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LT GREEN ENERGY PTY LTD
RENEWABLE ENERGY PRODUCTION

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GENERAL TECHNOLOGY and TESTING INFORMATION

How does it Work?

EWP technology is classified in a technology space called Capacitive Deionization (CDI). CDI has been around since 1950. The basic concept of separating compounds that are dissolved in water using electrical means is quite old. According to Kammer dates back to 1930. Some of these patents are in electro dialysis and others in Electro deionozation (ED) with thousands of variations of these patents. But the basic IP concerning CDI started in the 1960's.

The technology started to be refined in a 25 year period from 1980 by approximately 12 inventors. It's just that Aqua has refined CDI the most with hundreds of installed systems around the world in both consumer, commercial and industrial applications.

Various Dissolved salts and Silica in water are the major components of TDS (total dissolved solids). These dissolved salts need to be removed on many applications, or they will form deposits and affect equipment performance. (Figure 1)

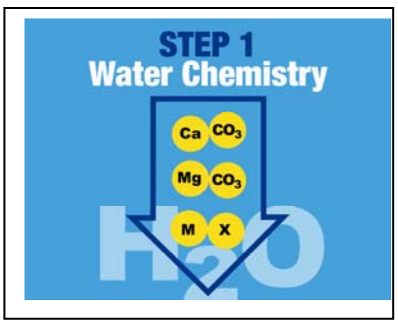


Figure 1

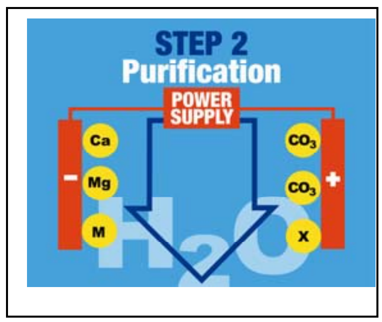


Figure 2

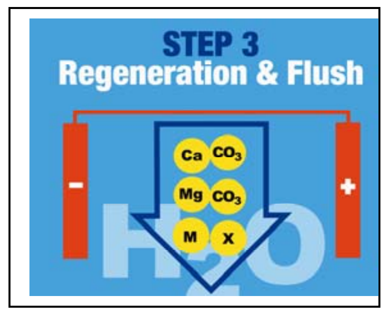


Figure 3

The Electronic Water Purifier makes patented technology available to generate DI quality water by removing these dissolved salts electronically.

Electrodes used are made from activated carbon that has a coating and a conductive material. When these electrodes are layered using a DC power supply, the individual electrodes are charged with different polarities. The dissolved salts in the water have polarity charges and are attracted to the opposite polarity of the electrode, thus removing the dissolved salts from the water. These dissolved salts are adsorbed though a process we call electrochemical diffusion" through the coasting and onto the activated carbon electrode surface creating the pure water. (Figure 2)

When sufficient dissolved salts are deposited on the electrodes, the electrodes are regenerated initially by shorting the electrodes to ground. The contaminants fall off the electrode in the same chemical form as was removed. After the regeneration, the waste at 2 times the original concentration is discharged through a valve. The waste is discharged to a drain. (Figure 3) Upon completion of this cycle, the polarities are reversed for normal operation.

<u>Process Description</u>

The EWP uses a capacitive deionization principal to remove dissolved ions from water. The device consists of multiple layers including chargeable electrodes or layers that work in response to an applied DC potential (1.2 VDC). Each electrode has an ion selective coating on the electrodes. The device contains a conductive surface sandwiched between layers of coated activated carbon. A non-conductive spacer material separates the plates from each other. These electrodes are alternately connected to the two sides of a DC power supply via appropriate connecting leads.

Our newest invention doesn't have the coating and the electrode touching each other, i.e. they almost float and the coating has holes in it—this provides 3 mechanisms for flow and mass transfer.

The device still works on the principles of capacitive deionization to purify water, via application of a low voltage DC potential to attract and discharge ions on the electrode surface. The high surface area carbon electrode layers attract and hold ions from a solution on its surface, flowing through the device. The positive ions are attracted to the negatively charged plate (anode), and the negative ions are attracted to the positively charged plate (cathode).

Eventually, all the charged sites are filled and the device must then be regenerated by discharging the irons from the carbon surfaces. This is achieved by an appropriate combination of flow, shorting of the capacitor and reversing the polarity of the applied DC potential. Once a substantial amount of the new displaced ions are flushed into the waste stream, after a fixed length of time, the unit begins to charge once again by attracting ions from the feed solution under the influence of the reverse potential. This action then begins a service cycle that last 4 minutes.

