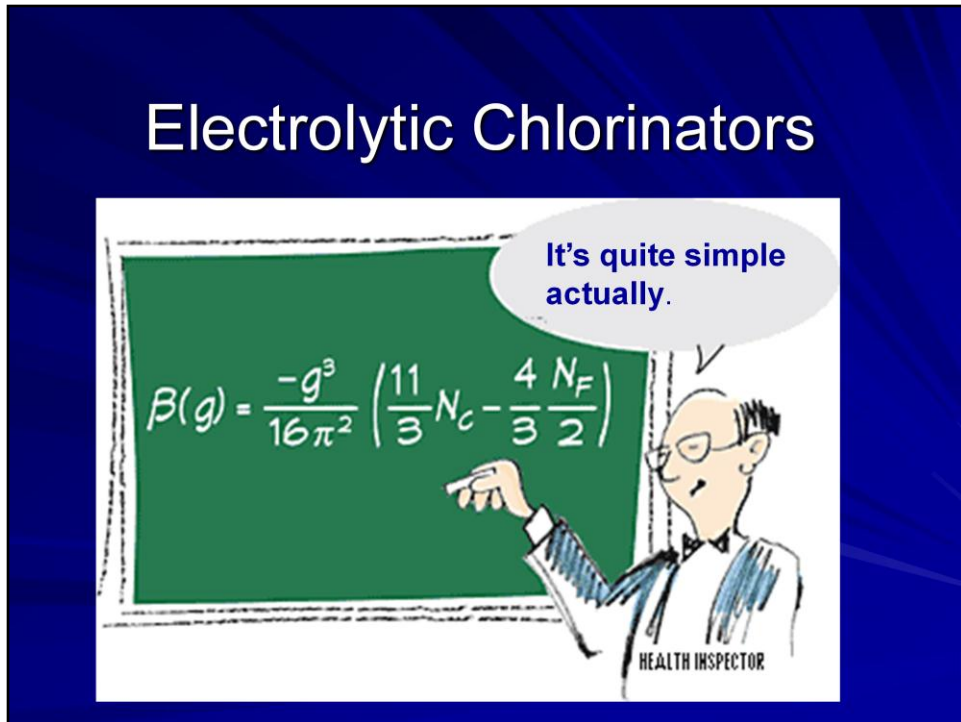


Electrolytic Chlorinators



In this section we will discuss electrolytic chlorinators, what are also known as onsite chlorine generators.

Electrolytic Chlorinators

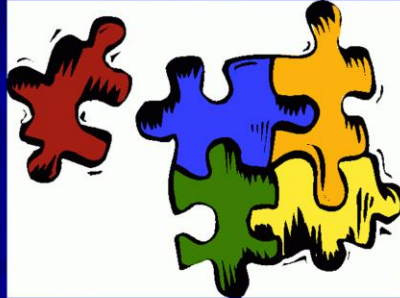
- The electrolytic chlorination process is achieved by passing a salt water solution through an electrolytic cell which converts salt in the water into chlorine gas which, when dissolved in water becomes sodium hypochlorite (liquid chlorine).
- So you produce your own chlorine to sanitize the pool.

. The electrolytic chlorination process is achieved by passing a salt water solution through an electrolytic cell which converts salt in the water to chlorine gas which, when dissolved in water, becomes sodium hypochlorite, or liquid chlorine. In this way you're producing your own chlorine to sanitize the pool.

Electrolytic Chlorinators

■ Electrolytic Chlorinators have 3 main components:

- Salt
- Salt Cell
- Control Box



. There are three main components to electrolytic chlorinators. Salt is needed, and there should be at least 3,000ppm of salt or around 250 pounds for every 10,000 gallons of water. The salt cell, the second component, is what actually makes the chlorine. Salt is passed through the cell, which contains layers of plates that are electrically charged. The plates in the cell convert salt to free chlorine by a chemical process called electrolysis. The third component, the control box, keeps everything running.

