



Established in 2007, privately-owned Aquaox™ manufactures, distributes, installs and services systems that produce **Electrolyzed Water** (EW) that is used for cleaning, sanitizing and disinfecting. The **natural, organic** and **non-toxic** (selected) pH values clean and degrease surfaces and destroy pathogens, viruses, algae and fungi.

As such, **Aquaox Infection Control Systems** competes directly with traditional chemical cleaners and sanitizers, such as sodium hypochlorite (bleach), chlorine dioxide, alcohol, peroxyacetic acid (PAA), hydrogen peroxide or chemical agents that consist of, among other chemicals, quaternary ammonium compounds or phenolics.

EW replaces **over 90%** of all chemical cleaners and sanitizers. **Electrolyzed Water** is especially effective because it can achieve a degree of disinfection that can not be achieved with potentially hazardous or environmentally unsound (traditional commercial) chemicals.

Advantages EW has over common chemical agents include its **biodegradability, non-toxicity** and **absence of residues**. EW **kills all pathogens** known to humans within five to thirty seconds and is **effective on all viruses and microbes**.

For example, EW is proven effective against *Methicillin-Resistant Staphylococcus Aureus* (**MRSA**), *Vancomycin-resistant Enterococcus* (**VRE**), *Multi-drug-resistant gram-negative bacilli* and *Clostridium difficile* (C-Diff) infections that are spreading in Healthcare facilities.

"Mini-factory" production of **on-site** and **on-demand** EW significantly reduces operating costs and avoids transportation, storage, handling and disposition for a wide array of environmentally unsound and hazardous chemicals.

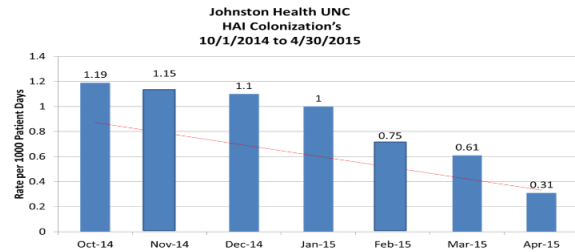
Environmental Service Staff can eliminate most chemicals plus bleach, surfactants and even antibiotics by substituting Aquaox EPA-registered EW solutions. Full-range EW systems are already installed in healthcare facilities.

Aquaox provides the services, technology and experience that enables facilities and their inhabitants (patients, clients, customers, students, members, residents) to appreciate and enjoy a safe and healthy environment, while efficiently achieving sustainable goals.

Validation

After 1.5 years of testing ending in 2014, Aquaox validated its **Infection Control System** (ICS) when UNC Johnston Health, a North Carolina healthcare group, fully integrated the Aquaox **Infection Control System** in their group ... replacing 95% of all chemicals with EPA-registered hypochlorous acid solutions ... to achieve improvement in cleanliness, patient ratings and productivity (of Environmental Service Staff).

In 6 months, the Aquaox ICS program **reduced by 74%** HAI Colonization Rates from 1.19 to .31:



Proficiently effective at cleaning and degreasing surfaces and destroying pathogens, viruses, algae and fungi unlike any other cleaning, sanitizing or disinfecting agents, the Aquaox **Infection Control System** combines organic, non-toxic Electrolyzed Water with specialized tools & applicators and specialized training.

To support small, low-consumption, low-budget facilities requiring disinfection, such as a veterinary practice, Aquaox produces/distributes bottled EPA-registered EW solutions.

Generators

KECA-50

This fully-automated, wall-mount generator produces a sanitizing solution that contains 45-50ppm Hypochlorous Acid (HOCL) at pH 5-6.5. The KECA-50 generates solution when a waving hand activates a sensor in front of the generator.

The on-site-produced EW solution is used as an all-in-one cleaner-sanitizer for **facilities without specific disinfection requirements**. The KECA-50 generator is ideal for use in fitness centers & gyms, daycares, school sports, restaurants, hotels, resorts, offices, condominiums and senior centers and residences.



EAW-1

This self-installed, semi-automated, wall-mounted generator simultaneously produces cleaning and disinfecting solutions which can be distributed as bottled EW products.

