



ROCKING THE WATER WORLD



GROUND EFFECTS
ENVIRONMENTAL SERVICES INC.

www.groundeffects.org
306.352.1400

**ELECTRO PURE
TECHNOLOGY**
WATER TREATMENT SYSTEM

Chemical-free treatment of:
• Frac water • Industrial wastewater
• Produced water • Mining wastewater
• Patent pending





Electro-Pure Technology

Advanced Water Treatment Technology

- EPT uses no added chemicals
- Patent-pending technology
- Ability to treat a wide range of contaminants simultaneously
- On site treatment
- Cost effective recycling of frac/flowback



Electro-Pure Technology

Applications:

- Frac-flowback water
- Produced water
- Mining waste water
- Industrial waste water



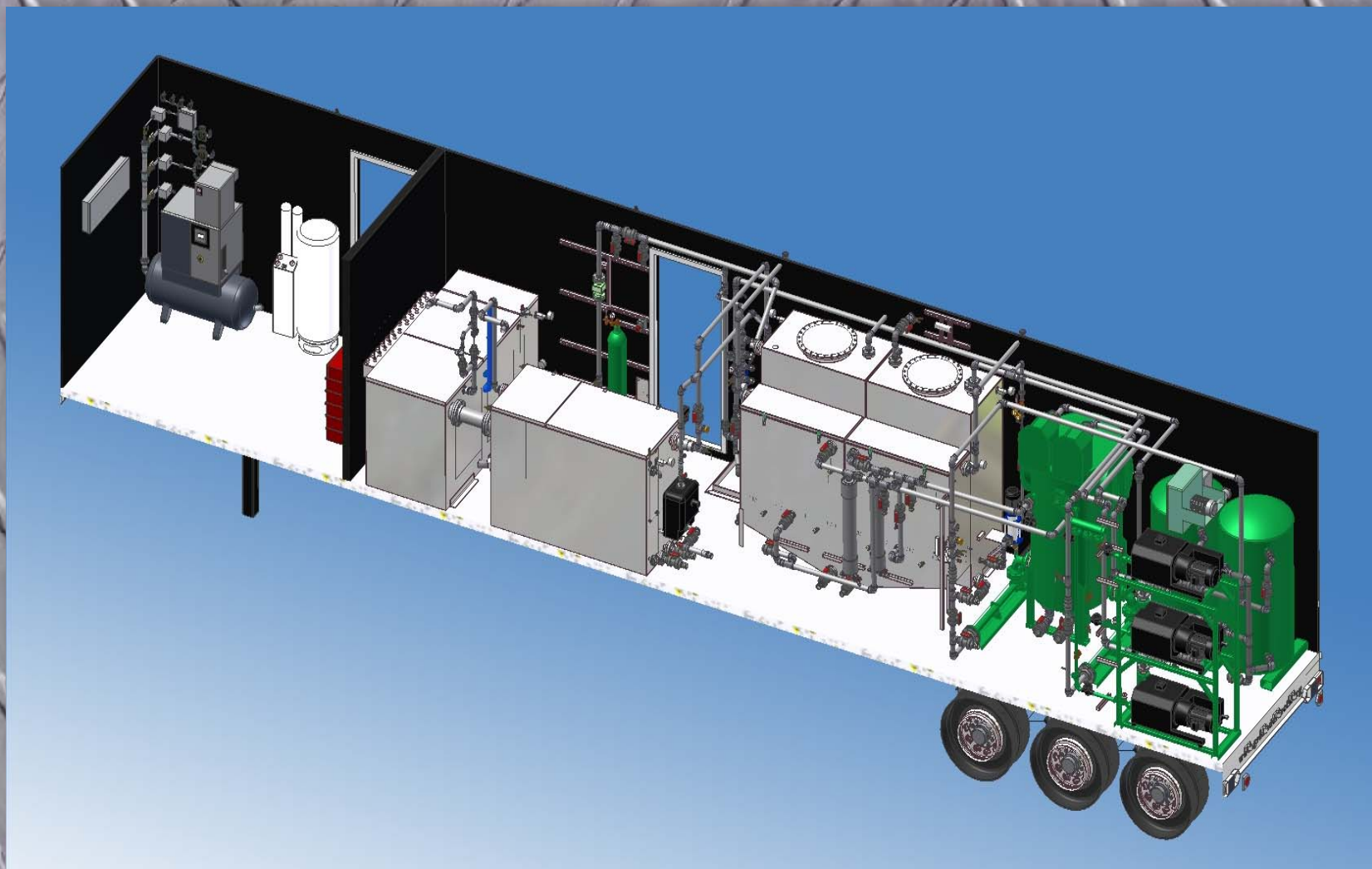
Electro-Pure Technology

The Process

- Oil/water separator
- Vacuum enhanced – 2 stage electrolytic cells
- 2 stage Submerged nano filtration modules
- Ozone
- Media contactor vessels



