PCS-Powell Water Systems

Powell Water is the industry leader and the world's largest supplier of industrial electrocoagulation (EC) systems with over 150 installations worldwide. EC has become recognized as a very effective means for economically treating a wide variety of challenging water treatment applications:

- **Cooling Water**
- **High Recovery RO**
- **Pharmaceuticals**
- **Plating Wastewater**
- **Potable Water**
- **Produced Water**
- **Scrubber Blowdown**
- **Semi-Conductors**
- **Sewage**
- **Trace Contaminants**
- **Wastewater**
- **Zero Liquid Discharge**

The Powell Water Electrocoagulation System has distinct advantages over competing technologies:

- ***No Process Chemicals Required***—The treatment process requires no chemicals. The system is periodically cleaned with an acid solution that is recycled.
- ***Nominal Operator Requirements*** – Even the largest systems can be operated with only 1 or 2 operators. Operator training is straightforward. The simple design ensures the system is very reliable and cannot be damaged by operator error or process upset.
- ***Low Operating Cost*** – Besides manpower, the only operating costs are power and periodic blade replacement. Power consumption is typically 4 kwh/1000 gallons and blade consumption is about 0.20 lbs/1000 gallons
- ***Minimal Waste Disposal*** – Most contaminants are precipitated as oxides which renders them non-hazardous and able to pass the TCLP. Since no additional chemicals are added, the waste volume is minimal and can typically be discharged to dumpsters for haul-off or on site landfill.
- ***Minimal Maintenance*** – Maintenance is limited to periodic replacement of the flat blade electrodes which consist of generic plate that can be purchased locally.
- ***Treats a Wide Range of Contaminants*** – Minimal, if any, pretreatment is required for a system effective on a broad range of items including suspended solids, colloidial solids, emulsions, fats, grease, bacteria, viruses, heavy metals, hardness, silica, boron, selenium, and organics.

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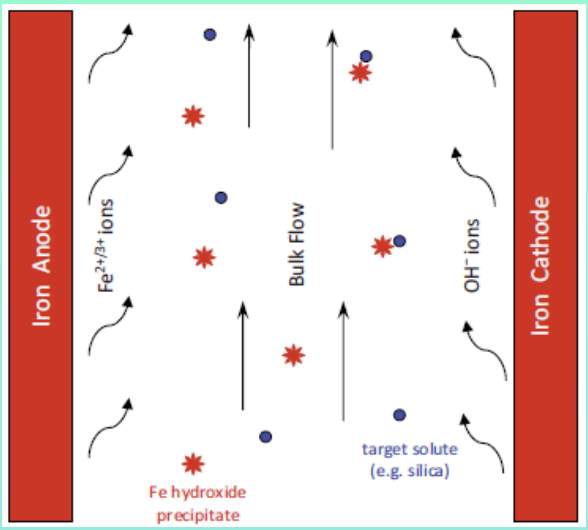
The Electrocoagulation Process

Electrocoagulation (EC) is a process that has been in existence for decades with the first patent issued in 1906. However, it has been only recently that the process has been fully commercialized as a result of technological advancements by Powell Water to overcome the deficiencies of previous units.



The Powell EC unit consists of flat metal blades placed parallel to each other. Untreated water is introduced into the bottom of the chamber and is dispersed evenly as it moves upward through the blades. Direct current is applied to the first and last blade. The liquid then becomes a conductor, allowing the current to pass freely throughout the chamber. This results in a flood of electrons into the water which neutralizes charged particles causing them to precipitate out of solution. In addition the metal blades react to the current by releasing charged metal ions which act similar to chemical coagulants. The unit also contains an air purge system to fluidize precipitates, polarity reversing to extend blade life and prevent contaminants from coating the blades, and an automated clean-in–place system. No chemicals are required for the treatment process. The acid solution used in the automated cleaning cycle is recycled and, when exhausted, it is routed through the EC system for final disposal.

Untreated

EC Treated

5 Min Settling

10 Min Settling

Final Waste Sludge

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Typical Removal Rates

CONTAMINANT	BEFORE (mg/L)	AFTER (mg/L)	REMOVAL RATE (%)
Aldrin (pesticide)	0.0630	0.0010	98.40
Aluminum	224.0000	0.6900	99.69
Ammonia	49.0000	19.4000	60.41
Arsenic	0.0760	<0.0022	97.12
Barium	0.0145	<0.0010	93.10
Benzene	90.1000	0.3590	99.60
BOD	1,050.0000	14.0000	98.67
Boron	4.8600	1.4100	70.98
Cadmium	0.1252	<0.0040	96.81
Calcium	1,321.0000	21.4000	98.40
Chlorieviphos (pesticide)	5.8700	0.0300	99.50
Chromium	139.0000	<0.1000	99.92
Cobalt	0.1238	0.0214	82.71
Copper	0.7984	<0.0020	99.75
Cyanide (Free)	723.0000	<0.0200	99.99
Cypermethrin (pesticide)	1.3000	0.0700	94.60
DDT (pesticide)	0.2610	0.0020	99.20
Diazinon (pesticide)	34.0000	0.2100	99.40
Ethyl Benzene	428.0000	0.3720	99.91
Fluoride	1.1000	0.4150	62.27
Gold	5.7200	1.3800	75.87
Iron	68.3400	0.1939	99.72
Lead	0.5900	0.0032	99.46
Lindane (pesticide)	0.1430	0.0010	99.30
Magnesium	13.1500	0.0444	99.66
Manganese	1.0610	0.0184	98.27
Mercury	0.7200	<0.0031	98.45
Molybdenum	0.3500	0.0290	91.71
MP-Xylene	41.6000	0.0570	99.86
MTBE	21.5800	0.0462	99.79
Nickel	183.0000	0.0700	99.96
Nitrate	11.7000	2.6000	77.78
Nitrite	21.0000	12.0000	42.86
Nitrogen TKN	1,118.8800	59.0800	94.72
NTU	35.3800	0.3200	99.10
O-Xylene	191.0000	0.4160	99.78
PCB (Arochlor 1248)	0.0007	<0.0001	85.71
Petroleum Hydrocarbons	72.5000	<0.2000	99.72
Phosphate	28.0000	0.2000	99.28
Platinum	4.4000	0.6800	84.55
Potassium	200.0000	110.0000	45.00
Proptamphos (pesticide)	80.8700	0.3600	99.60
Selenium	68.0000	38.0000	44.00
Sewage-Municipal (Fecal Coliform/Enterococci)			99.99
Sewage-Municipal (Polyomaviruses)			99.99
Silica	21.0700	0.1000	99.50
Sulfate	104.0000	68.0000	34.61
Silver	0.0081	0.0006	92.59
Tin	0.2130	<0.0200	90.61
Tolulene	28,480.0000	0.2270	99.99
TSS	1,560.0000	8.0000	99.49
Vanadium	0.2621	<0.0020	99.24
Zinc	221.0000	0.1400	99.90