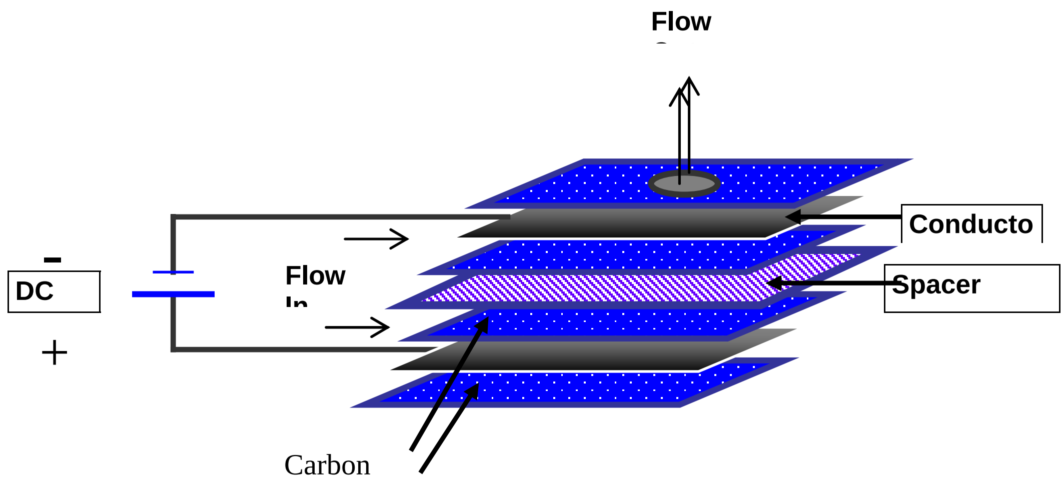
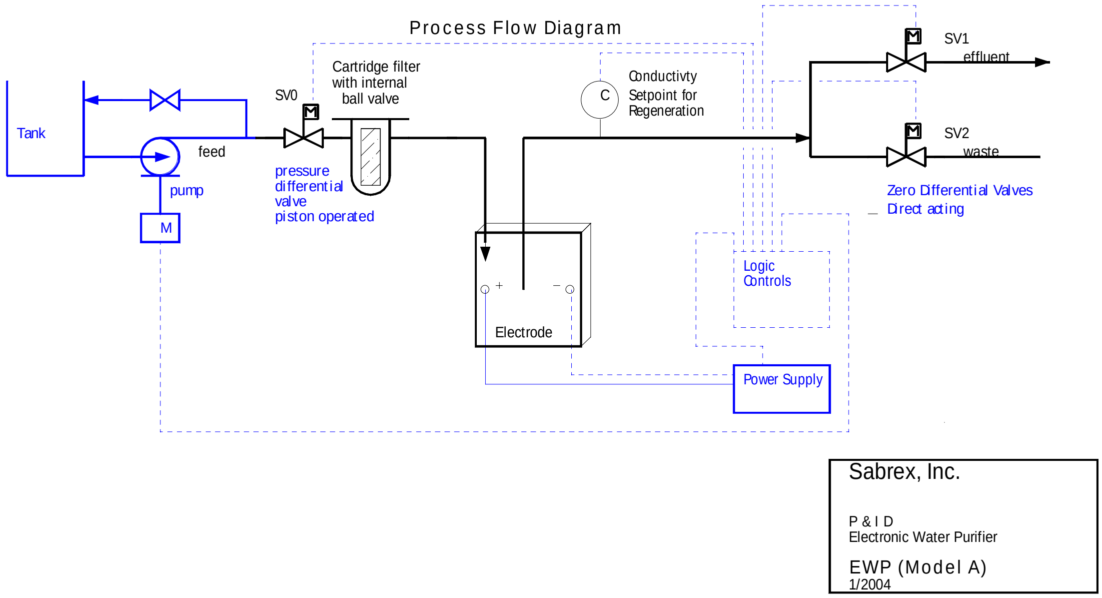
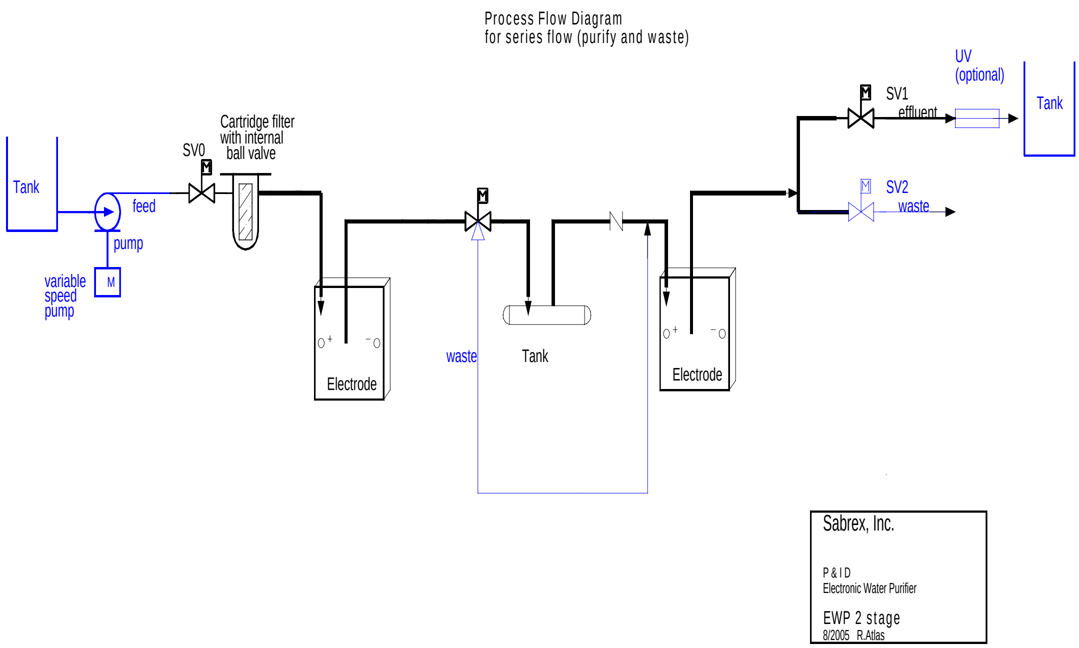


