generating over **\$70 million in revenue**.

## Environmentally Responsible

**Ozonix®** is the most energy efficient and environmentally sustainable solution for high-volume, chemical-free water management.

**Ozonix®** is a patented ozone-based advanced oxidation process that treats industrial wastewaters without the use of liquid chemicals. Ozonix® oxidizes heavy metals and eliminates highly resistant bacteria, biofilms and the food source for microorganisms.





# How Ozonix® Works

Ecosphere's patented **Ozonix®** process saturates contaminated water with ozone (O<sub>3</sub>) and uses hydrodynamic cavitation, acoustical cavitation, and electrochemical oxidation to oxidize and destroy bacteria and micro-organisms, while generating no harmful disinfection byproducts. As water cycles through an Ozonix® reactor, bacteria cell walls are destroyed and contaminants are oxidized, returning clean water that is ready for use, re-use and/or final treatment for discharge applications.

**Ozonix®** realizes an exponential multiplier over the use of ozone and cavitation when used by themselves, destroying bacteria in water and eliminating the need for chemical biocides and scale inhibitors. Disinfection time is fast making it perfect for on the fly, mobile wastewater treatment applications, and **Ozonix®** generates no harmful disinfection byproducts.



## ZONE 1 HYDRODYNAMIC CAVITATION

Hydrodynamic cavitation is a physiochemical process that produces localized hot spots that raise water temperatures around the cavitating bubble up to 6000° Kelvin. The bubble cavitating causes shock waves in the cavitating media, which then cause sonochemical reactions to occur. These reactions convert ozone into hydroxyl radicals, which have an oxidation potential of 2.8V. Ozone and cavitation create an exponential disinfection multiplier when combined – disinfection can be accomplished in seconds compared to minutes for chlorine when used by itself, which requires significant residence time.



## ZONE 2 Ozone (O<sub>3</sub>)

With a high oxidation potential of 2.07V, ozone has the ability to oxidize a wide range of pollutants including bacteria and heavy metals. It kills bacteria through a process called lysis – penetrating cell walls and oxidizing essential components such as DNA to break bacteria cells apart. Ozone purifies water 3000 times faster than chlorine, can be generated on site, and doesn't require storage.



## ZONE 3 ACOUSTIC CAVITATION

Similar to hydrodynamic cavitation, acoustic cavitation uses sound waves to produce localized hot spots, capable of raising water temperatures up to 6000° Kelvin. The bubble cavitating causes shock waves in the cavitating media, which then cause sonochemical reactions to occur. These reactions convert ozone to hydroxyl radicals, which have an oxidation potential of 2.8V. The process is extremely effective at removing biofilms because it decreases the tensile stress of water, which causes the breakdown of bacteria clusters. Acoustic cavitation realizes an exponential multiplier when combined with electrochemical oxidation.



## ZONE 4 Electrochemical Oxidation

Electrochemical oxidation uses electricity to create hydroxyl radicals. It is proven highly successful in removing sulfides, nitrogen species, and up to 99% of iron in water sources. In addition, it is extremely effective in removing calcium carbonate (a primary source of scaling) from water because the electricity creates the aqueous form of calcium carbonate.





# Numerous Industries & Applications

Regardless of industry, clean water is the most vital component of production processes, and scarce water resources and environmental regulations can limit both production capacity and profits. Ecosphere Technologies is dedicated to solving critical water recovery, water treatment, and water recycling challenges for major industries around the world – helping protect assets and mitigate risks.

Our patented **Ozonix®** technology is a proven solution for treating contaminated wastewater without the use of harmful chemicals. Because water recycling and wastewater treatment is a critical component to each and every industry, we provide cost-effective solutions to a vast range of industrial, commercial, and municipal operations.

## Agriculture

- Grain growing & processing
- Irrigation & runoff
- Nutrient runoff
- Livestock farms & feedlots (dairy, poultry, beef, hog)
- Aquaculture & fish farming

## Energy

- Oil & gas
- Cooling & boiler water
- Nuclear power generation
- Coal power plants

## Food & Beverage

- Breweries
- Bottled beverages
- Bottled water
- Dairy (milk, butter, cheese)
- Livestock processing (poultry, beef, hog)

- Fruits & vegetables
- Sugar
- Vineyards & wineries

## Industrial

- Automotive
- Aerospace & defense
- Manufacturing
- Metals & metal finishing
- Microelectronics
- Pulp & paper
- Biotechnology
- Pharmaceutical
- Laundry
- Textiles
- Lifestyle, leisure & water parks
- Material waste management
- Soil & groundwater remediation
- Solar & semiconductor production

## Marine

- Aquaculture & aquariums
- Ballast water
- Onboard grey water
- Onboard process water

## Mining & Minerals

- Hydrometallurgical extraction
- Base metals, precious metals, mineral contamination
- Pre-treatment of hard mineral mining ores
- Leachate pits
- Increased ore recovery

- Acid mine drainage
- Process water treatment
- Tailing ponds

## Municipal

- Drinking water
- Sewage water
- Storm & drainage water treatment
- Odor control
- Sludge treatment
- Municipal irrigation



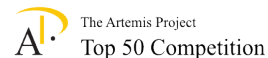


# Major Industry Awards and Accolades

## A proven, Track-Record

Ecosphere has received numerous awards and accolades for its patented and proven **Ozonix®** water treatment solutions for the energy sector, including but not limited to:

- 2013 Oil and Gas Awards—Water Management Company of the Year Award, Midcontinent Region;
- 2013 Bloomberg New Energy Finance - New Energy Pioneer Award;
- 2013 IHS CERAWeek - Energy Innovation Pioneer Award;
- 2013 American Technology Awards “Clean Tech/Green Tech” Winner;
- 2013 World Technology Awards Corporate “Environment” Category Winner;
- 2012 Frost & Sullivan North American Product Leadership Award in Disinfection Equipment for Shale Oil and Gas Wastewater Treatment; and
- 2010, 2011, 2012 Artemis “Top 50 Water Technologies” Winner



## Licensing Opportunities

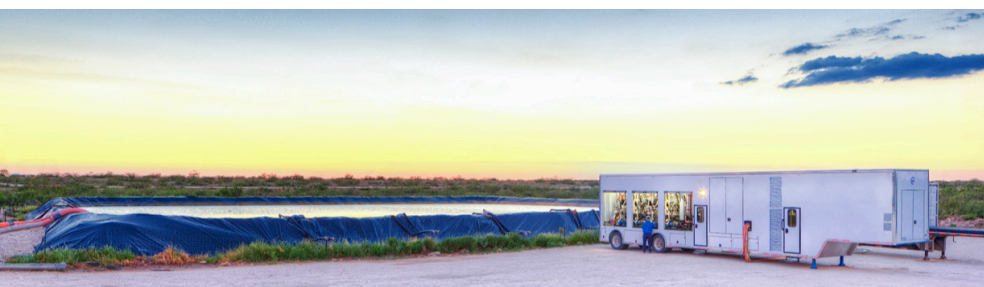
Reap the rewards of Ecosphere's patented and proven **Ozonix®** technology. **Ozonix®** will help your customers increase production, reduce costs, and protect the environment.

## Partner with Ecosphere

Contact us today to become a licensed technology provider.



ICAP Patent Brokerage is the exclusive broker for Ecosphere's patented Ozonix® technology.



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