

SECTION 4.2 - KEY CONCEPTS

PURPOSE: The purpose of the below information is to not only understand how our machines are different but to also understand the KEY CONCEPTS of the footbath electrolysis process & to **debunk false misleading concepts** that other manufacturers are publishing.

KEY CONCEPT	EXPLANATION	SOURCES	WHAT IS THE BEST OPTION
<p>DUAL Polarity vs. SINGLE Polarity</p>	<p>Dual Polarity, or reversible polarity, machine is just the reversing of polarity. Dual Polarity is a marketing gimmick and provides no benefit. This is why:</p> <ol style="list-style-type: none"> FALSE CLAIM: Systems that use Dual Polarity claim that switching Polarity (in another words which way the DC current flows) to create more Negative Ions or Positive Ions (Negative polarity to Positive Polarity & then Positive Polarity to Negative Polarity). REASON FALSE: DC Current only can go from Negative to Positive NEVER can it go from Positive to Negative as the companies that use Dual Polarity claim. Moving current from a positive to negative goes against the law of physics for DC current (refer below more details). FALSE CLAIM: Systems that use Dual Polarity claim that Negative Ions & Positive Ions are needed depending on the bodies PH level. REASON FALSE: Negative Ions are the good ions. Positive Ions are the depleting ions, free radicals (refer below about the difference). Why would you ever want positive ions? By reversing polarity, the plated material on the anode gets released back in to the water (explained further below) from the current footbath & previous footbaths. Obviously this is not a good thing. FALSE CLAIM: Systems that use Dual Polarity claim that their systems change the PH level of the water depending on the supposed Polarity. REASON FALSE: The only way the PH level can be altered is if the ionized water near the Anode or Cathode rings where the H₂O has split is extracted. <p>EXPLANATION Why DUAL Polarity is a hoax:</p> <ol style="list-style-type: none"> To further explain how this works you must first understand how DC (direct current) current works <p>DC CURRENT: ALL Footbath electrolysis units on the market are using DC current. They either run from an AC input or a battery input (a battery is DC). This is necessary to create the electrolysis process. Direct current or DC electricity is the continuous movement of electrons from negative to positive through a conducting material such as a metal wire or in the case of the footbath it is the water. A DC circuit is necessary to allow the current or steam of electrons to flow. The current ALWAYS flows from the negative (Cathode ring) to the positive (Anode ring) through the water. When the electrons move from</p>	<p>DC CURRENT: http://www.school-for-champions.com/science/electrical_generation.htm</p> <p>DC CURRENT: http://www.school-for-champions.com/science/dc.htm</p>	<p>SINGLE POLARITY</p>

the Cathode ring to the Anode ring it causes the Cathode ring to deplete and then binds with molecules in the water and then moves to the Anode ring creating a plating on the Anode ring ([refer to our research page showing the scrapings of the Anode ring click here](#)). When a machine switches polarity ALL THEY ARE DOING is changing which plates receive the positive and the negative. The current STILL flows from Negative to Positive. Remember the Cathode ring depletes the metal & the Anode ring attracts where a build up occurs, so when the Anode ring switches to receiving the negative, making it now the Cathode ring, it then releases all the build-up back in to the water. Not only are you releasing the toxins back in to the water but it gains NO BENEFIT. Dual polarity is a little like mixing a cake. The resultant is the same whether you mix it in a clockwise or counterclockwise direction, it really makes no difference.

Water electrolysis

<http://jchem.ed.chem.wisc.edu/JCEsoft/CCA/CCA3/STHTM/ELECH20/ELEC/W03.HTM>

False misleading statement by other companies state (i.e. AMD IONCLEANSE) when the unit is supposedly in 'positive' mode: *"When the unit is in positive mode, the current flows to the positive pole in the array, which results in more negative ions being produced in the water. When it is set on negative mode, the current flows to the negative pole in the array, which results in more positive ions being produced in the water. Therefore, negative polarity generates a positive ion flow. This process is known as the electrolysis of water."*

Water electrolysis

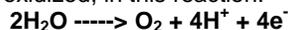
<http://www.madsci.org/posts/archives/2000-08/967423898.Ch.r.html>

**** THIS IS FALSE: A DC current cannot move from positive to negative pole as stated in the negative mode. (explained above)**

2. You must also understand how Water electrolysis works:

WATER ELECTROLYSIS is the process by which water is broken down into hydrogen and oxygen in the presence of a direct electric current and an electrolyte (NACL salt). Electrolysis of water is what's called a redox reaction. This means that electrons are being moved from one molecule to another. To electrolyze water, you need 2 electrodes, the cathode (negative) and the anode (positive). This would be the water module of the footbath unit. You also need to dissolve ions in the water to improve its conductivity; sodium chloride (salt) is often used as in the case of the footbath.