Figure 1: Cell Construction Diagram



2 stage Cells in Series
Purifies and Flushes in Series



Process uses

1. separate power supplies for each cell
2. series purify through the tank (which holds 1 volume for purification)
3. series waste water flush—bypasses the collection tank to purify in series
4. each stage requires 20 to 35 psi pressure

Atlas became the most advanced developer of CDI technology according to Culligan and Pentair. However we were always severely undercapitalized. As the world markets moved towards globalization, it became apparent to me in 2005 that we could not go much further without either a joint venture or investment capital. We are too small to do business with the "bigs".

Reverse Osmosis (RO) has become the benchmark technology. RO has developed into being more cost effective at all flow sizes, even though the technology has limitations. Most of the "bigs" business is based on RO. So there is no incentive to switch to a new technology that is apparently ahead of it's time. As environmental regulations drive customers to search for new technologies or the need for an improved technology to remove hazardous contaminant, EWP will be embraced—slowly.

During 2006 advancements were made in the cell to increase purification performance, flow and reduce cost. A cell pack containing 8 cells was developed and rated at 5 gpm of flow. A new power supply was developed, where two power supplies could be used per cell pack. Now further automation advancements are needed to increase the manufacturing volumes. We think that the cost per unit of flow can be halved by the first quarter of 2008. A new cell design has been successfully tested,

There has been significant operating history on applications such as CBM and waste water purification. In 2007 we made 7 commercial systems from 1 gpm to 25 gpm. Recently, through some developments we have made the commercial units very cost effective and in some applications the low cost solution. On supply water we could be preferred because of low maintenance and a non chemical approach to water purification.

Current State of the Art-

From 2000 to 2002 the basis for the current cell design started to emerge. In the beginning there were some test and evaluations units sold. Barnstead said it best "this technology is simply terrific". That sentiment has been also repeated by many other customers. One customer in Nevada wondered why we haven't marketed the product more because it is so good. So what makes this technology so good? The small power supply format was developed in 2002 which is still used today along with a small cell format (25g of carbon).

2003 a manufacturing process was developed to manufacture cells, both large and small in high volume. Electrodes were manufactured at a cost ¼ that of what can be purchased from others. A coating was developed by Patrick Altmeier of PCA (Germany) with significant performance and cost advantages.

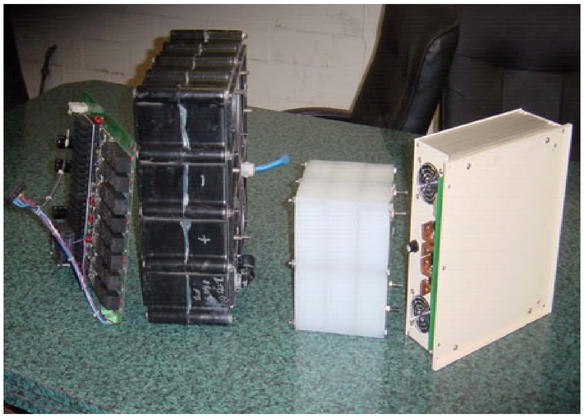
2004 The Water Genie design emerged as a platform for other products such as the water cooler and water dispenser. A new process was developed for 2,500 ppm that used no inter-stage tanks and pumps. This process was extended upto 10,000 ppm. Both Culligan and I developed a citric acid cleaning process to remove the last obstacle in performance. If the cell fouled due to mineral deposition on the electrode, it could be cleaned by the customer and not require a service call.

