

Using Activated Water to ‘Charge’ Your Operation

By Dr. David Mudarri

Sometimes simplicity can be the highest form of elegance and usefulness. In an industry that has traditionally been beset by a host of complex chemical mixtures for specific cleaning tasks, a “new” substance is now at the forefront of innovation: Electrically-charged or activated water (AW). While it cannot replace all of the cleaning chemicals that professionals have used for years, AW in spray bottle form is now turning heads as a viable alternative to cleaning chemicals for a large number of common cleaning needs.

If AW proves to be cost effective, it could change the industry for good. However, skeptical end users remain apprehensive that activated water is simply marketing hype and no more effective than plain tap water. They also harbor some lingering uncertainty about the durability of the spray bottle and its hardware components, since constantly replacing the unit would be costly and unsustainable. These concerns create roadblocks to the rapid adoption of this new technology. A closer look at the science, lab tests, and field experience is thus worthwhile.

Realizing opportunities

Today, cleaning departments and businesses must try to meet the demands of the organization for clean and healthy buildings with ever tightening budgets and reduced staff. End users in the professional cleaning industry are therefore looking for versatile products that are cost effective and perform well with minimum impact on health and the environment.

Activated water technology would seem to fit the bill, but for some, the benefits of using AW to replace the use of tried and true chemical cleaners sounds too good to be true. Fortunately, with widespread use, testimonials of field experience, and third party scientific testing, this perception is slowly being replaced by more realistic assessments.

Lab-based and field evidence strongly indicates that AW technology transforms plain tap water into a multi-purpose cleaner that is effective on glass, mirrors, stainless steel, plastic, whiteboards, stone, marble, finished wood, and many other hard and resilient surfaces. For example, research was recently conducted regarding activated water’s usefulness on 44 different surface and contaminant combinations. According to Toxics Use Reduction Institute (TURI) – Surface Solutions Laboratory at the University

of Massachusetts (at Lowell), activated water delivered through low pressure spray and with manual wiping successfully removed many contaminants such as carbon deposits, dirt, oily films, and soap residues from hard surfaces. In addition to the surfaces mentioned above, TURI testing also noted that AW was effective on aluminum, brass, ceramics, chrome, some concretes, fiberglass, glass/quartz, and plastic.

In recent years there has been a significant shift from cleaning for appearances to cleaning for a healthier environment, including prevention of disease transmitted by microbial contamination of surfaces. We now know from science and field experience that pathogens on building surfaces abound, and have the potential to cause serious illness if not removed or inactivated through cleaning. Therefore, any new technology that emerges in the janitorial/sanitation (JanSan) industry must be able to tackle these health-related issues. So, can activated water help safeguard a facility from infectious agents in any meaningful way?

According to third-party testing, which is in accordance with the Environmental Protection Agency's Good Laboratory Practices (GLP) protocol, the answer is yes. An activated water hand-held integrated sprayer was shown to remove or inactivate 99.9 percent of salmonella, Methicillin-resistant *Staphylococcus aureus* (MRSA), E. coli and other bacteria on surfaces. Recently, this manufacturer had its products laboratory-tested against H1N1 influenza A, also known as swine flu. The tests concluded that the virus is eliminated with a six second exposure to activated water - without the use of chemicals. As a result of these tests, the unit is now considered a sanitizing device as defined by EPA.

The science of activated water

Although the process of changing plain tap water into a cleaner and sanitizer may appear to be a "science project," the concepts behind it are simple to grasp.

Dr. Robert W. Powitz, M.P.H, R.S., D.L.A.A.S. , and PhD in environmental health), explains the concept well:

There is considerable confusion about how the current generation of activated water cleaning products – both hand-held sprayers and autoscrubbers – work. While most conventional products clean and sanitize based on chemistry or chemical-reactions, the newer solid-state activated water sprayers and scrubbers

work mainly on principles of physics and electrical engineering. Contrary to popular perception, the process is not solely or mainly based on typical electrolysis.

The technology does use electrolysis, causing almost imperceptible pH and other changes in water chemistry, but these barely measurable effects are not the 'active ingredient' used to clean. Water electrolysis is actually applied to create charged nano-sized gas bubbles or 'nanobubbles' in water. These electrically-charged bubbles attach themselves to dirt particles causing the particles in turn to become charged and repel from surfaces, enabling soils to be suspended in water and wiped away. Soil removal performance tests conducted by the University of Massachusetts TURI Lab show that it works effectively on most common soils.