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PCS-Powell Water Systems Installations

Alcan–Canada • Alcan International Limited–Canada • Alfa Appliance Service–Colorado • Anadarko Petroleum–Wyoming • Apex Processing Systems–Australia • Aquamanzi–California • Associated Plating–California • AWES–Colorado • BacTee Systems–North Dakota • Barreto Manufacturing–Oregon • BASX Systems–Colorado • Beckley Water Company–West Virginia • Beijing Wall Investment–China • Ben Gerker Company–Missouri • Boeing–Arizona • Brian Collins–United Kingdom • Burlington Engineering–California • Carige Water Technology–Puerto Rico • Chautauqua Hardware–New York • Chevron Energy Technology Company–California • Christ Water USA–Intel–Washington • CleanWaters LTD–Korea • Colorado Energy Management–New Mexico • Compañía Chilena de Tabacos S.A.–Chile • Conoco Phillips–Oklahoma • Consolidated Meats Group–Australia • Dong Lim Industrial–Korea • Doosan Industrial Development–Korea • E.A.R.T.H / I.M.S.E (Division) - Kingdom of Saudi Arabia • Eathan Allen Coachworks–Vermont • EC System (Thailand) Co–Bangkok • EC&P–Korea • Eco Dewell International–Arizona • EcoGeo International–South Korea • El Paso Electric Company–Texas • Electro Chemical Finishing–Michigan • Emerald Performance Materials–Wyoming • Environmental Solutions & Products–Indiana • ES3–Utah • Fontaniva Bonifico –Italy • Flagship Ecosystems Pte Ltd–Singapore • George A. Bull, Jr–Illinois • Gerber Pumps International–Florida • Golden Star Technology–California • Golder Assocates Inc – Colorado • Hyannis Car Wash–Massachusetts • I G B Vetsch AG–Switzerland • Ilen Seafoods–Ireland • Indland Empire Oilseeds–Washington • Integralsa SA–Mexico • Intel–Oregon • International Dehydrated Foods–Missouri • J C Engineering Consultant–Taiwan • Joe's Plating–California • Joyner's Die Casting & Plating–Minnesota • Kent Troup–New York • KVF–Quad–Illinois • Lawrence Livermore National Labs–California • LIG–Korea • Metal Preparations Co–New York • Natural Environmental Systems–Missouri • Natural Systems–California • NEAT Environmental Inc–Canada • New Century Water–California • New China Limited–Texas • Newalta Corporation–Canada • Office of Naval Research–Virginia • Peagasus Environmental Group–Washington • Piedras Negras–Mexico • Production Plating–Washington • Quantum Ionics–Florida • RAK Gas Commission–UAE • REW Nukem–South Carolina • Rhapsody Environmental–California • Rich–Aqua Environmental–Taiwan • Sam–Chang Foundry–Korea • Sammis Oil and Gas–Canada • Samsung SDI Cheonan–Korea • Samsung SDI Pusan–Korea • San Antonio Trade Group–Texas • Santa Clara Waste Water–California • Separation Process Technologies–Japan • Shihlin Electric & Engineering Corp–Taiwan • Southern California Water Company–California • Spence Electro Plating–California • SUMCO Oregon Corp–Oregon • Sumco USA Cincinnati Division–Ohio • Sustainable Industrial Development–Pakistan • Tecprosol International C. A. • Ted Bozarth–Texas • Terra–Magic–Oregon • The Art Alliance–Florida • Tom Beckwith International–California • Troop Environmental Alternatives–New York • TSS Filtration Services–Texas • Tyson Fresh Meats–South Dakota • U S Army Research–Pennsylvania • UCO–California • Ultra Wheel Company–California • United States Navy–California • Universal Systems–Oregon • Uxmal–Mexico • Vermont Organics Reclamation–Vermont • Wastech International–New Hampshire • Wastewater Treatment Associates–Colorado • Water & Power Technologies Inc –Utah • Water Solutions–Oregon • Water Systems Integrators–Colorado • Western Finance & Lease–North Dakota • William Long Sales–Michigan • WMC Corp–Ontario • World Water Works–New York

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