At the anode, electrons are removed from the water and it is oxidized, in this reaction:



At the cathode, electrons are added to water and it is reduced:

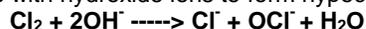


So at the anode we get oxygen gas and hydrogen ions, at the cathode hydrogen gas and hydroxide ions.

Other products can be formed depending on what the electrodes are made from and how the electrolysis chamber is built. If the cathode is made from iron, it will react with the hydroxide ions to make brown, insoluble iron hydroxide:



Chlorine gas can be formed, but this isn't because the electrodes are made of carbon. It will only happen if sodium chloride is added to the water. In this case, the chloride ions in the water can oxidise to chlorine and combine with hydroxide ions to form hypochlorite:



False misleading statement by other companies that use the DUAL Polarity claim that their machines can create more positive ions or negative ions depending on what mode the machine is in (positive or negative). This is a false statement. The current coming from the water module acts as a stimulus or Optimizer to break up the H₂O (water) and the NaCl (salt). Current will always flow the same way, meaning only from negative to positive (as stated above), so the breakup of the water molecule & salt will be exactly the same. The molecule makeup of the H₂O and the NaCl is what determines how many negative ions and positive ions are being produced NOT THE CURRENT (measured in e⁻). Just by adding salt this creates about a 2 to 1 ratio of negative ions (just like the ocean).

An example of this false statement is stated on AMD IONCLEANSE webpage. They state that depending on what 'supposed' mode (positive/negative) their unit is set to, affects differently the combination of Hydrogen & Oxygen gas release. They say it breaks down in:

FALSE:

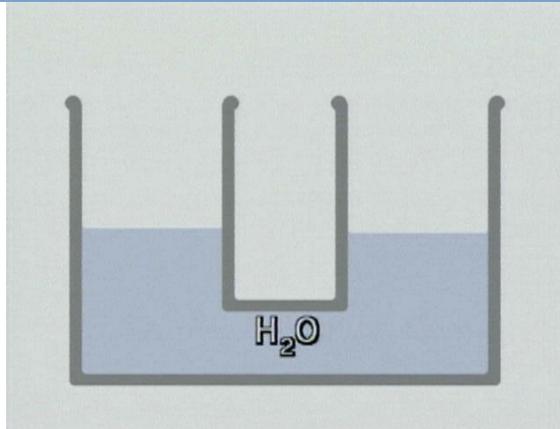
POSITIVE MODE: $4\text{H}_2\text{O} + 4\text{e}^- \rightarrow 2\text{H}_2 + 4\text{OH}^-$
OR

NEGATIVE MODE: $2\text{H}_2\text{O} \rightarrow \text{O}_2 + 4\text{H}^+ + 4\text{e}^-$.

This is a false statement because as you can see above where we explain how really 'water electrolysis' works, the electrolysis creates **at the anode** water is oxidized ($2\text{H}_2\text{O} \rightarrow \text{O}_2 + 4\text{H}^+ + 4\text{e}^-$) and **at the cathode** water is reduced: ($2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 2\text{H}_2 + 4\text{OH}^-$)

END RESULT OF ALL FOOTBATH ELECTROLYSIS

PROCESS: The overall effect from the footbath electrolysis **will always** breakdown in to $2\text{H}_2\text{O} = 2\text{H}_2 + \text{O}_2$ (for details <http://jchemed.chem.wisc.edu/JCEsoft/CCA/CCA3/STHTM/ELECH20/ELECW03.HTM> from American Chemical Society).