Salt

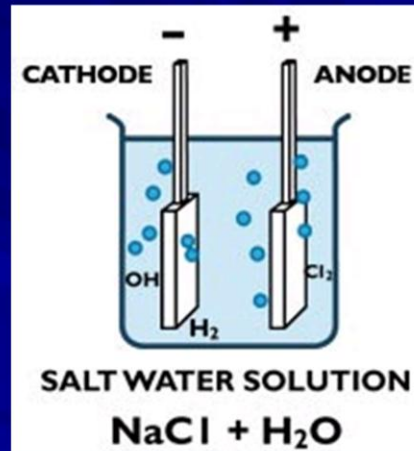
- A minimum level of 3000 ppm of salt in the pool water is required
- $\approx 1/5$ level sea water
- If salt levels drop too low, Chlorine production stops.



As I said before, a minimum of 3,000ppm of salt is required to maintain the system properly with adequate chlorine. This amount is equal to 1/5 the level of salt in sea water. Remember, if your salt levels drop too low, the production of chlorine will stop.

Salt Cell

- The salt cell is a series of plates with opposite charges. As the water passes between the plates, electrolysis takes place & releases the chlorine in the salt.



This is an example of the salt cell. The plates are oppositely charged, and as water passed between the plates, electrolysis takes place and releases the chlorine in the salt.

Control Box



- The control unit sends power to the salt cell.
- The unit controls how much Chlorine is produced by regulating how long the power is applied to the cell.

. The control box is the unit that sends power to the salt cell. The unit can control how much chlorine is produced by regulating how long the power is applied to the cell. The control box will also reverse the charges of the plates to prevent scale buildup on them.

Saltwater System Maintenance

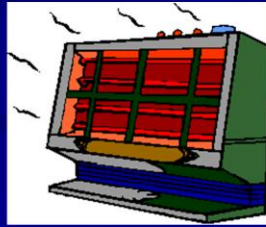
- Salt water pools should have 60-80 ppm stabilizer (cyanuric acid).
- In water, hydrogen / oxygen mixtures do not ignite. However care must be taken in ensuring that hydrogen levels do not build up in air or piping to flammable levels.



Salt water pools should have around 60-80ppm of cyanuric acid to maintain proper levels. In water, hydrogen/oxygen mixtures don't ignite. However, care must be taken in ensuring that hydrogen levels do not build up to flammable levels in the surrounding air or in the piping.

Saltwater System Maintenance

- When using salt chlorinators with gas or electric heaters, care should be taken to ensure the production of chlorine is properly adjusted.
- Internal components can be damaged by excessive salt and/or chlorine levels.



When using salt chlorinators with gas or electric heaters, care should be taken to ensure the production of chlorine is properly adjusted. Internal heater components can be damaged by excessive levels of chlorine and/or salt.

Saltwater System Maintenance

- If the salt level drops too low, the system will not be able to produce chlorine at all.
- The answer to low salt levels is to add rock salt into the water.



Remember, if the level of salt drops too low, the system will not be able to produce chlorine at all. Rock salt can be added to systems with low salt levels to quickly bring them back up to adequate conditions.

Saltwater System Maintenance

- If the chlorine reading gets too low then it is important to superchlorinate the pool in order to quickly raise up the chlorine level to avoid unsanitary water.
- Simply adding more salt to the system WILL NOT be enough to solve the problem if you have a low chlorine level. That will enable the salt system to begin making chlorine, but will not immediately raise the chlorine level

. If the chlorine reading becomes too low then you should superchlorinate the pool in order to quickly raise the chlorine level and avoid unsanitary water. Simply adding more salt to the system will not be enough to solve the issue if you already have low chlorine levels. Only adding salt will enable the system to start making chlorine again, but will not immediately raise the chlorine level.

What they don't tell you.....

- The hidden cost of running the electrodes at several hundred watts continuously whenever the pool pump is on.
- The cost of replacing the electrodes periodically.
- Salt Chlorinators are almost never sold with an ORP control system. (high bather load / no bather load)
- The salt in the water can cause corrosion of metal pool fittings, and can weaken the mortar joints of coping pavers around the rim of the pool.
- If the pool has a tiled finish around the top edge, the salt tends to form heavy scale build-up that looks awful and is difficult to remove.

