Envirolyte anolyte – A Great Disinfectant!

There are distinct differences between a *Sodium Hypochlorite* solution, a *Calcium Hypochlorite* solution and an onsite generated *Hypochlorous Acid* solution or in other words Envirolyte anolyte.

Sodium Hypochlorite Solution (NAOCL)

Sodium Hypochlorite solution often called bleach usually containing LYE is manufactured at a factory, stored, shipped to distribution centers, stored again and then sold.

Calcium Hypochlorite Solution (CAOCL)

Dry *Calcium Hypochlorite* tablets produce a "FRESH" *Hypochlorite* solution when mixed with water. In tests done, a solution produced with the proper *Calcium Hypochlorite* tablet, can maintain "Free Available Chlorine" or *Hypochlorous Acid* the active disinfectant in this *Calcium Hypochlorite* solution, for ONLY about 4 hrs, then it starts rapidly degrading.

Envirolyte ELA-2000 generator of HCLO - anolyte

Hypochlorous Acid Solution (HOCL)

Until now, HOCl has simply been thought of as a transient byproduct in the ubiquitous chlorine chemical family. However, HOCl generated by Envirolyte technology carries with it fewer negative hydroxides than the previous HOCl formed via disassociation from sodium hypochlorite. Because of this, Envirolyte generated HOCl behaves uniquely and must be considered separately from chlorine. HOCl as a stand-alone chemical, separate from chlorine, has not been available in the market until now. This breakthrough results in a need for a paradigm shift in biocidal approaches. HOCl is an "old", well appreciated chemical but is now "new" availabie as onsite generated solution.

1. Free available Chlorine content

For a chlorine solution to be a good disinfectant it must meet the Chlorine Demand. The chlorine demand is the amount of Free Available Chlorine (FAC) often called *Hypochlorous Acid* (HOCl), needed to disinfect or oxidize organic matter before a FAC residual is reached. If the chlorine demand is not met then complete disinfection has not been obtained. One of the best signs that the Chlorine Demand has not been met is the strong chlorine odor.

If a chlorine solution does not contain enough HOCl to satisfy the chlorine demand of the surface or product to be disinfected, chloramines will form as chlorine and nitrogen-based materials combine. Examples of nitrogen-based materials are proteins and blood. Chloramines are responsible for the obnoxious odor sometimes associated with chlorine disinfection. The obnoxious, pungent, eye-stinging smell of chloramines, mistakenly identified as free chlorine, indicates that the chlorine/water mix is not effective. There is not enough HOCl to satisfy the chlorine demand.

2. Chlorine Efficacy determined by pH

Chlorine in water splits into two forms, *Hypochlorous Acid* (HOCl) and *Hypochlorite Ion* (OCl-). At the high pH the chlorine provided by bleach contains a maxiimum of Hypochlorite Ion. The chlorine produced by onsite generators by Envirolyte System contains a maximum concentration of *Hypochlorous Acid* (HOCl).How much of each is present in a chlorine solution is totally dependent upon the pH of the solution. As pH rises, less *Hypochlorous Acid* and more *Hypochlorite Ion* is in the solution. As the pH rises, less germ killing power is available. According to a University of Illinois study, HOCl is 120 times more effective as a sanitizer than the -OCl ion. The ideal pH of a disinfecting Envirolyte anolyte solution is a pH of 6-7.

Most FRESH *Calcium Hypochlorite* solutions have a pH of between 7 and 8. ALL (fresh or old) *Sodium Hypochlorite* solutions, ("bleach") have a pH of 10.25+ producing NO HOCl at all! These solutions produce only the OCl- ion, a very poor disinfectant which is from 80 to 120 times less effective as a disinfectant than HOCl, providing that there is any chlorine left in the stock solution.

3. Contact time

The amount of time that chlorine is present during treatment is called the contact time. Contact times are calculated to determine the amount of time that a disinfectant must be present in the system to achieve a specific kill of microorganisms, for a given disinfectant concentration. A long contact time means that disinfection alone will not be sufficient treatment and additional methods will be necessary to eliminate the microorganisms. The contact time is directly related to the chemicals' efficiency of eliminating bacteria and viruses from the water. HOCl requires by far the shortest contact time to achieve a 99% kill of *E. coli* (Reynolds, 1996).

