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E·floc®
Wastewater Solutions

WASTEWATER **SOLUTIONS** Refineries

- Industrial Wastewater Treatment
- Industrial Storm Water Treatment
- Reuse of Process Water
- Cooling Tower Water Treatment

EFLOC Wastewater Solutions “The World Leader in Electrolytic Water Treatment”

E-FLOC® leads the world providing electrolytic water treatment equipment and systems used in a variety of water treatment applications for industry and environment. Patented E-FLOC® technology destabilizes multiple contaminants to remove both dissolved and suspended contaminants including heavy metals, FOG, emulsions and water soluble hydrocarbons (TPH, BTEX). With over 20 years of success in oil & gas and petrochemical refining, E-FLOC® can provide custom engineered, turn-key solutions for new construction projects or to be installed into existing infrastructure for improved system performance to meet the most stringent discharge requirements. Portable Treatment Units are available for temporary service offering an immediate solution for an “out of compliance” condition. With increasing costs and demands for water, E-FLOC® Solutions provides the most economical approach to clean your water for discharge to the environment or to meet specifications for tertiary polishing equipment and the beneficial reuse of effluent.

Benefits and Advantages

1. Removes Multiple Contaminants in a Single Unit Process:
 - Dissolved Metals
 - Emulsions: FOG / TPH
 - Complexed Anions: SiO₂, PO₄, SO₄
 - Oxidation of Organics : H₂S / BTEX / S⁻ / VOC
 - Bacteria: SRB / Aerobic / Lactic Acid
 - Colloidal Particulates / TSS
 - AFFF: PFOA / PFOS
 - Fluoride
2. Treats Combined Waste Streams - No Segregation of Wastes
3. Considerable Reduction in Residuals for Disposal
4. Residuals pass EPA TCLP
5. Easily Retrofits into existing Infrastructure
6. Eliminates Hazardous Materials and Reduces HS&E Concerns
7. Produces a Superior Effluent for Tertiary Membrane Systems
8. Up to 20 times reduction in O&M Costs compared to Chemical Treatment
9. Removes Metals in the Presence of Organics

Applications

- Oil & Petrochemical Refining / Process Wastewater
Desalter Effluent / Catalyst Remnants
- Storm Water from Contained Areas
- Cooling Tower Blowdown
- Pretreatment to RO for Process Make-Up Water
- Pretreatment to Biological Systems
- Groundwater Treatment Systems
(BTEX / TPH / AFFF / PFOA / PFOS / M++)

Products and Services

- Electrolytic Reactors for Precipitation (EC & EP)
- Electrolytic Reactors for Oxidation (EOX)
- Electro – Flotation DAF Clarifiers
- Custom Engineering / Turn-Key / Design and Build Services
- Portable Treatment Units Available for Immediate Response
- Treatability Bench Studies (On-Site or In-House)
- On-Site Feasibility / Pilot Studies
- Installation, Commissioning and Operator Training Available
- Service and Maintenance Programs Available
- Rental / Lease to Own Options

Ancillary Equipment

- Inclined Plate Clarifiers
- Gravity Sludge Thickeners
- Plate & Frame Filter Presses
- Neutralization / Mix Tanks
- Backwashing Sand
- FiltersControl Panels with ABB PLC / HMI

Patented Technologies

- Electro – Precipitation (EP)
- Electro – Oxidation (EOX)
- Electro – Disinfection (ED)
- Electro – Coagulation (EC)
- Electro – Flotation (E-Float)
- Electro – Fenton Oxidation (EFO)

Silicon Carbide Membrane Filtration from Liqtech, Intl.
(MF / UF / NF / RO)

Patented, E - FLOC® Technologies

Electro - Precipitation (EP) and Electro - Coagulation (EC) utilize a low Voltage direct current to sacrifice metallic ions (Fe, Al, Zn, Mg) into solution and neutralize ionic charges while simultaneously liberating hydrogen and oxygen gas. Contaminates present in the wastewater react with the sacrificial ions, gases and subsequent products such that they are adsorbed and coprecipitated 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 species 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 to the oxy-hydroxide floccules and are thus co-precipitated by occlusion within the resulting sludge. The process is particularly advantageous for the simultaneous reduction & precipitation of multivalent metals such as Cr+6 / Va / Co / As / Se, etc.