Some things you may not know about salt chlorinators and what companies will fail to tell you is the hidden cost of running the electrodes at several hundred watts continuously whenever the pool pump is on, or the cost of replacing the electrodes periodically, which should be done. Also, salt chlorinators are almost never sold with an ORP, which helps keep a handle on your levels. The salt in the water can cause corrosion of metal pool fittings, and can weaken the mortar joints of coping pavers around the rim of the pool. Also, if the pool has a tiled finish around the top edge, the salt tends to form heavy scale buildup that looks awful and is difficult to remove.

No more sodium hypo....Right?

- During periods of high bather load it may be necessary to manually supplement with sodium hypochlorite to maintain correct chlorine levels.



. You may think you don't have to use sodium hypochlorite with salt chlorinators, but during periods of high bather load it may be necessary to manually supplement with sodium hypo to maintain correct chlorine levels.

The **ABC's** of ORP's

The Basics of ORP Controllers



Now we will discuss ORPs and the basics of ORP controllers.

ORP Intro

- ORP stands for Oxidation-Reduction Potential (Redox).
- ORP is a measurement of ability to oxidize contaminants.
- ORP is a method to electronically monitor sanitizer effectiveness.



ORP stands for oxidation reduction potential, also known as redox. It is a measurement of the ability to oxidize contaminants. The ORP controller is a method used to electronically monitor the sanitizer effectiveness.

What makes up an ORP?

■ Probes



■ Controller



An ORP is made up of probes and a controller. The probes indicate the oxidizing/reducing capability of pool water by measuring the electron activity. The ORP probe reading signals the controller to adjust the chemical feeds as needed.

What Exactly is ORP?

- As we stated earlier, ORP stands for Oxidation-Reduction Potential, or also known as Redox Potential.
- "Oxidation" means, "to combine with oxygen."
- Chemicals like chlorine, bromine, and ozone are all oxidizers. It is their ability to "steal" electrons from other substances that makes them good water sanitizers, because in altering the chemical makeup of unwanted plants and bacteria, they kill them.

As we stated earlier, ORP stands for oxidation reduction potential, or redox potential. Oxidation means "to combine with oxygen." Chemicals like chlorine, bromine and ozone are all oxidizers. It is their ability to steal electrons from other substances that makes them good water sanitizers, because in altering the chemical makeup of unwanted plants and bacteria they kill them.

What Exactly is ORP?

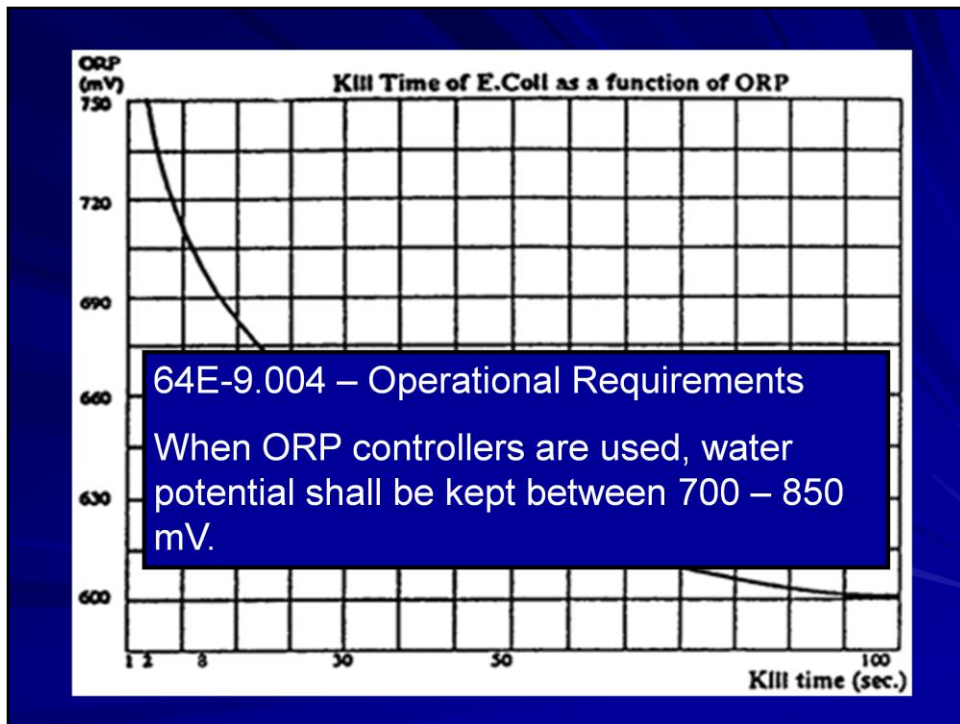
- In the process of oxidizing, oxidizers are themselves reduced - so they lose their ability to further oxidize things.
- To make sure that the chemical / sanitizing process continues to the very end, you must have a high enough concentration of oxidizer in the water to do the whole job.
- But how much is "enough?" That's where the term potential comes into play.

