

efloccolutions.com



E·floc®
Wastewater Solutions

**WASTEWATER
SOLUTIONS**
Oilfield E&P

- Beneficial Resuse of Frac, Flowback, and Produced waters
- Mobile Water Treatment Services

OIL AND GAS

E-FLOC® is the world leader for electrolytic equipment and systems used in a variety of water and wastewater treatment applications including the treatment and beneficial reuse of frac, flow-back and other produced waters associated with oil and gas exploration and production activities. Patented E-FLOC® technology uses a low Voltage electric current to destabilize multiple contaminants simultaneously via a single unit process. Both dissolved and suspended contaminants are removed, emulsions are split and water soluble hydrocarbons (TPH, BTEX) are oxidized. Bacteria is also destroyed by secondary oxidants and removed along with other contaminants. With over 20 year of success in the in the oil & gas and water treatment industries, E-FLOC® provides custom engineered, turn-key solutions for the construction of centralized facilities to treat produced waters. E-FLOC® applies this same technology to fabricate Portable Treatment Units and offers complete Water Treatment Services for operators and contractors. With increasing costs and demands for water, E-FLOC® technology provides the most economical method to “clean” flow-back and produced waters and the savings is passed on to customers by reduction in price.

Benefits and Advantages:

1. The most economical technology for the beneficial reuse of oil field waters.
2. Removes Multiple Contaminants in a Single Unit Process
 - Dissolved Metals and Colloidal Particulates
 - Emulsion Splitting: FOG / TPH / BTEX
 - Complexed Anions: SiO_2 / PO_4 / SO_4
 - H_2S and S^{2-}
 - Bacteria: SRB, Lactic Acid, Total AerobicEliminates the use of Hazardous Chemicals / HS&E
3. Considerable Reduction of Residuals for Final Disposition
4. Residuals pass USEPA TCLP
5. Produces a Superior Effluent for Membrane Polishing
6. Smallest Footprint available
7. Reduced Costs and HS&E concerns
8. Easily Retrofits into Existing Infrastructure
9. Treats Multiple Waste Streams / No Segregation of Wastes!

Products and Services:

- Mobile Produced Water Treatment Systems & Services
- Turn-Key / Design and Build for Centralized Treatment Facilities Installation / Commissioning / Operator Training
- Custom Engineering and Upgrades of Existing Equipment
- Treatability Studies / Field Pilot Studies / On-site Bench Studies Service and Maintenance Programs
- Rental / Lease / Service Options

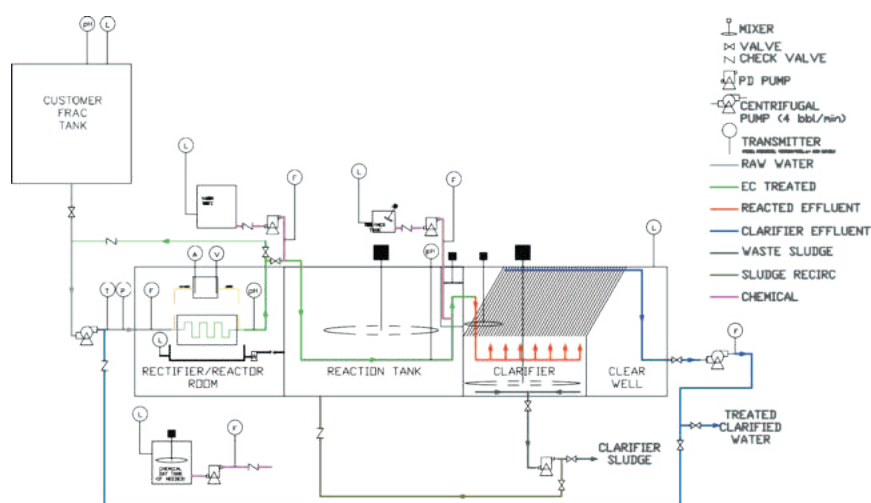
Technologies we offer for this:

- Electro-Precipitation (EP)
- Electro-Coagulation (EC)
- Electro-Flotation (EF)
- Electro-Oxidation (EOX)
- Electro-Disinfection (ED)
- Electro-Fenton Oxidation (EFO)
- Inclined Plate Clarifiers
- Electro-Flotation Clarifiers
- Membrane Filtration Systems (MF/UF/NF/RO)
- Sludge Thickeners
- Plate & Frame Filter Presses

