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OrganiClear™

What is OrganiClear™

OrganiClear is a new treatment machine that captures and converts organic hydrocarbons and other toxins in water produced by the oil and gas industries.

Who manufactures, sells, and installs OrganiClear?

IX Power Clean Water, based in Albuquerque, NM and London, England manufactures, markets, and installs OrganiClear. We also design complete treatment trains, leveraging other proven techniques and machinery in our designs..

Where did the technology come from?

Scientists at Los Alamos National Laboratory, the University of Texas, and New Mexico Tech all contributed to OrganiClear. The team was led by Dr. Enid (Jeri) Sullivan from Los Alamos National Laboratory. The other contributors are Dr. Rob Bowman from New Mexico Tech, and Dr. Lynn Katz, Dr. Kerry Kinney, and Dr. Soondong Kwon from the University of Texas at Austin

Who owns the rights to the OrganiClear technology?

The IP rights belong to IX Power, New Mexico Tech, and the University of Texas. Los Alamos National Security, LLC who has the O&M contract to manage Los Alamos National Laboratory transferred their rights to IX Power in August 2013.

How does OrganiClear work?

The OrganiClear machine is central to a complete treatment train and cleans produced water in a manner unparalleled in the industry.

Produced water is first pumped through a Voraxial™ separator that also removes suspended solids and heavy metals. Then the system:

Step A: Pumps the contaminated produced water into the Surfactant Modified Zeolite (SMZ) Reactor. This step of the treatment system works by adsorbing organic compounds from the water and filtering out iron and manganese floc that may be present. Flow rates depend on customer requirements and are scalable using modular components.

Step B: When saturated with organics, the SMZ is regenerated by air stripping in the field. This means operators are no longer faced with endless toxic filters and transport of the used filter materials for disposal. The off-gas is directed to the Vapor Phase Bioreactor (VPB), which biologically converts the volatile components, particularly BTEX, to innocuous by-products at up to 99% removal efficiency.

Step C: The produced water is then pumped through the Membrane Bioreactor (MBR) component, which removes residual organics, particularly organic acids, which contribute to bio-fouling of subsequent TDS membranes systems.

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The treated produced water is then processed through TDS systems to remove salts and other dissolved solids.

The result is clean water that can be used for industrial or agricultural purposes, or safely reintroduced to a water system.

What is the waste product coming out of OrganiClear?

OrganiClear converts organic compounds to water and (a small amount) of CO₂ via its integrated Vapor Phase Bioreactor. Other contaminant waste depends on the produced water content. One of the key benefits of OrganiClear is that organics are converted and thus operators no longer have to replace an endless train of consumable filters or adsorption media (and pay for the proper disposal of that media).

Is OrganiClear certified?

Produced water treatment solutions are regulated the same as any other industrial machinery. The treated water is what is regulated. IX Power includes automated monitoring and control systems in our produced water plant designs.

Is OrganiClear proven and commercially available?

OrganiClear was extensively tested in oil field operations, water reclamation, and on 'frack flowback' before IX Power Clean Water acquired the technology. Our job since the Los Alamos testing has been to create a scalable and efficient commercial design. We have since altered the OrganiClear design to provide for scalable treatment systems based on modular components.

What is the flow rate?

Flow rates can be adjusted to virtually any amount, either continuous or in batches. OrganiClear is built on 50 and 100 gallon per minute modules that can be assembled in a manner that scales the volume to meet the customer requirement..

What's the cost?

Cost will vary with the size of an OrganiClear treatment system, the amount and kind of contaminants in your produced water and the level to which you need to treat the water. We estimate the cost to be \$0.28 to \$0.50 per barrel.

How much electricity/power is used?

OrganiClear runs on a very modest amount of electricity, again based on the size of the treatment train required. Each module uses a low pressure pump and a simple air compressor.

What is in Produced Water?

Produced water is a term used in the oil & gas and extractive industries to refer to water created in conjunction with a production process. Produced water quality and constituent contaminants vary from formation to formation, but all have some mixture of the following:

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- dispersed oil, and dissolved or soluble oil and organics, including BTEX
- treatment chemicals
- dissolved solids (salts)
- bacteria
- naturally occurring radioactive material (NORM)
- additional concerns are pH, metals content, other total dissolved solids (TDS), and sulfate levels

What is BTEX?

BTEX is an acronym that stands for benzene, toluene, ethylbenzene, and xylenes, which are closely related. These compounds are some of the volatile organic compounds found in petroleum derivatives. Benzene is carcinogenic, while toluene, ethylbenzene, and xylenes have harmful effects on the central nervous system. BTEX compounds are notorious due to their biohazard nature and the prevalence of contamination of soil and ground-water with these compounds. **BTEX is**

- Carcinogenic
- Aromatic & soluble in water, thus difficult to eliminate
- Lowest weight, not easily filtered
- OrganiClear eliminates 99% of BTEX

BTEX vs. “Oil & Grease”

Environmentally conscientious regulations measure not just “oil and grease” in treated produced water, but also BTEX content. Because they dissolve in water, seemingly clear water can contain toxic amounts of BTEX. Some regions still rely on old standards that measure the weight of oil and grease (say 5 mg/L) for discharge of treated produced water. The correct way to determine the efficacy of treating produced water is to measure the amount of BTEX in the water. Many standards now dictate that BTEX constituents measure less than 0.5 ppm (less than one-half of one part per million).

Produced water intended for discharge or beneficial use must be treated for BTEX, not just oil and grease. OrganiClear treats and converts BTEX to less than 0.5 ppm, leaving only small amounts of CO₂ and water vapor.

What does OrganiClear do to handle Total Dissolved Solids (TDS) and Salts?

It doesn't. OrganiClear is focused on everything but TDS.

BUT, using OrganiClear helps TDS solutions do a better job, by removing other toxins and eliminating bacteria found in produced water, which extends the life of filter and membrane based systems, reducing the overall cost of treatment.

By definition all produced water contains organic hydrocarbons, so all produced water treatment systems can benefit from using OrganiClear.

But, we use paper filters (or some other membrane) now and it works fine.

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OrganiClear has many advantages over paper filters and membrane systems, not the least of which is that OrganiClear converts organic hydrocarbons into CO₂ and water and the adsorption media is reusable. This means no more endless consumables and toxic leftovers.

So, What Do I do with the salts?

There are numerous existing technologies for reducing salt content (and other dissolved solids) in produced water. What will work for your water depends on a) the TDS content coming into the system, and b) what you want to do with the produced water after it's treated.

Reducing TDS basically comes down to filtering TDS out of the water or evaporating the water leaving solids behind. Both are very expensive. IX Power has concluded that, while most O&G operators are not removing enough TDS to meet local regulations, many O&G operators are actually going too far. TDS must be viewed in the context of the entire treatment train.

There are many cases where high, benign, salt levels can be diluted to a point where clean, salty water, can be legally discharged or even used for beneficial use. For example, IX Power has seen low salt levels (<8,000 ppm) in the Intermountain Western U.S. that, if treated with OrganiClear, can then be used for livestock and irrigation. We've also seen very high TDS levels (80,000 ppm ++) that can be used in hydraulic fracturing, but only if organics and metals are removed first.

What about NORM?

Naturally Occurring Radioactive Material (NORM) is a special case. High levels of NORM occur either from a direct deposit (such as radium) or because of build-up in a system (such as a settling tank) that actually creates concentrations high enough to be regulated.

Again, the IX Power philosophy is that any produced water treatment train must be designed with all of the contaminants and the discharge requirements in mind.