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 contaminant directly to the Anode surfaces. **Indirect or Mediated 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 and include the Hydroxyl Radical (OH[•]), Cl₂↑, H₂O₂ OCl⁻, O[•], O₃, etc. **Electro-Fenton Oxidation (EFO)** combines sacrificial Iron Anodes to introduce ferrous ions with H₂O₂ liberating Cathodes to generate the Hydroxyl Radical OH[•].

Electro – Flotation (E – FLOAT) incorporates the electrolytic reactor within the recirculation / repressurization loop of a DAF clarifier to liberate off gases that are used for flotation mechanics in the body of the clarifier. The reactor may include different types of electrode configurations depending on contaminants present in the wastewater and the desired treatment goals. Most applications incorporate Dimensionally Stable Electrodes (DSE) that do not sacrifice material into solution, but liberate Secondary Oxidants for simultaneous treatment of organics and destruction of Bacteria. The E – FLOAT, Electro – Flotation Clarifier removes TSS / FOG / Bacteria / H₂S / S⁻ / Fe and other dissolved Metals in a single unit considerably reducing footprint, capital costs and O&M costs.

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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

CONTAMINANT	WASTEWATER SOURCE	CONCENTRATION (mg/L)		% REMOVAL
		Raw	After Treatment	
Alkalinity	Municipal Wastewater	267	11	95.8
Alkalinity	Can Manufacturing	224	0.69	99.7
Alkalinity	Food Processing	49	19.4	60.41
Arsenic	Acid Drainage	0.3	<0.01	96.7
Bacteria, Virus, Cyst	Municipal Wastewater	110,000,000	2700	99.998
Barium	Steam Cleaner	8	<0.01	99.8+
BOD	Municipal Wastewater	1050	14	99.67
Boron	Mining	2.7	1.7	37
Cadmium	Electroplating	31	0.34	98.9
Calcium	Cooling Tower	1321	21.4	98.4
Chromium, total	Electroplating	210	0.0216	99.99
Cobalt	Metal Harvester	0.1238	0.0214	82.7
Coliform	Municipal Wastewater	318,000	0	99.9+
Color removal	Textile and Dye	2340	4.5	99.8
Copper	Electroplating	287	0.484	99.8
Cyanide	Electroplating	10.19	0.89	91.3
Fats, Oil, Grease	Food Processing	18165	26	99.8
Fluoride	Mining	0.59	0.16	69.5
Iron	Acid Drainage	151	0.57	99
Lead	Foundry	8.21	0.23	97.2
Magnesium	Metal Harvester	13.15	0.0444	99.66
Manganese	Metal Harvester	1.061	0.0184	98.27
Mercury	Steam Cleaner	0.01	<0.002	80.0+
Molybdenum	Steam Cleaner	0.18	0.035	80.7
Nickle	Manufacturing	185	0.2	99.9
Nitrate	Food Processing	21	12	42.88
Phenol	Mining	520	145	72.1
Phosphates	Municipal Wastewater	36	0	99.9+
Radium (pCi/L)	Leaching Operation	1093	19	98
Selenium	Drainage	0.068	0.038	44

CONTAMINANT	WASTEWATER SOURCE	CONCENTRATION (mg/L)		% REMOVAL
		Raw	After Treatment	
Silicon	Acid Drainage	21.7	<0.1	99.5
Silver	Film Processing	42	0.09	99.8
Sulfate	Mining	104	68	34.6
Strontium	Canal	2.74	1.4	48.9
TDS	Mining	1060	470	55.66
Tin	Metal Harvester	0.213	<0.02	90.61+
Total Hardness	Municipal Wastewater	127	11	91.3
TKN	Food Processing	1118	59.08	99.9+
TOC	Syn Fuel	1278	2	99.9+
TSS	Municipal Wastewater	4620	7	99.9+
Uranium	Mining	14.6	0.6	99.9+
Canadium	Syn Fuel	0.2621	0.0035	99.9+
Volatile Solids	Municipal Wastewater	12300	126	99.9+
Uranium	Leaching Operation	16.2	0.6	99.9+
Zinc	Electroplating	221	0.014	99.9+

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