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E - FLOC® Technology

Electro Precipitation (EP) and **Electro Coagulation (EC)** utilize a low Voltage electric current to sacrifice metallic ions (Fe, Al) into solution and neutralize ionic charges while simultaneously liberating hydrogen and oxygen gas. Contaminants present in the wastewater react with the sacrificial ions, gases and subsequent products such that they are adsorbed and co-precipitated from solution in the form of acid resistant, metallic oxide complexes. Once precipitated, these materials are removed from the water by typical liquid-solids separation methodologies such as gravity settlement, flotation and/or filtration. Ecolotron patented E-FLOC® technology adds only cationic (Fe/Al)ions without anionic enrichment considerably reducing sludge volume and associated disposal costs. Iron is sacrificed from the electrodes in the ferrous oxidation state and hydrolyzes to the ferric state where it precipitates as ferrous / ferric oxide-hydroxides. Dissolved and suspended contaminants adsorb onto the Iron oxy-hydroxide floccules and are thus co-precipitated by occlusion within the resulting sludge.



Electrolytic Oxidation (EOX) occurs via two pathways, Direct and Indirect. Direct Anodic Oxidation occurs within the E-FLOC® Cell as electrons are transferred from the organic contaminants directly to the Anode surfaces. Indirect or Mediated Electrolytic Oxidation occurs as the organic contaminants are destroyed by reaction with Secondary Chemical Oxidants that are formed within the E-FLOC® Cell. Secondary Oxidants are generated by Redox reactions within the cell. Examples of secondary oxidants include the Hydroxyl Radical (OH^\bullet), Cl_2 , H_2O_2 , OCl^- , O^\bullet , O_3 , etc. Electro-Fenton Oxidation (EFO) incorporates a sacrificial Iron Anode with an H_2O_2 generating Cathode to generate the Hydroxyl Radical, OH^\bullet .

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Treatability of Produced Water

LOCATION/PARAMETER	Cotton Valley Louisiana		Marcellus Pennsylvania		Haynesville Louisiana		Eagle Ford Texas			Fixed Facility Colorado Pond	
Units in mg/l (except where noted)	Raw	EC	Raw	EC	Raw	EC	Raw	EC	Membrane	Raw	Membrane
TPH, Total (C6 -C35)	11,506	2.67	2.18	5.54	49.50	5.93	35.50		BRL	n/c	n/c
BTEX, Total	35,339	2.745	-	-	-	-	0.03227		BRL	n/c	n/c
BOD	26,022	208	-	-	102	81.2	-		-	n/c	n/c
Iron	61.8	0.81	50.0	1.0	160	<1,0	82	1	0.0	25	BRL
SI	40.8	0.273	-	-	17.02	3,286	23.4	0.351	<0.5	49.3	4
Barium	282	254	258	38	1,90	1.0	4.78	3	0.1	14	5.0
Strontium	1,307	1,270	108	72	2,000	417	578	352	5.8	n/c	n/c
Total Hardness (CaCO ₂)	7,585	7,124	1,250	697	6,930	3,650	6,681	5,399	195	720	4
Calcium (Ca ⁺²)	-	-	437	250	-	-	6,080	5360	178	240	1.2
Magnesium (Mg ⁺²)	669	101	39	17	360	280	691	504	9.2	28,8	0.24
Total Phosphate (PO ₄)	-	-	-	-	-	-	n/c		<0.4	4.6	BRL
Nitrate (NO ₃)	-	-	-	-	-	-	n/c		<1.0	n/c	n/c
Total Sulfur (SO ₄ ⁻²)	-	-	0	53	-	-	185		<5.0	9	BRL
Chloride (Cl ⁻)	-	-	7,000	7,200	-	-	24,700		985	25,080	600
Total Sodium (Na ⁺)	-	-	4,298	4,196	-	-	23,100		906	n/c	n/c
Total Potassium (K ⁺)	-	-	35	31	-	-	501		12.1	n/c	n/c
Turbidity (ntu)	opaque	<1,0	-	-	-	-	opaque		<5.0	615	<1.0
TSS	382	46	300	8,0	1,326	154	470		BRL	410	<3.0
SRB (cfu/100ml)	-	-	450,000	4,200	-	-	-		-	n/c	n/c
Specific Conductance, at 25 C° (µmhos)	-	-	20,900	21,400	-	-	89,000		1,200	28,300	1,330

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US Patent No. 6,719,894 b2
US Patent No. 7,087,176
Mexican Patent No. 261,817
European Patent No. 1575875