These consumer product developments lead to consumer products being licensed to Catalyx Fluid Systems, Inc. This gave us the chance to finish development on commercial systems.

2005 We found a way to decrease the commercial products pricing in half by switching to a small cell format and then by doing some experiments with higher voltage the price could be halved again because we could get a 20% increase in flow. The estimated system price for a 20 GPM flow module is $2,000 per GPM. A cell was built that can flow at ½ GPM net and we now see a way to increase to flow to 1 gpm net. It possible to lower this cost to $1,500 per GPM of flow with some more cost effective purchasing of materials and more efficient assembly. Now we feel we can achieve a cost wholesale cost of $750 per gpm of flow.

I am 110% confident in the long term reliability of this technology. We have units in service for six years that are still operating with periodic maintenance such as replacing filters and every 6 months doing a citric acid clean.

The changes in the cost of the cell and power supply are best summarized in the graphic below:



Prior to 2004		After 2004
Carbon in Cell	1,354 g	336 g
Flow	2.8 lpm	5 lpm
Flow per gram of carbon	2.0 ml/min/g-c	15
Pressure	42 psi	35 psi
Weight	60 lbs	8 lbs
Power use	600 watts	150 watts
Wholesale price	$1,500	$575

Technology advantages and disadvantages

POU: Benefits of EWP over RO
salt less water softener + more
1/3 smaller size
configured into countertop appliance, water dispenser, water cooler
designs at 2,500 ppm
scalability small or large
70%+ recovery
lower maintenance--cleaned with citric acid
no membrane replacement
better contaminant removal such as with As, FL, Nitrates, Perchlorate
better tasting water--purification better with no TDS creep
no pump needed only 2 to 8 psi needed
1 log disinfection-no bacteria growth in cell
insensitive to pretreatment
loved by environmentalists

POE Benefits over Softener
salt less water softener + more
no salt or other chemicals
better feeling water
shinier hair, softer clothes--same benefits as softener
less spotting deposits
lowers TDS and \better contaminant removal such as with As, FL, Nitrates, Perchlorate
in small cell format--no pump needed only 2 to 8 psi needed

70%+ recovery
can work off generator
1 log disinfection-no bacteria growth in cell
insensitive to pretreatment
lower cost than whole house RO
lower maintenance--cleaned with citric acid
designs at 2,500 ppm
1/2 smaller size than a softener
loved by environmentalists

What are the ionic constituents that the technology will remove very effectively and why?

See exhibits 5 to 17 and the analysis listed below. The EWP is especially good at removing the primary pollutants of arsenic, fluoride, nitrates, and metals better than any other single technology on the market today. EWP is rated to remove 70% of all dissolved minerals @ 1,000 ppm.

Our testing shows good removal of by Culligan in 2003 showed good removal of everything except Silica

Example A

Cations	Befroe	After		
Calcium	65.0	2.9	<0.1	95.5%
Magnesium	17.9	0.8	<0.1	95.5%
Sodium	55.8	4.4	<0.1	92.1%
Potassium	12.5	0.9	<0.1	92.8%
Strontium	5.71	0.2	<0.05	96.0%
Barium	0.0	ND	<0.01	
Iron	ND	ND	<0.05	
Manganese	ND	ND	<0.02	
Copper	ND	ND	<0.003	
Lead	ND	ND	<0.003	
Zinc	ND	ND	<0.05	

Anion				
Chloride	11.9	0.9	<0.5	92.4%
Nitrate.Nitrate (as N)	16.1	1.1	<0.5	93.2%
Sulfate	116	6	<3	94.8%
Bicarbonate	170.4	11.7		93.1%
Carbonate	ND	ND		
Fluoride	1.1	0.1	<0.05	90.9%
Silica	7.81	7.82		-0.1%

Example B: **CBM (8 stage system)**

TDS Feed Water **7,796 ppm**
TDS purified water **357 ppm**

Feed Water

Schlumberger

Client:	**AEC**
Well Name:	**Couey 32-5 & 32-4**
Formation:	**0**
Treatment No:	**N/A**
Date:	**08/24/07**
Tested By:	**B. Stringham**

WATER ANALYSIS REPORT

	32-5	32-4	
Temp (°F)	66	68	
pH	6.5	7.0	
Specific Gravity	1.025	1.015	
Chlorides (mg/l)	15975	14200	
Iron (mg/l)	140	200	
Bicarbs (mg/l)	1830	3050	
Carbonates (mg/l)	0	0	
Hydroxides (mg/l)	0	0	
Calcium (mg/l)	4000	1200	
Magnesium (mg/l)	1200	1680	
Sulfates (mg/l)	625	150	
Sodium (mg/l)	4236	5560	
TDS (mg/l)	7796	6281	
Resistivity (W-m)	0.27	0.30	