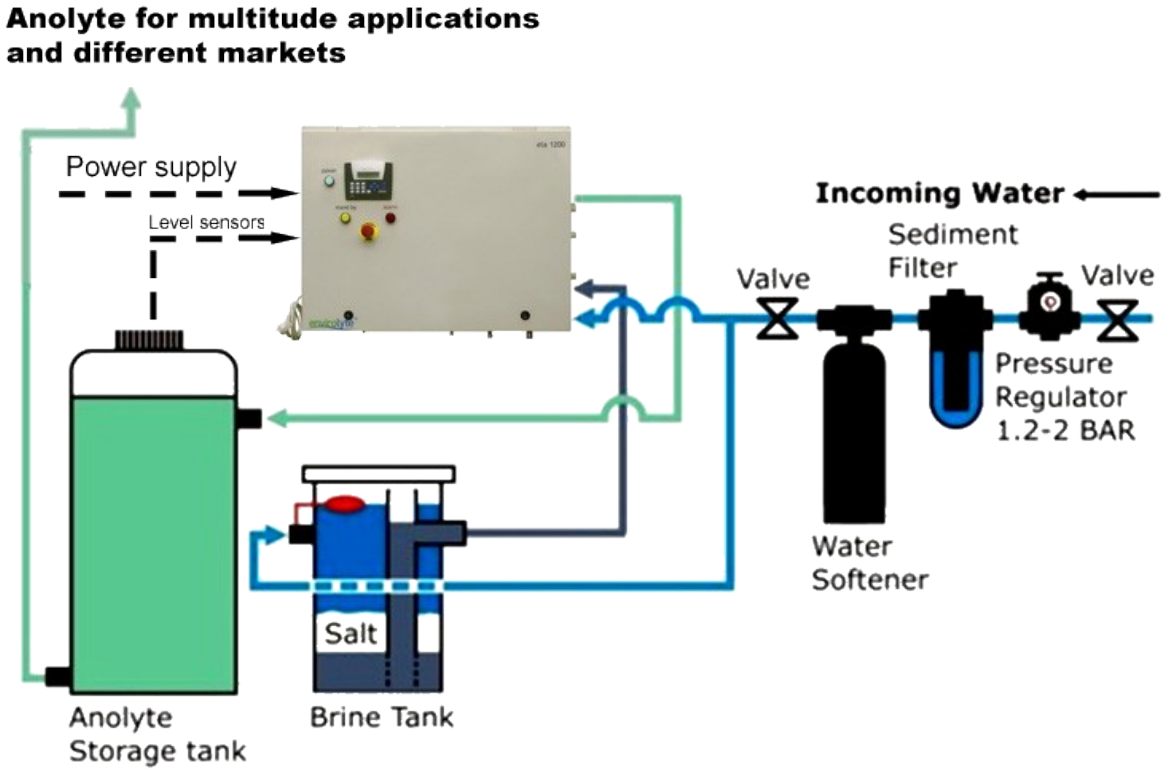
4. Shelf-life and added lye

Finally, just as champagne or carbonated water "go flat" on sitting as the bubbly carbon dioxide gas escapes into the air, chlorine escapes from a *Hypochlorite* solution

thus weakening its germ killing value. In order to slow this escape, bleach manufacturers add *Sodium Hydroxide* (lye) to their product causing the pH to rise dramatically. Lye burns animal and plant tissues; it saponifies (converts) fats in poultry and meat products. *Hypochlorous Acid* dispensed from Envirolyte Systems contains NO LYE!

According to all the technical literature, depending on storage conditions; ALL *Hypochlorite* solutions will lose half of their potency in less than thirty days. Light, temperature and age are the biggest factors. The biggest misconception is that liquid household bleach (*Sodium Hypochlorite*) does not loose potency until you make a *Sodium Hypochlorite* solution; "liquid household bleach" is already a *Sodium Hypochlorite* solution, that starts degrading soon after manufacture, so a "bleach" bottle bought at a retail store or chemical supply house is, NOT a FRESH *Hypochlorite* solution. It is a *Hypochlorite* solution with an unknown chlorine content, so when we make a solution all we are doing is diluting an already weak *Hypochlorite* solution even more. All literature recommends that if you are using "chlorine bleach", daily tests should be conducted by a laboratory to assure its potency.

Typical layout of Envirolyte system



Why Use onsite produced *Hypochlorous Acid* **solutions instead of** *Calcium* **or** *Sodium Hypochlorite* **solutions?**

1. Onsite electrolyses of a brine solution in Envirolyte Systems produces a maximum of *Hypochlorous Acid* whereas pH can be accurately set and controlled anywhere between 3-7.

2. At an pH of ~5 the *Hypochlorous Acid* solution consist almost solely of Free

Available Chlorine and maximum disinfection is achieved.

3. *Hypochlorous Acid* requires the shortest contact time to eradicate a microorganism.

4. As *Hypochlorous Acid* is produced onsite, there is no need of mixing and dilution of *Hypochlorite* solutions with unknown chlorine content. Shelf life is no issue, as *Hypochlorous Acid* solutions are produced on demand. Therefore no addition of Lye is required, as shelf life became more or less irrelevant. In such cases where shelf life is under consideration consideration, Envirolyte anolyte remains biocide for up to 24 months ans sporicide for up to 6 months.

REFERENCES:

George Clifford White, Handbook of Chlorination and Alternative Disinfectants. Third Edition, Van Nostrand Reinhold, New York, 1999.

George R. Dychdala. Chlorine and Chlorine Compounds. In: Block SS, ed. Disinfection, Sterilization, and Preservation, 5th ed. Philadelphia Lippincott Williams & Wilkins, 2001.

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