Electro-Pure Technology





Oil/Water Separation

- Oil removal capacity of less than 5ppm using air floatation and coalescing media
- Removal of hydrocarbons allows for more effective and efficient treatment of waste water



Oil/Water Separation





Electrolytic Cells

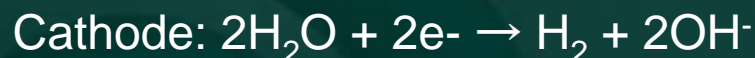
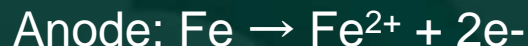
- Cell contains parallel metal plates that act as either anodes or cathodes
- When an external power source is applied, the plates act as monopolar electrodes. This creates a reactive and excited state causing contaminants to be released from the water and able to be removed
- Released ions neutralize the charges of the particles, thereby initiating coagulation
- Released ions remove undesirable contaminants by chemical reactions that promote precipitation and/or flotation
- Ionization, electrolysis, hydrolysis and other free radical formation can also occur



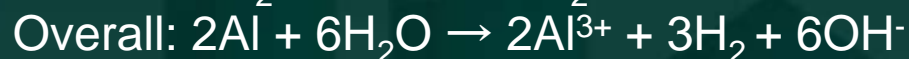
Electrolytic cells

Induced Chemical Reactions

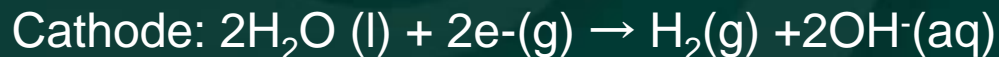
Iron



Aluminum



Electrolysis Of Water



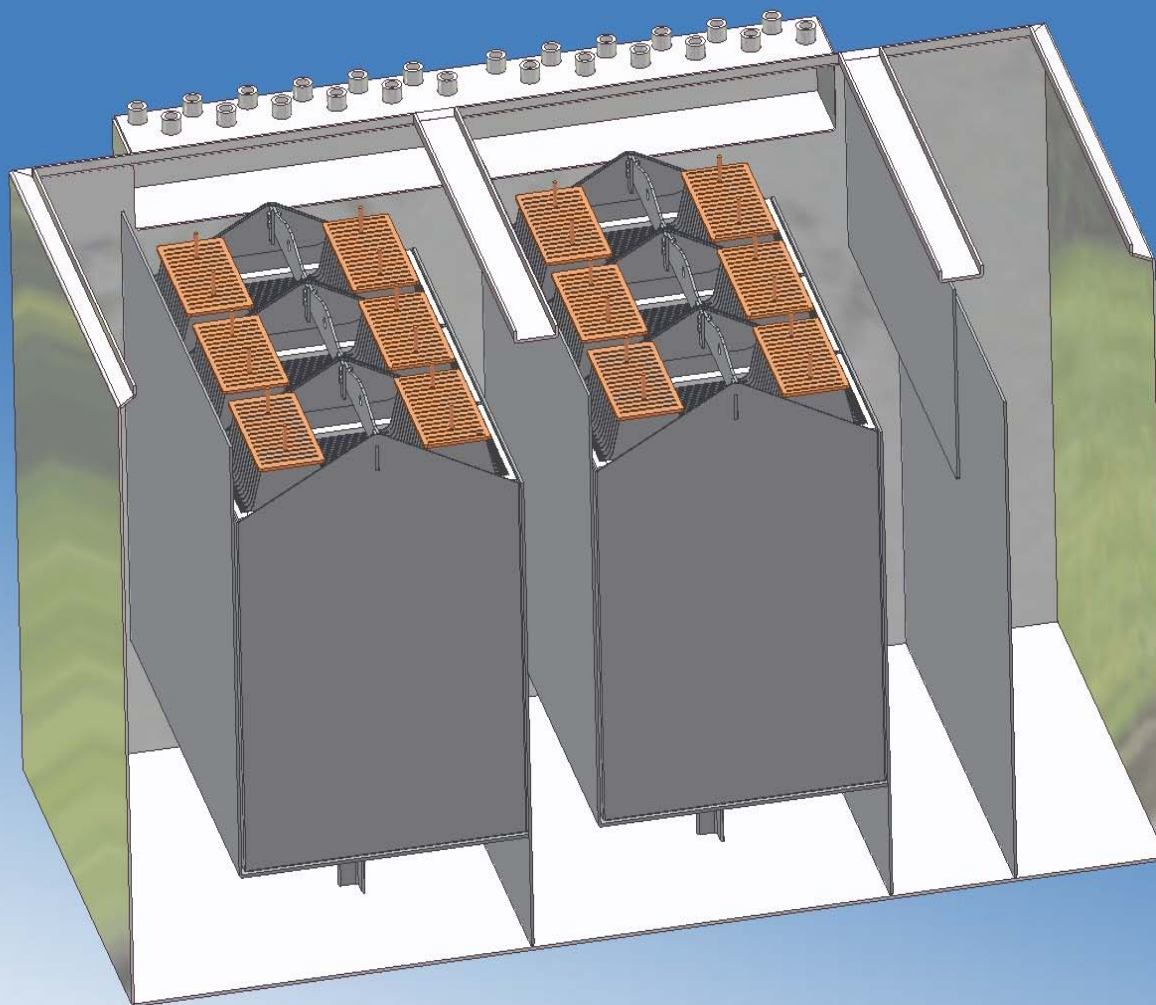


Electrolytic cells

- Coagulation is the most important physio-chemical reactions occurring
- Precipitation of ions and colloids are held in solution by electrical charges
- EC destabilizes these charges allowing for coagulation to occur
- Coagulation occurs by reducing the net surface charge to a point where the colloidal particles can overcome electrostatic repulsion and allow aggregation to occur