COMMENTS: VUT00S1038

Purified Water

WATER ANALYSIS Out		
	sample	Sample
	32-5	**32-4**
Temp (°F)	**66**	**68**
pH	**6.5**	**7**
Specific Gravity	**1.025**	**1.015**
Chlorides (ml slvr ntrt)	**4.5**	**4**
Sample Size (ml)	**1**	**1**
Iron (mg/l)	**7**	**10**
Dilution Factor	**20**	**20**
Carbs, Bicarbs, OH		
Sample Size (ml)	**1**	**1**
P (ml of HCl)	**0**	**0**
T (ml of HCl)	**0.3**	**0.5**
Calcium (ml EDTA)	**1**	**0.3**
Sample Size (ml)	**1**	**1**
Magnesium (ml EDTA)	**1.5**	**1**
Sample Size (ml)	**1**	**1**
Sulfates (mg/l)	**125**	**150**
Dilution Factor	**5**	**1**
TDS	**357**	**299**

Example C:
Our testing recently by Secules in Hew Hampshire showed good removal of Arsenic and Nitrates

	Before mg/l	After mg/l	Reduction
TDS	260	10	96.2%
pH	7.75	5.54	28.5%
<u>Anion</u>			
Chloride	7.44	<1.0	86.6%
Fluoride	<.1	<.10	90.0%
Nitrate (as N)	3.44	<1.00	90.0%
Nitrite (as N)	<0.05	<0.10	90.0%
Nitrate/Nitrite (as N)	3.44	<1.00	90.0%
<u>Metal Analysis</u>			
Copper	<0.010	<0.010	
Iron	<0.010	<0.010	
Manganese	<0.010	<0.010	
Sodium	3.39	<0.50	90.0%
Hardness	181	<0.50	90.0%
Calcium	42.5	<0.50	90.0%
Magnesium	18.2	<0.50	90.0%
Arsenic	0.039	<0.010	90.0%

Example D: On 2001 we did testing in a printed circuit board manufacturer Dynamic Details. Again there was good removal on all compounds.

Dynamic Details, Inc.
End of Pipe Waste Treatment Pilot Test

		waste water feed	Composite effluent	% Purify
Calcium	mg/l	119	14.3	88.0%
Copper	mg/l	0.488	0.008	98.4%
Iron	mg/l	0.02	0.004	80.0%
Magnesium	mg/l	17.7	1.79	89.9%
Manganese	mg/l	0.092	0.007	92.4%
Nickel	mg/l	0.267	0.032	88.0%
Potassium	mg/l	19.2	5.97	68.9%
Sodium	mg/l	260	78	70.0%
Zinc	mg/l	0.016	0.0032	80.0%
Bicarbonate	mg/l	186	37.2	80.0%
Alkalinity	mg/l	152	30.4	80.0%
Total Hardness	mg/l	370	43	88.4%
Specific Conductance	umos	1990	398	
Total Dissolved Solids	**mg/l**	**1200**	240	**80.0%**
Chloride	mg/l	240	72	70.0%
Nitrate	mg/l	25.3	0.76	97.0%
Sulfate	mg/l	408	81.6	80.0%
Total Organic Carbon	mg/l	3.8	1.1	
MBAS	mg/l	0	0	
Fluoride	mg/l	12	2.4	80.0%
pH		7.7	7.35	
Total Anions	meq/L	21.8	5.37	
Total Cations	meq/L	21	5.71	

Example E: CBM Data in Big George

TDS Before 2,630 ppm
TDS after 526 ppm

Improvements in the technology since this testing was done in 2003. will make it possible to reduce the TDS in the range of 300 to 500 ppm

Typical CBM Water Analysis Estimator

with Surface Discharge Limits

G02050097-001 2-stage

After treating with EWP

Purify 93%

Major Ions	Results	Units	After
Sodium	980	mg/L	68.6
Potassium	19	mg/L	1.3
Calcium	33	mg/L	2.3
Magnesium	18	mg/L	1.3
Carbonate	0	mg/L	-
Bicarbonate	3,030	mg/L	212.1
Chloride	29	mg/L	2.0
Sulfate	0	mg/L	-
Nitrite+Nitrate as N		mg/L	-
Fluoride	3	mg/L	0.2

Non-Metals			
Total Petroleum Hydrocarbons	<1	mg/L	
Total Dissolved Solids @ 180°C	2,630	mg/L	526.0
Specific Conductance @ 25°C	4,208	umhos/cm	294.6
pH	7.5	std. units	
Sodium Absorption Ratio (SAR)[4]	34	unit less	9.0
Alkalinity as $CaC0_3$	2,480	mg/l	173.6
Hardness, total as $CaC0_3$	158	grn/gal	11.1