In the process of oxidizing, oxidizers are themselves reduced, so they lose their ability to further oxidize things. To make sure that the chemical/sanitizing process continues to the very end, you must have a high enough concentration of oxidizer in the water to do the whole job. But how do you know how much is enough? That's where the term "potential" comes into play.

Redox Potential

- "Potential" is a word that refers to ability rather than action.
- Potential energy is energy that is stored and ready to be put to work, in electrical terms, potential energy is measured in volts.
- These voltages give an indication of the ability of the oxidizers (Chlorine/Bromine) to keep the water free from contaminants.

"Potential" is a word that refers to an ability rather than an action. Potential energy is energy that is stored and ready to work. In electrical terms, potential energy is measured in volts. These voltages give an indication of the ability of the oxidizers, like chlorine and bromine, to keep the water free from contaminants.



In the background is a chart that shows how many seconds it takes to kill E.coli according to how high the ORP controller is set. The higher the millivolts are the quicker the kill time will be. Under the state code for public pools, ORP controllers shall be kept between 700 and 850 millivolts.

Proper way to measure ORP Potential

- An ORP probe is really a millivolt meter, measuring the voltage across a circuit formed by a reference electrode constructed of silver wire, and a measuring electrode constructed of a platinum band.



An ORP probe is a millivolt meter, measuring the voltage across a circuit formed by a reference electrode constructed of silver wire, and a measuring electrode constructed of a platinum band.

Proper way to measure ORP Potential

- The reference electrode (made of silver) is surrounded by a salt solution that produces a constant voltage, so it forms a reference against which the voltage generated by the platinum measuring electrode & the oxidizers in the water may be compared.
- The difference in voltage between the two electrodes is what is actually measured by the meter.

The silver reference electrode is surrounded by a salt solution that produces a constant voltage, so it forms a reference against which the voltage generated by the platinum measuring electrode and the oxidizers in the water may be compared. The difference in voltage between the two electrodes is what is actually measured by the meter.

How pH affects ORP

- The killing form of chlorine is hypochlorous acid which is a powerful oxidizer. The % of HOCl present in pool water depends directly on the pH.
- At pH of 6.0, 96.5% of the FAC in the water is in HOCl form. At pH of 8.5, only 10% is in this active killing form.
- Although ORP does not tell you the chlorine concentration in ppm, it does indicate the effectiveness of the chlorine as an oxidizer. As the pH goes up, the millivolt reading will go down, indicating that the sanitizer is not as effective. Bringing the pH down or adding more sanitizer will raise the millivolt reading.

. The killing form of chlorine is hypochlorous acid which is a powerful oxidizer. The percentage of hypochlorous acid present in the pool water depends directly on the pH. At a pH of 6.0, 96.5% of the free active chlorine in the water is in hypochlorous acid form. At a pH of 8.5, only 10% is in the active killing form. Although the ORP does not tell you the chlorine concentration in parts per million, it does indicate the effectiveness of the chlorine as an oxidizer. As the pH goes up, the millivolt reading will go down, indicating that the sanitizer is not as effective. Bringing the pH down or adding more sanitizer will raise the millivolt reading.