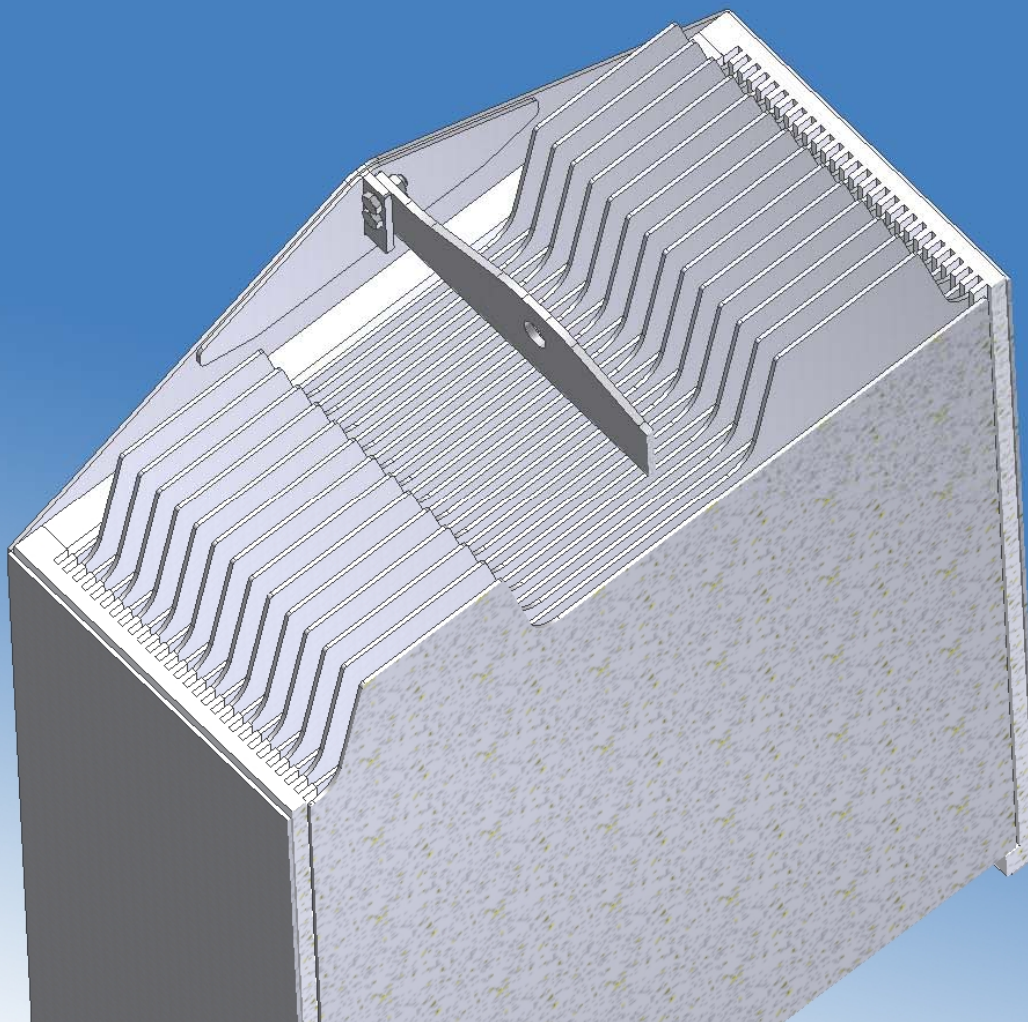


Electrolytic cells





Electrolytic cells





Electrolytic cells



03/22/2010

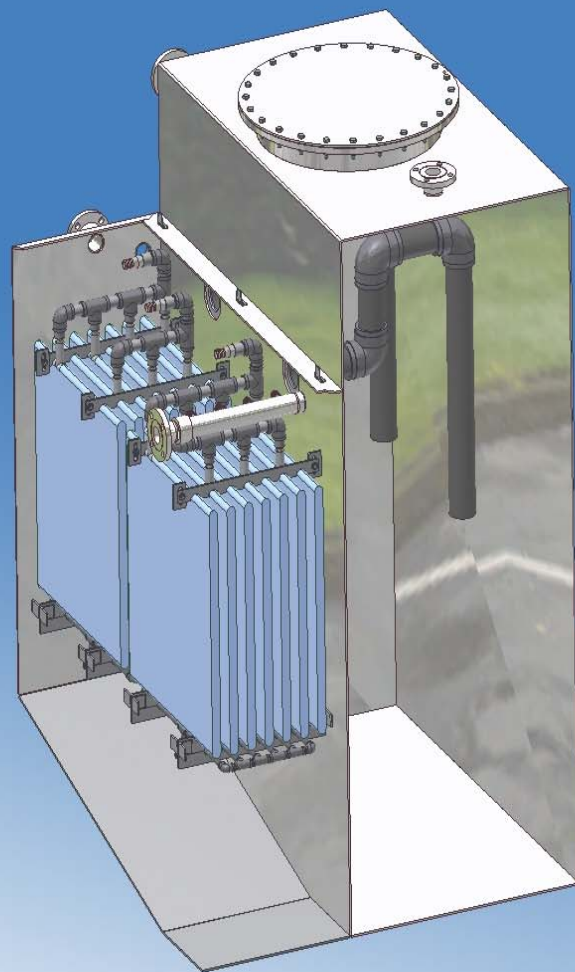


Nano Filtration

- 2 stage -Submerged hollow fiber membranes
- Filtration below 0.04 micron
- Benefits include large surface area, ability to backwash, air burst and chemically clean, if required

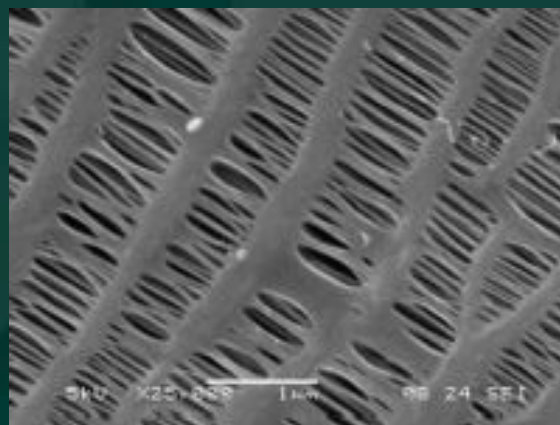


Nano Filtration





Nano Filtration





Nano Filtration





Ozone

- Ozone is highly unstable gas that readily donates its extra oxygen molecule to free radical species
- Powerful oxidizing agent that is quick to react particularly to metals
- Very destructive to organic materials, including microorganisms
- Increases the water's wetting ability by reducing water surface tension
- Can reduce friction reducers by up to 50%