Total Metals			
Arsenic	2.3	ug/L	0.16
Aluminum	0	ug/L	
Barium	1500	ug/L	105.0
Iron	480	ug/L	33.6
Boron	0	ug/L	-
Zinc	17	ug/L	
Manganese	19	ug/L	1.3

Radiochemical			
Radium 226	0	pCi/L	-

[1] Probable limits may vary depending on the quality of the receiving stream
[2] Sodium, calcium and magnesium limits determined by SAR
[3] Sulfate limit will be much lower due to TDS/SC limit

Example F: (Jonas, WY-- Four Stage Unit)

TDS before 6,730 ppm
TDS after 450 ppm

Analytical tests

Lab ID	C 8114	C8128	C8116
Unit #	1	3	6
Stream	Influent	Effluent	waste
Test #	2	**1**	2
pH, std. units	7.73	7.18	7.3
Chloride, mg/L	2,699	193	6,648
Sulfate	184	4	930
Total dissolved solids, mg/L	6,730	450	14,230
Alkalinity as CaCO3 mg/L	1,058	122	1,079
Carbonate, mg/L	-	-	-
Bicarbonate, mg/L	1,058	122	1,079
Conductivity, umhos/cm @ 25	10,010	686	19,470
Sodium	1,735	104	3,370
Potassium	175	5	368
Calcium	391	10	1,297
Magnesium	79	0	340
Iron	0.43	0.4	0.45
Barium	0.71	<0.5	<0.5

These test results were samples pulled by Aqua EWP but tested by ABCO.

The results show that the water can be purified to 450 mg/l in total dissolve solids while keeping Calcium and Magnesium to rather low levels which help to hold the polymeric emulsion for frac.

We did notice that the feed water has a substantial amount of organics by the color of the water, which appeared to be removed in the first stage, however COD tests were not run.

Example G: Powder River (JM Huber)

We achieved the following results

Feed Conductivity	1770	ppm (EC)
Estimated Feed SAR	24	
Purified Effluent	270	ppm
Purified Effluent after waste recovery	227	ppm

Estimated SAR without blending Ca/Mg (of purified stream)	9 (1)
Estimated SAR with blending (400 mg/l Ca/Mg)	1 (2)

Waste Water (reject) conductivity	3,200	ppm
% Purification average	85%	
Recovery	75%	
Overall Recovery with Waste Recovery Recycle	95%	
Power Consumption—estimated	2.63 whr/gal	

List all market sectors where the technology in its present state of the art can be brought to market

Consumer Products: (Already licensed)

POU: Water Genie is ready to go to market. Mostly packaging is needed and a slightly enhanced EPROM logic circuit boards and of course cost reduction. 6 months is normally needed to get molds designed and made for the cell casings—at a higher cost they can be machined out of plastic sheets, which is what we do today. A new power supply is needed and again Wall Industries is quoting this item according to our specifications.

Also the product line has to be completed with Water Dispenser Shells for 1,000 and 2,500 as well as water cooler products.

POE: The whole house unit is ready to go. . Mostly packaging is needed and a slightly enhanced EPROM logic circuit boards and of course cost reduction. 6 months is normally needed to get molds designed and made for the cell casings—at a higher cost they can be machined out of plastic sheets, which is what we do today. A new power supply is needed and again Wall Industries is quoting this item according to our specifications... The 600 watt power supply is needed, but if the 40 watt power supply becomes available, then we can couple these together.

A manufacturer that will make prefilters to our specification is needed as well as citric acid cartridges.

Commercial Products:

Modular Units:have been made. A new power supply has been developed. The largest unit has been built, 1000 BPD. Four licensees have the right to assemble systems.

Further automation is needed to produce higher quantities of cells; An Automation Engineer has been hired. The process has been defined.

A 10,000 BPD unit should be designed, built and filed tested. Then the technology would be like “Field of Dreams”. The devil is always in the details.

Small Community Water Supply Systems (SCWS)

Small Community Water Supply Systems (SCWS) appears to be a very large market that has a fit with our largest flow modules (20 gpm or 50 gpm??) (If we can be competitive with RO, or customers don't want the high opex costs of RO).

Currently our CAPEX wholesale cost is $2,000 per GPM of flow and RO is probably around $1,500 per GPM of flow with pretreatment. When factoring in OPEX costs EWP is probably equal to the cost of RO (Total OPEX and CAPEX costs). If we can purchase components cheaper, optimize our design and make a few improvements in flow, our cost could be less than RO in the near term based on OPEX and CAPEX costs..