<http://jchemed.chem.wisc.edu/JCEsoft/CCA/CCA3/STHTM/ELECH20/ELEC W03.HTM>

NEGATIVE Ions vs. POSTIVE Ions

The harmful positive ion (cation) is a particle that loses an electron. The healthful negative ion (anion) gains an electron in the valency orbit; that is it increases the ability to absorb and utilize oxygen and reduces any excess of harmful serotonin.

These two small invisible electrified particles have an effect on our physical and mental well-being and we are constantly bombarded with negative and positive ions (eg. polluted air). The negative ions make us feel good, they destroy harmful bacteria. The positive ions make us feel bad (TV. screen produces positive ions).

If the positive ions occur naturally in sufficient numbers, for instance during the onset of the commonly known hot and dry desert winds, the winds cause depression, nausea, insomnia, irritability, lassitude, migraine, asthma attacks, and also affect the normal function of the thyroid glands. Biochemically speaking, the body becomes exhausted and this can lead to an increase in accidents, violent crime and suicides. These can be counteracted with the beneficial negative ions.

To read further http://watershed.net/neg_ion_cbs_news.htm

[Negative Ion Report: The CBS Nightly News, Feb 14, 1995](#)

You want NEGATIVE IONS

Power Supply Construction

We (OPTIMUM) have built both performance and safety into our newest generation of machines:

- The Power supply design uses state-of-the-art regulator technology (unlike Transformer Rectifier [TR] technology from the 1960s that many other manufacturers employ)
- The use of a regulator makes the unit safer; TR technology, on the other hand, can malfunction and cause ripples and spikes or static interference
- A **dual regulation** system, featuring:
 - a switching regulator with over-current and over-voltage protection
 - adjustable regulator with fold-back circuit when the Optimizer is out of the electrolyte (does not blow a fuse)
 - the first stage delivers a voltage of 24vdc, and the second stage an adjustable voltage of .5vdc to 22.5vdc
- Clean power (pure DC power without excessive ripple) produced by the switching regulator
- **Higher power (from 10 to 16 volts)**, which translates to creating more negative ions for cleansing and more ability to draw toxins from the body
- OPTIMUM machines operate as high as 3.0 AMPs for the standard model and **5.5 AMPs** for the professional model;

because the units operate at higher amps, they produce a more powerful footbath which translates to more negative ions.

- Full **digital current display** with large, easy to adjust knobs
- **Adjustable current control** for a variety of external variables (no other unit allows you to do this):
 - Differences in human skin resistance
 - Differences in the water used
 - Differences in the electrolyte/electrolysis
- **Safe construction** through three levels of safety protection: a fallback circuit that turns itself off if it detects too much current; an external fuse that shuts down the machine if the fuse blows; and an internal fuse that offers overall protection for the entire unit
- We have a **chassis ground** for all internal assemblies to stop any voltage potential ever being on the case. (no need for a GFI certification)
- An Optimizer water module that lasts for an average of 30 footbaths and then is completely disposable without the need to replace separate parts
- Components used in the OPTIMUM machine are **UL rated and CE approved**, and the wiring and connectors are also **CSA approved**
- Investment in quality construction materials that costs more to build the OPTIMUM machines, but assures a high quality, safe and durable product.
- OPTIMUM machine costs more to build due to the quality of the parts. Other units out in the market are produced for under \$100 dollars then are sold from \$495 up to \$1900.
- **OPTIMUM Engineer team** has over 40 years experience working with power supplies. These range from TR units to the cigarette pack sized power supplies producing 30,000vdc that are sitting on the moon and beyond.
- **Most units on the market are using a Transformer Rectifier (TR) concept.** This is technology from the 1960's. Since then there have been several evolutions in the power supply technology. The OPTIMUM unit does not use the Transformer Rectifier concept. By using qualified components and holding the output below 24vdc anywhere in the unit, the OPTIMUM machine is ahead of the footbath industry.