EAW-2

This fully-automated, remotely-controlled generator produces and stores Hypochlorous Acid (HOCL) and Sodium Hydroxide (NAOH) as 3 different EW-rated solutions:



AQUAOX 112 – Electrolyzed Alkaline Water is a NAOH biodegradable, bactericidal **all-purpose cleaner** used for

cleaning all hard, non-porous surfaces of patient rooms and bathrooms. Aquaox Cleaner 112 is also used for spot-cleaning fabrics, carpets and upholstery.

AQUAOX 275 – EPA-registered HOCL is a sanitizer/ broad-spectrum hospital disinfectant used for **disinfection** of high-touch surfaces as well as interior surfaces of sinks, toilet bowls, commodes and basins. When applied as directed Aquaox 275 achieves 6 log reduction against pathogenic microorganisms such as MRSA, E.coli, salmonella, pseudomonas aeruginosa and H1N1.

AQUAOX 525 – EPA-registered HOCL is a high-level hospital disinfectant used with electrostatic sprayers for final disinfection of all hard non-porous, soft surfaces and patient care equipment. When applied as directed, this disinfectant and sporicide achieves 6 log reduction against pathogenic microorganisms such as clostridium difficile (C.diff) spores.

Understanding Environmental Services

Hospital Cleaning is the removal of all dust, oil, and organic materials such as blood, secretions, excretions and microorganisms. **CLEANING** reduces or eliminates the populations of potential pathogenic organisms. It is generally accomplished with water, detergents and mechanical action. **HOSPITAL DISINFECTION** is the inactivation of disease producing organisms. Disinfectants are used on inanimate objects. Disinfection does not destroy high levels of bacterial spores. Disinfection usually involves chemicals, heat or ultraviolet light. Levels of chemical disinfection vary with the type of product used. Within hospitals and healthcare facilities, there are three types of cleaning and disinfection applications: critical, semi-critical and non-critical.

A. Critical Applications

Medical devices and items represent a high risk for infection if they are contaminated with any microorganism. Objects that enter sterile tissue or the vascular system must be sterile because any microbial contamination could transmit disease. Critical cleaning and disinfection includes surgical instruments, cardiac and urinary catheters,

implants, and ultrasound probes used in sterile body cavities. These items are to be sterilized with steam, if possible. Heat-sensitive objects can be treated with hydrogen peroxide gas plasma or ... if other methods are unsuitable ... by liquid chemical sterilants.

B. Semi-Critical Application

Minimally requiring high-level disinfection are devices such as vaginal-rectal ultrasound probes, endoscopes, laryngoscope blades, cystoscopes, esophageal manometry probes, anorectal manometry catheters, respiratory/anesthesia equipment, all GI scopes, transesophageal echocardiogram probes and rhinoscopes. Medical devices and equipment that contact mucous membranes or non-intact skin.

C. Non-Critical Applications

Devices that come in contact with intact skin but not mucous membranes. Intact skin acts as an effective barrier to most microorganisms; therefore, the sterility of items coming in contact with intact skin is "not critical." Non-critical items are divided into non-critical patient care items and non-critical environmental surfaces. Non-critical patient-care items are bedpans, blood pressure cuffs, crutches and computers.

Terminal Room Cleaning

A segment within non-critical environmental surfaces is Terminal Room Cleaning, which is a thorough cleaning of a patient room after patient discharge. The requirement is to eliminate the residual bacteria left in a "contaminated room" whether it is a hospital room, OR room, ER room, nursing home room or any room in which another patient can potentially contact residual bacteria. The size of the Terminal Room Cleaning problem is huge, with 35,000,000 patient "discharges" per year in about 5,500 hospitals and 15,000 outpatient surgery centers.

Transmissions of most HAI (Healthcare Acquired Infections) are related to contamination of patient surfaces, in-room equipment, and high touch surfaces within patient rooms. Patients shed microorganisms into their environment by coughing, sneezing or having diarrhea. Bacteria and viruses can survive on dry surfaces for weeks or months. When a patient, doctor, nurse or visitor touches surfaces, microorganisms are transmitted throughout the hospital.