Ozone





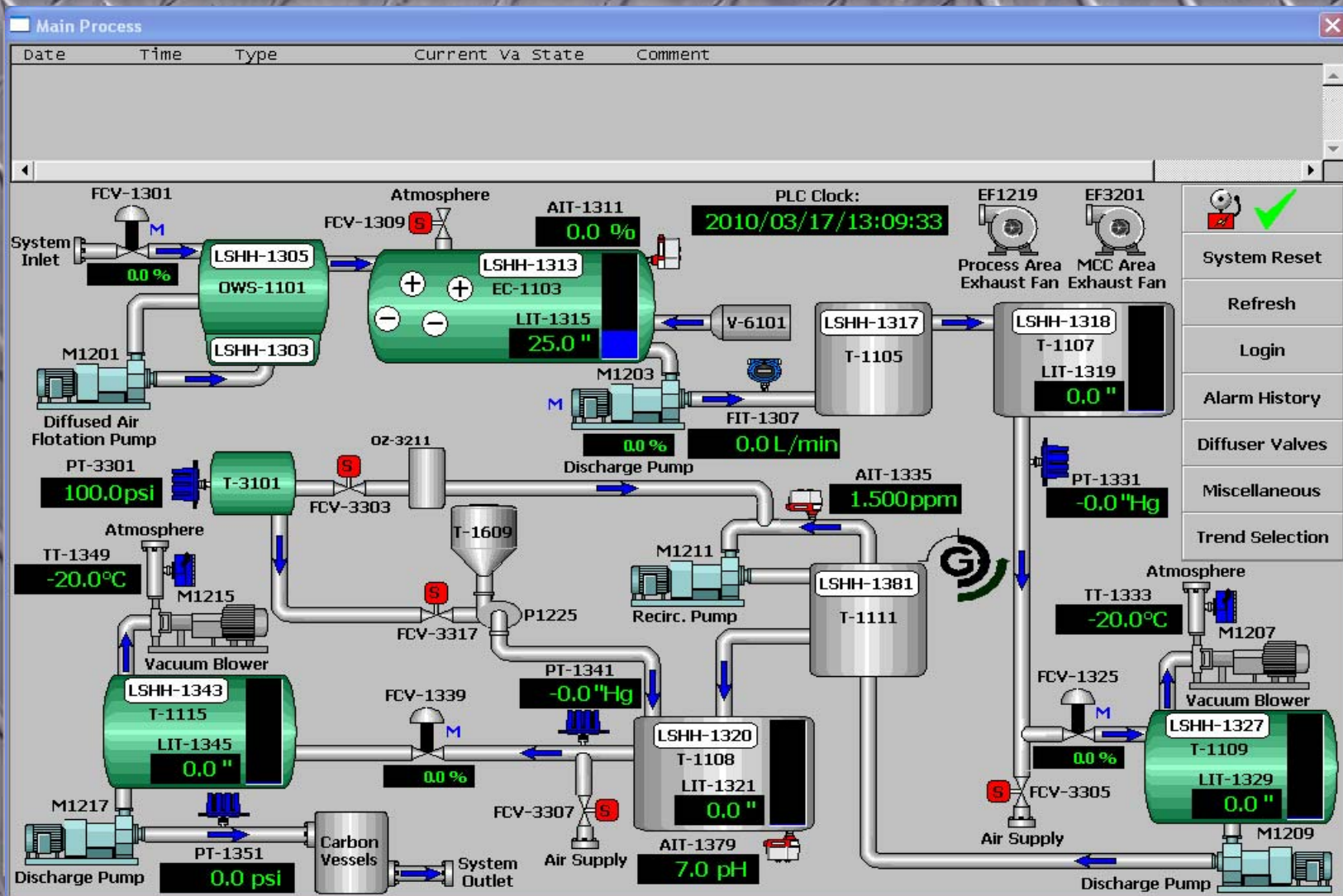
Control Systems

- Satellite telemetry system (STS) is a web server technology that allows you to monitor, optimize and operate the EPT from anywhere in the world, anytime in real time
- GEE STS gives you trend analysis data when you want it
- Converts m^3 treated to \$\$\$ revenue for GEE





Electro-Pure Technology





Polishing

- Tertiary treatment using contactor vessels
- Specific media can be used based on customers needs
- Auto backflushing



Polishing





Electro-Pure Technology

Results:

Corrosion Enhancing Bacteria	>99%
Coliform Bacteria	>99%
BOD	99%
Turbidity	99%
Chlorinated hydrocarbons	>98%
Hydrocarbons (F1-F4)	85-99%
Herbicide	>99%
PCB	99%



Electro-Pure Technology

Iron	>99%
Manganese	>99%
Barium	87%
Arsenic	99%
Lead	98%
Titanium	99%
Zinc	95%
Copper	91%



PCB Results

PCBs (ug/L)	INITIAL	Post
Aroclor 1016	ND	ND
Aroclor 1221	ND	ND
Aroclor 1232	ND	ND
Aroclor 1242	ND	ND
Aroclor 1248	ND	ND
Aroclor 1254	24	ND
Aroclor 1260	22	ND
Aroclor 1262	ND	ND
Aroclor 1268	ND	ND
Total PCBs	46	ND



Herbicides and PAH Results

	Units	Initial	Post EPT
Napthalene	mg/L	14	0.000163
COD	mg/L	2140	47.7
MCPA	mg/L	59	0.0103
2,4-D	mg/L	<0.16	<0.00010
Bromoxynil	mg/L	190	0.0672



Mining Wastewater

	Units	Initial	Post EPT
Cyanide	mg/L	5.1	0.016
Aluminum	mg/L	0.41	0.016
Arsenic	mg/L	424	6.8
Lead	mg/L	0.18	0.004
TSS	mg/L	970	5
Turbidity	NTU	655	8