Electrical Safety Issues with other units	OPTIMUM Points
1. Transformer paper breakdown	1. We do not use transformers, the unit is not in the TR family
2. Malfunction can result in 110vac applied to patient	2. The only technology that can have this malfunction is the TR technology. The OPTIMUM unit has two internal stages of regulation; the first stage delivers a voltage of 24vdc, the second stage delivers an adjustable voltage of 0.5vdc to 22.5vdc. The unit has an external fuse that is visible which is a system level safety device, then an internal fuse on the inside which will shut down voltage delivered to the customer.
3. Ripple and	3. Ripple and spikes are the

	spikes.	product of TR technology (even with full wave rectification there is still 120 pps). The OPTIMUM unit does not use TR technology.
	4. Static Interference	4. Another product of TR technology (it operates at the same frequency as a fluorescent light, or a harmonic thereof). OPTIMUM technology does not use TR technology.
	5. Switchers operate at radio frequencies. Switchers and TR are totally different technologies	5. OPTIMUM uses switching regulation technologies, the components have UR registration

CURRENT vs. SALT	<ul style="list-style-type: none"> • Adjustable current control for a variety of external variables: <ul style="list-style-type: none"> ○ Differences in human skin resistance ○ Differences in the water used ○ Differences in the electrolyte/electrolysis • Most units on the market do not allow you to adjust the current. There are several factors that raise or lower the Amperage: current, salt, human body skin resistance, and water. If you raise the current or the salt the Amperage moves up. Other units do not allow you to adjust the current, ONLY SALT. The only way to raise the Amperage with these machines is to add more salt. This means there is a straight 24 volt current coming through since you are not able to adjust the current. If you were to add too much salt, then you either have to dilute the water or dump the water out then start over. With our machine, the salt, body and water stay constant and then you either raise or lower the current to get to the desired Amperage. Our bodies differ; there are differences in the resistance, capacitance, and inductance within each of us on a daily basis. With the capability of adjusting the unit we are able to constantly access and help each customer as an individual other than as some inert object(s) that is (are) totally identical and never change in spite of environmental changes in the air, water and food we consume on a daily basis. To thrust a straight 24 volt current, as these other machines do, on a body is too much. It can be draining to the body. 	You want to CONTROL AMPS via CURRENT not by SALT
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AMPS	OPTIMUM units are the most powerful machines on the market: Most of the units out in the market operate only as high as 1.4 to 2.5 AMPS. OPTIMUM standard models run as high as 3.00 AMPS & our new OPTIMUM ES8000 Professional runs as high as 5.5 AMPS.	Above 2.5 Amps
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HZ	<p>OPTIMUM units run at 10,000 Hertz and NOT 60 Hertz: - Most of the units out in the market operate at 60 hertz which is a resonant frequency of a healthy heart, thus they have some potential danger. OPTIMUM units run at 10,000 Hertz which when graphed is a smooth line vs. a spike lined graph of 60 Hertz.</p> <p>If you plot the 60 cycle and the 60 hertz signals you will see that they have common points sixty times in a minute. This is the point of resonance that could cause a reaction. The easiest way for the public to envision this is to think of sound. Ever use the quiet, sound cancelling devices? They are used on airplanes and sometimes promoted for use in your home. They work with something often called 'white noise' which means it has enough frequencies and harmonics to cancel the sound before it gets to your ear drums. Harmonics cancel sound. I do not know what the direct risk is of harmonics cancelling a heartbeat, and do</p>	10,000 HZ..
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	not plan to find out with any of our users.
IONS VOLTAGE	OPTIMUM units' generate IONS at a higher VOLTAGE - Other machines produce ions around 300-400 milliV (or 0.400 volts), very low voltage. OPTIMUM runs 35 times higher than this. Depending on the amps being ran during a session, as an example 1.6 amps (only 1/2 the full power of our machine), the OPTIMUM machine would be around 14 to 15 volts, again 35 times higher. The OPTIMUM standard machine runs as high as 3.00 Amps & the OPTIMUM ES8000 runs as high as 5.5 Amps there by the ion voltage would be even higher. A client would barely feel anything at a .400 v (the other machines). Their electrodes (water module) would last much longer because they are doing less work. When trying to cure anything that has had an adverse effect on the body, do we want to cleanse it at the same rate as the toxin build up? A 50 year old person would have to take footbaths for 50 years to neutralize the accumulated toxins. At the age of 100, who cares?
# of IONS produced in bath	We have had independent labs test our bath water against other footbaths machines and we far out produce the number of ions in the water. This is due to several reasons: we run more current through our water module, higher power, and a faster cubic per meter rate (meaning that our machine processes the water at a faster rate). *test results coming soon
Cost of construction	Most vendors produce their unit at a cost under \$100 dollars then sell them for \$495 up to \$1900. Ours costs significantly more for better quality without pricing our machine accordingly. We price our units moderately. Other units on the market range from \$200-\$3600
Water module (electrode)	<p>OPTIMUM Water Module:</p> <p>Construction and Function (many advanced features):</p> <ul style="list-style-type: none"> • Our connections are metallurgical other than mechanical, we will not have any disconnects as a result of bending, pulling or and differences in the coefficient of expansion from different temperatures, • Advanced surface design and round metal rings to enhance the ionic osmosis process; the Optimizer generates ions about 35 times higher than the average footbath • Welded connections for stronger conductivity • Use of 100% copper construction and stainless steel for the rings • Clean power supply and discharge, producing more negative ions • Disposable after using the Optimizer for an average of 30 baths, so there is no need for cumbersome manual replacement of individual components (plates, rings, or clips) • The unique construction of the Optimizer includes electrodes (metal rings) made of copper and stainless steel. The center ring is an electronic shield made of copper, a material of proven durability used in the electronic and space/missile programs. The Optimizer is constructed so that it has the longest possible circuit for the corona action (electricity jumping from one electrode to another) that produces the ions. There are two sets of rings, with each set having one cathode and two anodes, for a total of six rings. The two sets provide a long electronic field for the corona activity to take place. The rings (cathodes and anodes) are spaced and staggered to promote a fast, strong,