Example G:

Laboratory and Field Testing of An Electronic Water Purification System Using Activated Carbon Electrodes to Treat Water with High Levels of Total Dissolved Solids

Zachary J. Zaletel, University of Alaska Anchorage, 3211 Providence Drive, ENGR 201, Anchorage, AK 99508 and **Nyrée V. McDonald**, Civil Engineering, University of Alaska Anchorage, 3211 Providence Drive, School of Engineering, Anchorage, AK 99508

The purpose of this report is to outline the results of laboratory and field testing of a capacitive deionization system. First, laboratory testing was completed in order to close a mass balance around the Sabrex Electronic Water Purification (EWP) system. Second, simulated coal bed methane water was treated with the EWP. Field testing of a 75 gallon per day EWP took place in Chefornak, Alaska over July 29 – August 5, 2006. The goal of the testing was to determine the suitability of the EWP system for the reduction of high TDS levels in the Chefornak groundwater. Two batches of coagulated and filtered water were treated with the EWP during testing, and measurements for total dissolved solids, color, turbidity, pH, temperature, volume and UV absorbance were collected from the feed, treated and reject water. Lab analysis was also performed in order to determine metals content, alkalinity, total hardness, total organic carbon and total inorganic carbon. Finally, laboratory testing using the EWP was carried out with different natural and simulated waters at the University of Alaska Anchorage. Natural waters tested include raw water from Copper Center, Alaska and Barrow, Alaska. High iron-content water was also treated using the EWP system. Results indicate that the EWP system effectively lowers the level of TDS in a wide variety of waters. Field testing illuminated the dangers of inadequate pre-filtration and demonstrated the quick and effective recovery of the system following an chemical cleaning cycle. Though TDS reduction was dependent on feed concentration and system throughput, 40-60% reduction was typically possible on a 1000 mg/L TDS feed after a single pass through the system. A number of metal species were also removed from the feed water as well, with average removal anywhere from 25-50%. The ratio of permeate to reject is variable depending on flow rate, though is ~1:1 – 1:1.2 during ideal conditions. Power consumption during testing is 7.1-8.3 Whr/gal when standardized to manufacturer throughput rating. The technology appears to be a good option for treatment of water with high levels of TDS in rural communities.

Small Waste Water Recycle Systems (SWWS) has always been a large market and is a derivative of SWCS.

CBM

Currently, it is difficult to handle water produced from CBM wells in cost-effective methods. Before methane gas can be extracted, water must first be pumped from the well and either treated for surface use or re-injected into the well. After successful completion of testing EWP technology, a 10,000 BPD unit will be jointly designed that produces water from CBM wells. This water can then be discharged at a 98% recovery rate. The remaining 2% will be injected into a disposal well.

The value of this extracted water is immense especially if we can retain the water rights. With EWP purification, this water can be used for irrigation or other commercial needs. Projections indicate that this water, re-sold to a municipal water supply, can potentially generate revenue streams in excess of $3,500 per day. The value of the water rights is greater than the leasing revenue.

EWP projects a salinity range for CBM wells up to sea water concentrations, although 1,000 ppm to 15,000 ppm will more than likely be the normal range seen in Wyoming, Texas, Colorado, Montana and New Mexico.

At 2,500 ppm, the cost per barrel should be approximately 10¢/per BBL, with a 2 to 5 year rental commitment.

EWP technology offers a very low profile in the field with no hazardous chemicals. The units are modular, installed in a container, and during their lifetime of operation can be easily moved. This is unlike current technologies being used that are frequently large, disrupt the landscape and are difficult, if not impossible, to relocate.

We are also planning additional international installations. Looking towards the future, we envision markets other than CBM – such as desalination

Sea Water Desalination and Waste Recovery

For years, scientists the world over have struggled to build affordable, clean and economical desalination plants without much success. The ocean represents a nearly limitless supply of drinking water – if biological and mineral vectors could be removed. Unfortunately, costs have always been very high and overruns frequent due to expensive purification techniques that primarily utilize RO.

However, EWP, the world's lowest-cost water purification technology, has now been configured to desalinate sea water to drinking water—from 35,000 ppm to less than 500 ppm with 80% recovery and 35 whr per gallon of feed water.

The desalination purification technique utilized by EWP has 8 sequential stages. Although large-scale commercial systems are being designed the initial point of entry into market will most likely be smaller commercial systems less than 25 gpm or waste water recovery in CBM.

Patents Pending

EWP Power Cell

Electronic Water Purifier

An UltraCap in a battery format

Picture pending

Many industries are evolving to hybrid power and backup systems such as automotive and telecommunication. The existing Lithium and Nickel based technologies can't deliver power fast enough, cheap enough and be environmentally safe.

Sabrex developed the EWP for water purification and now now the exact opposite of this makes patent pending technology available to generate power at very favorable recharge/discharge times..