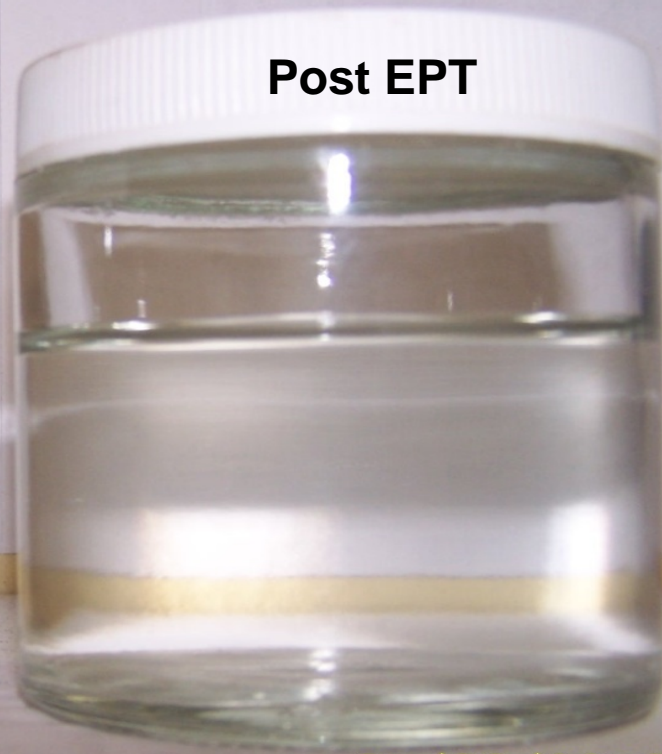


Mining Wastewater

Initial



Post EPT



01/06/2010



Industrial Wastewater

	Units	Initial	Post EPT
Iron (Fe)	mg/L	31.8	0.255
Manganese (Mn)	mg/L	5.74	0.078
Aluminum (Al)	mg/L	4.18	0.28
Barium (Ba)	mg/L	0.341	0.074
Copper (Cu)	mg/L	0.066	0.002
Nickel (Ni)	mg/L	0.106	0.024
Lead (Pb)	mg/L	0.0293	0.0007
Titanium (Ti)	mg/L	0.164	0.002
Zinc (Zn)	mg/L	0.233	0.013
Turbidity (NTU)	NTU	118	2
Total Coliform		>2,419,600	<10
E-Coli		51,200	<10

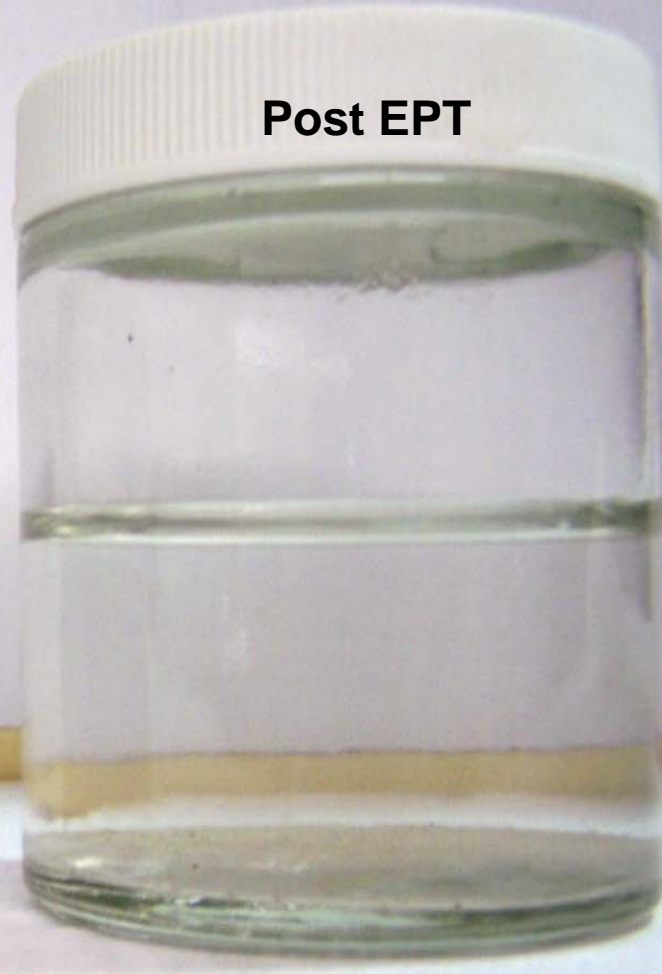


Industrial Wastewater

Initial



Post EPT





Oil and Gas Wastewater

Parameter	Unit	Initial	Post EPT
Total Suspended Solids	mg/L	243	10
Oil and Grease	mg/L	38.6	1.2
BTEX and F1 (C6-C10)			
Benzene	mg/L	5.28	0.0426
Toluene	mg/L	13.4	0.307
Ethybenzene	mg/L	2.28	0.0565
Xylenes	mg/L	14.2	0.35
F1(C6-C10)	mg/L	150	1.1
F1-BTEX	mg/L	115	0.34
Extractable Hydrocarbons			
F2 (C10-C16)	mg/L	299	3.9
F3 (C16-C34)	mg/L	76.9	0.66
F4 (C34-C50)	mg/L	22.2	<0.3
TEH (C11-C22)	mg/L	330	4.16
TEH (C23-C60)	mg/L	73	0.59