Setting the Standard

- In 1972, the World Health Organization adopted an ORP standard for drinking water disinfection of 650 millivolts. WHO stated, when the oxidation-reduction potential in a body of water measures 650 millivolts, the sanitizer in the water is active enough to destroy harmful organisms almost instantaneously.

In 1972, the World Health Organization adopted an ORP standard for drinking water disinfection of 650 millivolts. WHO stated, when the oxidation reduction potential in a body of water measures 650 millivolts, the sanitizer in the water is active enough to destroy harmful organisms almost instantaneously. Remember, the pool standard is 700 to 850 millivolts.

Chemical Automation

- Use of ORP's does not eliminate or supersede the need for testing the sanitizer level with standard kits.
- ORP controllers dispense chemicals as needed. This type of automation can result in significant savings on chemicals.
- ORP's eliminate the peaks and valleys in sanitizer residual and pH that often occur due to fluctuations in bathing load.

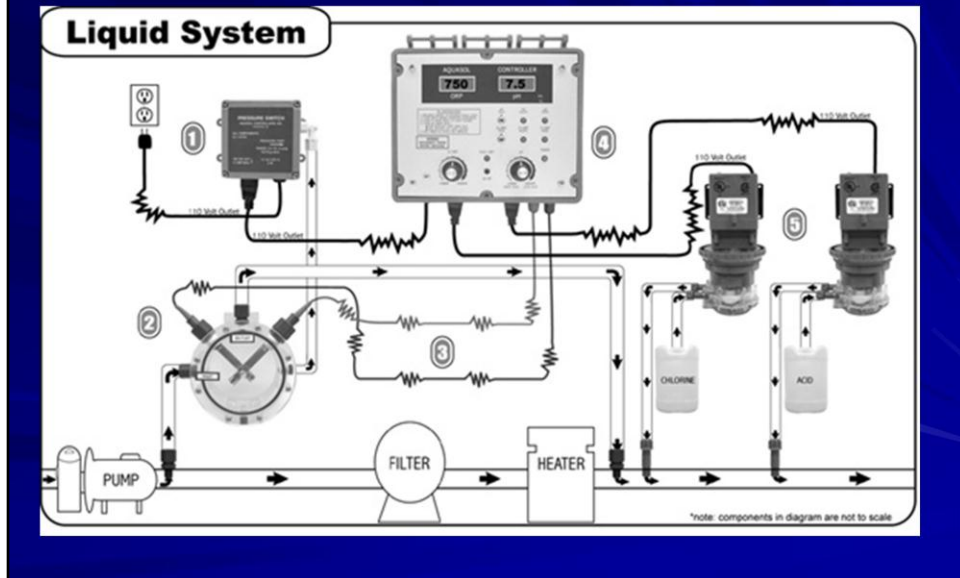
The use of an ORP controller does not eliminate or supersede the need for regular testing of the sanitizer level with a standard test kit. ORP controllers dispense chemicals as needed. This type of automation can result in significant savings on chemicals. ORPs eliminate the peaks and valleys in sanitizer residual and pH that can often occur due to fluctuations in bathing load.

ORP Set-up

- Control equipment is generally installed with the ORP and pH probes placed in the pressure line.
- Probes are always installed prior to the point of chemical injection. This way, water passing over the sensors is representative of water in the pool.