and consistent discharge process for maximum corona effect.

- Our water module is disposable after ~25-30 baths.. Other companies claim 50-100 baths. This is because they are running less current through the water module to get more baths. We OPTIMUM on **quality & not quantity**. If we run less current through our water module then we could easily get a 100 & something baths.

In a nutshell, here is the way the Optimizer functions from a technical standpoint: Through the process of electrolysis (separating elements by passing an electronic current through them) chemical reactions occur at the electrodes (cathodes/anodes). The corona discharge path travels from the cathodes to the anodes; this release of metal from the cathode (positive) plate to the anode (negative) plate is called "plating." Each electrode attracts ions that are of the opposite charge. Positively-charged ions (called cations) move towards the cathode, and negatively-charged ions (anions) move toward the anode.

- The cathodes, which erode, are designed for optimum thickness before they are depleted, thus enhancing the life of the Optimizer. Overall, the Optimizer is designed to deliver a maximum amount of power at minimum cost due to the design and materials used in construction

Comparison of replacement rings module vs. our disposable module

- The machines that use disposable rings for their water module get an average of 14 baths between replacements. We doubled the ring thickness to get an extended life. This makes 2 times 14 which equals 28. Then we recognized that people vary so we hung a plus/minus 4 on that to make the range from 24 to 32 baths per unit. At \$85 each for the OPTIMUM water module, the per footbath cost range from \$2.65 to \$3.54.
- The replacement ring modules actually come out to be more expensive than our disposable module. The cost of the replacement ring water module comes to \$3.74 per foot bath compared to our \$3.54. This was calculated by determining the total cost of the replacement ring water element, rings, cables, etc that would have to be replaced in a one year time frame, then dividing it by about 90 footbaths in a year.

Protection Mechanism

- **Safe construction** through three levels of safety protection:
 - a fallback circuit that turns itself off if it detects too much current;
 - an external fuse that shuts down the machine if the fuse blows;
 - and an internal fuse that offers overall protection for the entire unit
- We have a **chassis ground** for all internal assemblies to stop any voltage potential ever being on the case. (no need for a GFI certification). Others have such things as GFI connectors and they are not even hooked up inside the unit.
- Others do not have protection so that if their water element comes out of the water it blows a fuse or the machine turns off.