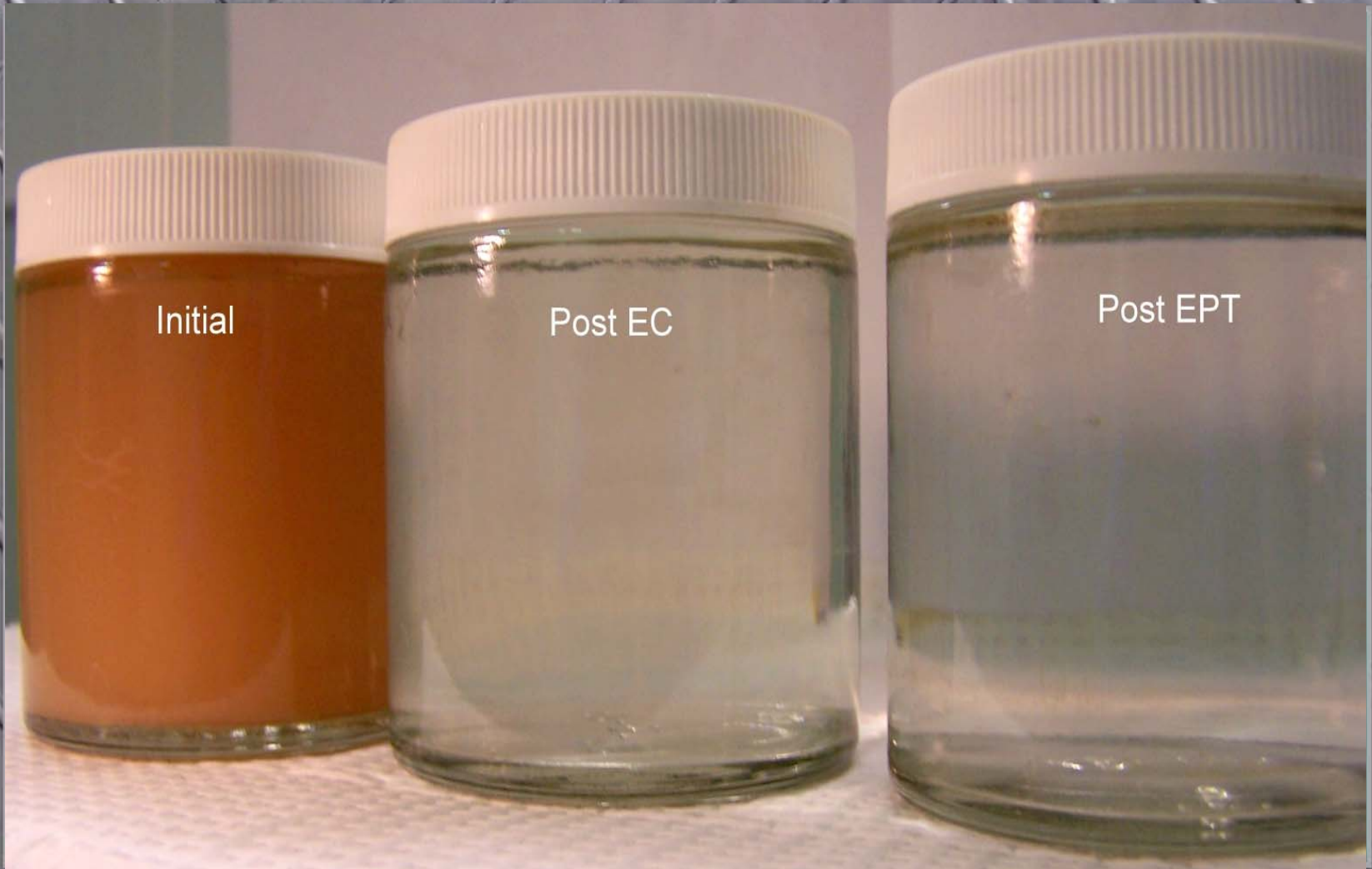


Oil and Gas Wastewater

Parameter	Unit	Initial	Post EPT
Escherichia coli	MPN/100mL	<3	<3
Total Coliform	MPN/100mL	21000	<3