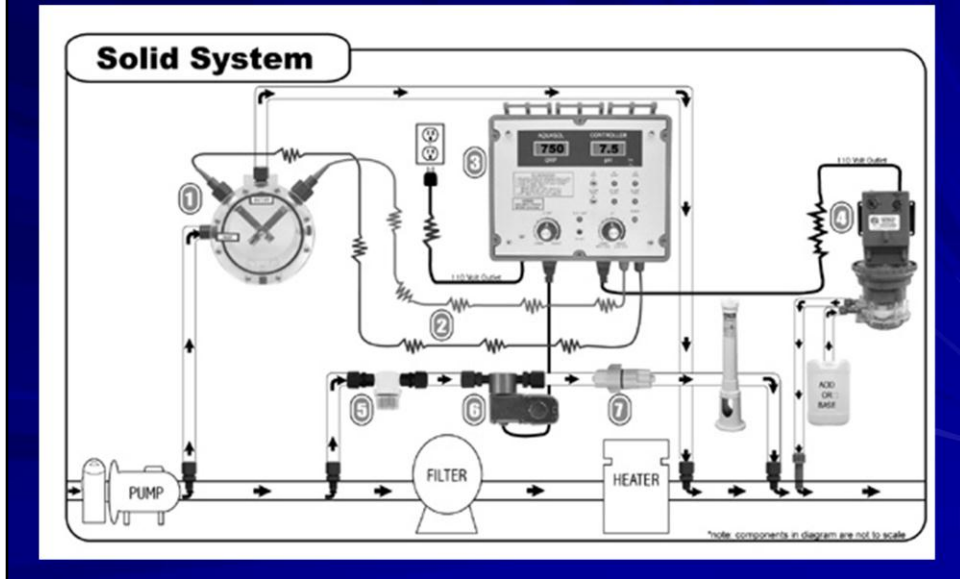
The control equipment is generally installed with the ORP and pH probes placed in the pressure line. The probes are always installed prior to the point of chemical injection. This way the water passing over the sensors is similar to the water in the pool.

ORP System Setup



This is a diagram of an ORP system set up with liquid chemicals. Water goes into the cylinder with the probes to be read and sent to the controller, which will adjust the liquid chemicals as necessary.

ORP System Setup



. This diagram shows an ORP system set up on a solid system, or an erosion system.

Note on Algaecides

- Ions in the algaecide can electrically plate onto probes, reducing its readings.
- The following algaecides should not be used in pools with an ORP controller:
 - ◆ Quats / Polyquats
 - ◆ Copper Salts
 - ◆ Colloidal Silver

A note on algaecides, the ions in algaecides can electrically plate onto the probes, reducing their readings and effectiveness. You should not use these algaecides on any pools with ORP controllers: quats and polyquats, copper salts and colloidal silver.

ORP Fouling

- As bather load increases, more pollutants such as sweat, lotions, & other body oils infiltrate the water.
- These contaminants collect in the water & reduce the probe's accuracy (probe fouling).

As the bather load increases, more pollutants like sweat, lotions and other body oils can infiltrate the water. These contaminants will collect in the water and reduce the probe's accuracy, known as probe fouling.

ORP Fouling

- When ORP's are fouled, the effect is a delay in the probe's ability to detect changes in sanitizer level & causing lower ORP values.

- Probes require maintenance



When ORPs are fouled, they can delay the probe's ability to detect changes in the sanitizer level and can cause lower ORP values. Your ORPs require regular maintenance.

ORP Probe Cleaning

- Wet with tap water, clean the probe surfaces lightly with a soft or medium-soft brush (small, soft toothbrush), then rinse. Sometimes a bit of dish detergent in water will assist in the brushing and removal. Typically this will restore probe to "good" use.
- At least once or twice per month, soak probe in a 25% to 50% solution of chlorine bleach water for at least 15 minutes. Agitate or swirl probe at times to help circulate cleaning solution and remove contaminants. Rinse with tap water. Replace probes carefully to avoid damage.

To clean the probe, wet it with tap water, clean the probe surfaces lightly with a soft or medium-soft brush, like a small soft toothbrush, then rinse it. Sometimes using a very small amount of dish detergent in the water will help with brushing and removal. This will typically restore the probes to good use. Once or twice a month you should soak the probe in a 25 to 50% solution of chlorine bleach water for at least 15 minutes. Swirl the probe around a few times to help circulate the cleaning solution and remove contaminants, and then rinse with tap water. Replace the probes carefully to avoid damaging them.



Questions?



**Please call our office at
(941) 861-6675.**

If you have any questions about anything that was discussed, please give us a call.