Terminal Room cleaning is performed by **Environmental Services Staff**. The cleaning includes emptying trash and removing loose items, changing bed linen, wiping the mattress with a disinfectant, washing walls with detergent, cleaning bathroom sink and toilet with a disinfectant, wiping all bed rails, tables, light

switches, door handles, telephone, call buttons, privacy curtain and other "high touch" items with a disinfectant, then mop the floor with a detergent cleaner and disinfectant. Once Environmental Staff completes terminal room cleaning, their Supervisor inspects the room, looking for visible dirt, blood, secretions, etc. They use a bio-luminescence meter to measure bacterial contamination. If the inspected room is rejected, the entire room is re-cleaned and disinfected.

Infection Control

In the U.S., the **average time from patient discharge to another patient occupying the same room is 27 minutes**. As noted, the work required by Environmental Service Staff to terminally clean the discharged patient room in 27 minutes is almost impossible. This creates extreme pressure and stress on the Environmental Service Staff, resulting in poor cleaning and very high job turnover. Other factors contributing to poor cleaning and high turnover is the use of toxic and corrosive detergents and disinfectants. To improve cleaning performance, stronger and more toxic chemicals are required. However, these chemicals elongate the cleaning time due to 1) required, more-careful Staff handling of these chemicals, 2) adding a rinse step and 3) allowing time to dry and "air out" the room.

Surprisingly, using stronger, more toxic cleaning and disinfecting chemicals does not necessarily provide the level of disinfection required by hospital guidelines.

The over-prescribed use of antibiotics created "super-bugs" that can develop resistance to disinfectants. There are sixteen hospital-identified "super-bugs". A few of these are **MRSA** (methicillin resistant staphylococcus aureus), **C.diff** (clostridium difficile), **VRE** (vancomycin resistant enterococci) and **Acinetobacter baumannii**.

Other technologies have attempted to reduce the human factor in terminal room cleaning and eliminate the chemical resistance of "super-bugs".

VHP (vaporize hydrogen peroxide) is a more than \$200,000 technology that meets HICPAC (Hospital Infection Control Procedures Advisory Committee) cleaning guidelines for *terminal room surface disinfection*. VHP requires a full-time, in-hospital company representative to operate the equipment. While VHP provides 6-log surface cleanliness, VHP requires **4 hours** to clean, disinfect and "air out" the room – a non-starter for hospitals requiring fast turnaround.

UV-C light has been used for years for surface disinfection. To achieve 6-log disinfection (a properly cleaned and disinfected room), UV-C

takes **more than 90 minutes**. Difficult to use, UV-C light must be directed at an exact angle to the surface and requires a long contact time as well as regular checking to insure proper wavelength.

While these technologies (and others) meet HICPAC cleaning guidelines for terminal room cleaning, they do not come close to most hospital time requirements.

Electrolyzed Water is the only new technology that can provide 6-log disinfection within (or less than) the 27-minute time requirement. In addition, electrolyzed water is non-toxic, requires no chemical storage, mixing, dries faster and does not require Staff to wear protective clothing. Electrolyzed Water can reduce turnover by lowering Environmental Service Staff stress and time pressure. EW has no chemical residue or odor that cause patient sensitivities.

Electrolyzed Water technology used with applicators can reduce hospital cleaning and disinfection costs and improve Environmental Service productivity while lowering hospital liability insurance premiums. This proven technology has reduced HAI to less than 2% in Japanese hospitals, where EW has been in use for more than 20 years.

Product Enhancements

After 4 years of working in hospitals with Environmental Service and Infection Control Professionals, we realized that the most important cleaning solution is Aquaox 112 alkaline water. Aquaox 112's cleaning performance is due to its very negative ORP (oxidation-reduction potential). The more negative the solution, the greater cleaning power and faster drying properties.

In an open container (exposed to air), Aquaox 112's negative ORP has a very short life span – usually less than 1 hour. The key to hospital acceptance of Electrolyzed Water technology is to make the Environmental Service Staff job easier, safer and with less pressure. There is only one way to make that happen: Electrolyzed Water must work in their cleaning process as a direct replacement to detergents.