COPPER Tub vs. PLASTIC Tub

- Our OPTIMUM Copper Tub is used for optimum footbath treatment. The copper acts as an additional conductor thereby making the treatment all that more powerful. One will get more life out of the OPTIMUM water module due to the conductivity of the copper there

COPPER TUB IS BETTER THAN

	<p>by less current is ran from the unit to achieve the same AMPs.</p> <ul style="list-style-type: none"> • Copper also resonates a certain healing frequency. People wear copper on their body for healing. • The tub is handmade and 100% copper with no beryllium. Beryllium is a carcinogen and it is what creates the green patina, so in essence you don't have to polish the tubs. • A Plastic tub is not a conductive material so as the energy comes out of the water module the energy dissipates as it moves away from the water module. With the copper tub it is amplified because copper is a conductor. 	PLASTIC
<p>HIMALAYAN SALT vs. OTHER SALT</p>	<ul style="list-style-type: none"> • We have chosen to use the Himalayan Crystal Salt because of its balanced crystalline structure, which can be easily metabolized by the body. Regular Table Salt is processed & has lost its natural crystalline structure. • EPSON Salt: There is less heavy metal in the brine when using epson salts vs the Himalayan salts. 	Himalayan Salt or a natural salt w trace minerals
<p>WRISTBAND vs. NO WRISTBAND</p>	<p>A wristband is simply used to ground the body since the unit is so cheaply made the unit itself is not grounded. This is a marketing gimmick when the say it is 'to complete the circuitry' or 'stimulate the upper body'.</p> <p>The wrist bands are designed to prevent the destruction of CMOS devices. (CMOS is the deposition of doping and etching of a Metal Oxide on Saphire device, in short an Integrated Circuit). Most units on the market use TR (Transformer Rectifier) concepts in producing their output, this concept does not utilize CMOS substrate devices. We often build static as we walk and move, this is more pronounced if we are wearing anything nylon. The wrist band is conductive and conducts the static electricity from the body to ground. This prevents the charge from going through the CMOS device. If a charge goes through a CMOS integrated circuit, it can destroy it instantly, most often it damages it which causes a diminishing deterioration until the ultimate failure. During the "slow death" of the device performance becomes unreliable, unrepeatable then ultimately the device fails.</p> <p>The conductive wristbands may or may not require any liquid or gel to add to the conductivity of the band to ground. This depends on the quality of the grounding strap and the wristband.</p> <p>Most circuit designers "know their stuff" and design the circuits such that the input and output pins of the integrated circuits are connected into circuitry such that they are buffered from outside forces. Our units have the proper buffering so that stray voltages cannot and do not reach the components that can be affected by static. In addition the care of our unit is electrically connected to earth ground, this will direct any stray charge that even gets to the case to ground and protect the components as well.</p> <p>The ground strap is a marketing gimmick. Think about it, your computers and cell phones have large scale integration in their operating systems and you do not wear a ground strap when working with either of them. Why would you need grounding for something as simplistic as the power supplies in a footbath? The control circuitry may have some active devices that can be damages as we do, but with proper configuration this can be protected</p> <p>The wristband has nothing to do with the footbath process. The key to</p>	NOT GOOD, our units are grounded

the ionic detox footbath is the ions from the salt & water that are interacting with your body, not the current or so called 'circuitry' that these companies claim. **WE DO NOT USE WRISTBANDS since our unit has a chassis ground for all internal assemblies to stop any voltage potential ever being on the case**

COLOR CHARTING

It has been stated by various companies that the water colors relate to different organ cellular waste and other body parts. We do not support this analysis of water. There is no scientific data supporting this analysis & some colors can appear without a body. Not all impurities can be seen with the naked eye just as you cannot see the impurities in water. In order to prove that this process does pull out impurities, we have performed control tests (for test results refer to Section 2.2) showing that heavy metals exist in the water after the 35 minute bath & also encapsulated on the water modules' rings. When water samples are tested by labs we need to specify what to test for & since the range of impurities a body may contain are too many to specify, we decided to OPTIMUM on heavy metals. At minimum this proved that particles are moving out of the body.

More important than the color change is an oily substance on the surface thereby indicating energy being produced (called EMASS by researchers) and the change in color of the urine caused by the release of toxins & stimulation & elimination of the lymphatic system.

With different water conditions your OPTIMUM unit will not necessarily cause color changes in the water; however, the very process of electrolysis of the water causes color changes in the water.. this is called oxidation (which is mainly the orange color, not joints as what is stated in the color charts). The interaction of the OPTIMUM water module with the City added chemicals can cause quite a discoloration in the water. It must neutralize those chemicals and energize the water. Some sediment is seen depending upon the amounts of solids that are inherent in water to begin with. The final result has to do with the health of the person being treated. This will then determine the water color change.