How it Works

Electrodes used are made from activated carbon with an integral polymeric coating. These electrodes are layered into a cell casing like a sandwich. A DC power supply is used to charge the electrodes. The individual electrodes are charged with different polarities. The minerals in the water soluble based electrolyte solution are attracted to the electrode surface and diffuse through the polymeric coating. The mass deposited on the surface of the electrode is relational to the residual charge available

When sufficient minerals are deposited on the electrodes , the minerals are released during a regeneration step. The charge is also released—ready for useable The discharge time is greater than the recharge time.

The power cells are put in duplex. While one is charging the other is generating power. Then the cells alternate.

Benefits

- Simple Operation
- Much Lower cost than other technologies
- No hazardous chemicals and no recharge limits
- Small physical size-modular in design
- Quick recharge
- Can perform like am Ultracap (if desired)

Sizes: (2 vdc)

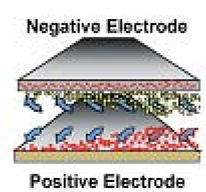
- **60w (2,500 Farads)**
- **135w (5,600 Farads**
- **240w (10,000 Farads)**

Applications

- Hybrid power in vehicles
- Use for regenerative power from braking
- Backup power

How it works

When DC voltage is applied across the electrodes, mass transfer of ions in the electrolyte solutions diffuse through a semi permeable coating onto the electrode surface.



The mass deposited is proportional to the charge available. During discharge the ions release from the surface in a reversible process creating power available for use.

SABREX

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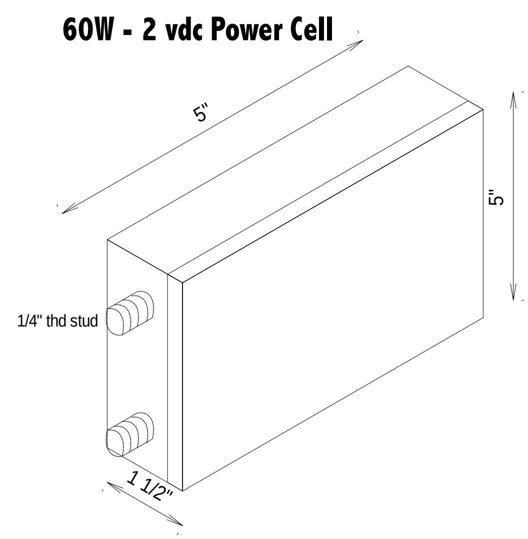
SABREX
EWP Power Cell
Electronic Water Purifier

Model	Dimensions L inches	W inches	H inches	Weight Kg	Volume (L) liters
PCell 60	7.00	1.50	6.00	1.00	
PCell 135	8.00	1.50	7.00	2.25	
PCell 240	10.00	1.50	9.00	4.00	

Features

- More power than Lithium Hydride and Nickel Hydride per minute of use
- Over 1,000,000 duty cycles
- Voltage range of 1.5 VDC to 2.6 VDC—with buck/boost circuit —discharges at 2 VDC for 2 minutes
- Modular design for series and parallel configurations
- Fast recharge time of 1 minute—designed for use with hybrid power recharge
- Discharge time of 2 minutes
- 75% available for power use with buck/boost circuitry
- Higher power than Ultra Caps
- Can function just like an Ultra Cap for regenerative braking
- Environmentally safe, water based electrolyte solution
- Polypropylene construction



Preliminary Performance Specifications

				Pcell 60	Pcell 135	Pcell 240	
Mounting				*data not*	*available yet*		
Capacitance each 2 VDC cell		Cp	Farads	2,500	5,625	10,000	estimated--not measured
Charge Voltages		Vp	DC	3.3	3.3	3.3	for 1 minute
Nominal Voltage	★	Vr	DC	2	2	2	for 2 minutes
efficeincy of power in vs power out				98%	98%	98%	
Rated Current		Ar	amps	30	70	124	
Leakage Current			mamps	1	1	3	
operating temperature range			deg C		-50 deg C to 80 deg C		
storage temperature	★		deg C		10 deg C to 40 deg C		
maximum power			watts	60	135	240	for 2 minutes of discharge
Power Density			W/kg	333	333	333	
Life time				10 years @ 16 hours of use per day			
Cycle Life				1,000,000 charge cycles			

★ future technology development can yield increases of double present performance

Preferred process arrangement is duplex, one bank of power cells charging while another bank of power cells are discharging

Comparison of Key Parameters

from exerimental data

Battery Technology	power density w/kg	power density w/kg/min use	energy density wh/kg	life cycles	cost $/W
DOE Standard	**600**	**3.33**	**5**	**100,000**	
Li Co	760	4	200	1,200	$ 2.50
Power Cell	**1,100**	**550**	**40**	**1,000,000**	**$ 0.08**
Ni MH	1,000	3	80	1,500	$ 0.25
Lead Acid	180	10	40	800	$ 0.15