At present, Environmental Service Staff starts their shift by filling an open container with a detergent solution and inserting 8–10 microfiber mopheads. One mophead mops walls and floors of one room. When staff changes mopheads, they agitate the solution, causing ORP to be lost quickly. That is why Aquaox is performing product enhancement R&D to preserve negative ORP in a way that actually continues the electrolysis process, making the alkaline more negative. The enhancement will keep Aquaox 112 ORP at the

required level for several days. The enhanced product is able to fill spray-mop containers, spray bottles and other applicators. The product will maintain negative ORP, even with the addition of dyes, surfactants or other cleaning aids.

When cleaned with alkaline water, surfaces have a negative charge. This is the appropriate time to apply Aquaox 275 or Aquaox 525 disinfectant with an electrostatic spray or fogging device that coats every room surface with a 5-10 mil coating. Electrostatic (positive) spray reaches every side of (negative) surfaces, even if the sprayer is not pointed directly at the surface. Electrostatic spraying of a patient room takes **less than 3 minutes**. This technique gives Environmental Surface Staff more time to clean with Aquaox 112 solution and finish under the 27-minute time requirement.

Applicator: Electrostatic Sprayer

Wiping down discharge rooms with alkaline water leaves damp surfaces. In thousands of swab tests on surfaces, Aquaox validated that electrostatically spraying all room surfaces with a 1-3 mil film of Hypochlorous acid electrostatically keeps surfaces wet for approximately 10 minutes ... to very effectively kill all bacteria, viruses and spores without corroding, discoloring or damaging surfaces.

We researched the technique for electrostatic spraying, to define the optimum droplet size, the angle of the spray nozzle, the distance between the spray nozzle and the target surface. We concluded that Hypochlorous acid concentration in the air does not overreach the PEL (personal exposure limit), which importantly eliminates the need for **Environmental Services Staff** to wear a respirator (as required by **OSHA**) while disinfecting a patient room.

For OSHA requirements, airborne FAC (Free Available Chlorine) concentrations are measured to ensure that Hypochlorous acid electrostatic spray will not exceed the PEL for 2-4 minutes.

A big issue and huge selling point for the ICS technology is its ability to eliminate **endotoxins**, specifically **LPS**. This requires an acid-base hydrolysis reaction. Contact time, concentration and solution cycles need to be finalized to insure these inflammatory toxins are eliminated.

Note: endotoxins such as LPS are released as gram negative bacteria, like E.coli, pseudomonas and Acinetobacter baumannii, are dying. (One single E.coli bacterium can produce up to 2 million endotoxin particles within 30 seconds of dying.)

Aquaox Strengths

- Aquaox' reliable, long life-cycle equipment produces proven results and positive references
- Aquaox generators cover the complete range of needs (50ppm to 5000ppm)
- On-site generated solutions are very cost-efficient
- Equipment can be remotely monitored, operated and serviced
- On-site equipment is EPA exempt.
- Aquaox owns the proprietary Technology, has the engineering know-how and controls its own designs and production

Usage Fee program for KECA-50 and EAW-1

The KECA-50 and EAW-1 generators can be an expensive, unknown investment for clients that consider improving productivity while saving money through use of the **Aquaox Infection Control System**.

Within contiguous continental United States, Aquaox installs on-site generators without up-front payment (not a rental, per se), paying only a Usage Fee of \$.24/gal. against a minimum monthly advance.

Marketing material, leaflets, datasheets, manuals and instruction videos are being created to assure that the client can install, operate and maintain their on-site generator without physical Aquaox support. Aquaox will remotely monitor the equipment to maintain customer-service.

Closing Point

As you read this Review, you correctly surmised that (human) obstacles get in the way of effecting change.

Client C-level executives taught us how best to achieve a successful transition – clearly dictate to **Environmental Services Staff** (or third-party commercial cleaners) that violation of using or even bringing (unapproved) chemicals onto the property is cause for termination.

Leadership seeking positive outcomes ... in the form of greater productivity, lower cost and a safer & healthier facility for their people ... appreciate the merit of making the change to Electrolyzed Water has far greater value than the risk of status quo.

Aquaox' years of onsite experience validates that disinfectants do not effectively remove debris. Keeping surfaces clean requires effective, periodical cleaning using a detergent. Then, spray disinfectant and let air-dry. For more information, contact Michel van Schaik at 800.790.7520. info@aquaox.net/info@greenspeed.biz.