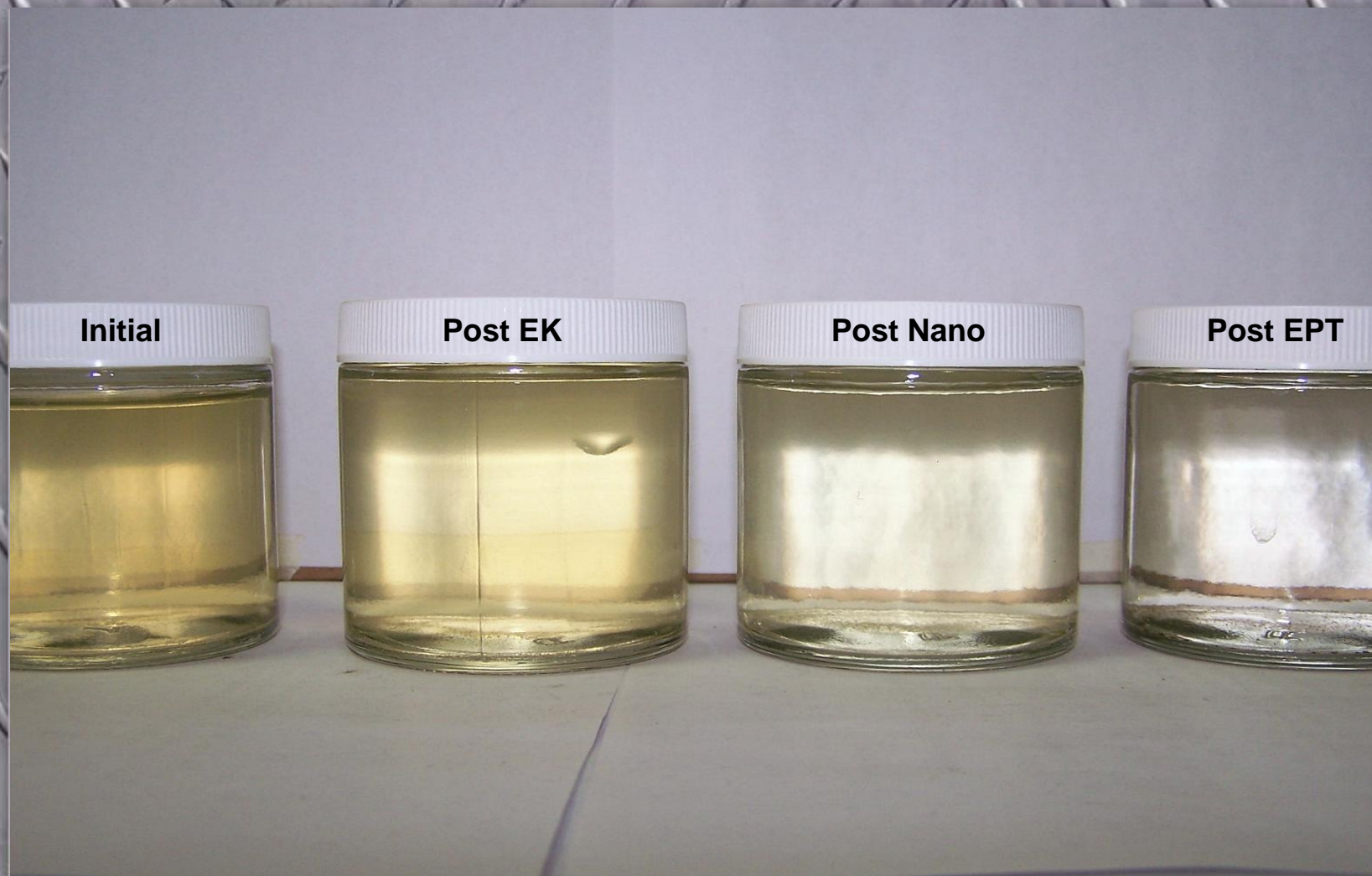


Oil and Gas Wastewater





Oil and Gas Wastewater





BENEFITS

- Turn key service
- Chemical free process
- Mobile treatment system
- Reduces hauling and disposal costs
- Reduce usage of biocides by up to 100%
- Reduce usage of friction reducers by up to 50%



BENEFITS

- Eliminate harmful bacteria and scaling qualities.
- Ability to treat a wide range of contaminants simultaneously
- Allows energy companies to recycle 99% of high TDS flowback and produced water.



Economics

- 100% Plug and Play Scalability
- Up to 30% less cost than current practices
- Services based on an “All-In” fee per cubic meter of flow through
- Fee based on contamination level of influent and quality requirements of effluent
- CURRENTLY LOOKING FOR TECH DEMO's



HIRE THE EXPERTS



**GROUND EFFECTS
ENVIRONMENTAL**

(306) 352-1400

www.groundeffects.org