The main 'ingredient' behind the germ-killing effect of modern activated water devices is electroporation, a scientific process that applies a low-level electrical field to bacteria or viruses. This electric charge creates holes in the membrane of the cell, known as 'porating' the cell wall and thus breaks down the walls of bacterial cells, pathogenic viruses and other germs killing them. This electrical porating activity - i.e., punching holes in germs - only occurs when the unit is activated and sending the electrical charge through the water, which acts as a conductor. With a hand-held device, this entails spraying the surface constantly for six seconds to sanitize it. EPA-compliant Good Laboratory Protocol (GLP) tests show that it works and is an effective sanitizer.

Limitations

While activated water can sanitize surfaces, registered disinfectants should still be used in critical care environments such as in hospitals and other healthcare facilities. “We have enabled AW to kill microorganisms by breaking down the cell wall in less than six seconds,” says Chris Deets, marketing director for Activeion Cleaning Solutions LLC, “but it’s not a miracle cleaner. The process doesn’t work on heavy grease or grossly soiled surfaces and isn’t yet approved by the U.S. Food and Drug Administration (FDA) for use on food preparation surfaces in restaurants.”

AW is typically not effective against most heavy petroleum-based and grease-based soiling. Therefore, in heavily-soiled or grime-ridden areas, tried-and-true detergents and degreasers are still recommended. “While effective on windows, mirrors and lightly-soiled hard surfaces, activated water won’t replace all of your cleaning products,” says Andrew Bales, director of EVS/Emergency Preparedness for Mason General Hospital. “For restrooms, shower walls and heavier concentrations of petroleum-based soil, activated water is not as effective as other products. Chemicals and processes designed for those specific tasks should be considered.”

Additionally, cleaning professionals may also find that activated water is ineffective on some scuffs and embedded markings. Black heel marks, for example, present challenges for this technology. These marks usually do not respond to activated water and, in fact, to most traditional chemicals, without agitation.

As a result of these limitations, activated water should be used to complement other needed products in the janitor’s closet. Since activated water is generally non-toxic and won’t harm the user or the environment, it is acceptable to use trial-and-error methods to determine the appropriate application in your facility. Manufacturers and educated distributors are also good sources of practical information.

Minimizing damage and theft

In addition to being a high performance substance, activated water is often contained and released from a durable, innovative spray bottle system. The spray bottle is relatively light and easy to carry, use, and store. Housed in thick, robust plastic and featuring a brass nozzle as well as a comfortable rubber trigger, the spray bottle of activated water will stand up to most of the common abuse, dings and nicks that go along with cleaning and transporting. In fact, the system has been put through repeated field drop-testing and emerged virtually unscathed.

Tommy Little, manager of Building Services for Georgia Tech University, describes his experience over about a year’s time: “We have been using activated water spray bottles since June 2009. We first started a pilot program using 30 units and we implemented another 130 units recently. To date, we have replaced three units at no charge due to a defect.”

Since activated water has a “wow” factor, it can add “pizzazz” to a cleaning operation, but it can also draw attention from some building occupants who may have bad intentions. Since the spray bottle is eye-catching and high-tech, some facility managers are concerned that theft will occur. Similar to protecting chemicals, equipment, and other tools of the trade from being stolen or vandalized, owners and managers must be diligent with effective inventory management measures.

“To protect your investment, it is important to put in place good control mechanisms to prevent the units from being lost or stolen. We number each unit and assign that unit to an employee who signs the unit in and out each day,” adds Little. “In addition, we purchased inexpensive tote bags with a shoulder strap to make it easy for the custodian to carry. To date, we have not had a unit damaged, lost or stolen.”

Health, Safety, Environmental Impact, and Cost

The cleaning products and procedures of the past have had mild to serious negative impacts on worker and occupant safety and health.

“The cleaning industry has recently been rated by the Occupational Safety and Health Administration (OSHA) as a leading source of workplace injuries so it is important that we strive to create a safer atmosphere for our students, faculty and staff. The more harmful chemicals we can remove from our campus, the safer we’ll be,” notes Bob Pils, director of housekeeping and maintenance for Colgate University. The downsides of using powerful, toxic chemicals may be increased sick days, illness, absenteeism and decreased morale and productivity. Thus, activated water, along with other less toxic products and methods, is helping to reverse these trends.

In addition to testing a product’s efficacy, the UMass TURI lab also provides a “Safety Screening Score.” This score is used as a guide to help determine the potential safety concerns of a product. It is based on five environmental screening criteria: volatile organic compounds (VOCs), global warming potential, ozone depletion potential, HMIS/NFPA ratings, and pH. The activated water unit that TURI tested received 50 points, which is the maximum as a Safety Screening Score, and indicates no environmental concerns in the assessed categories.

According to a manufacturer’s literature and third-party validation, facilities of medium size can save 186 gallons of gas, four barrels of oil and one metric ton of coal

from entering the environment by switching to just two hand-held activated water spray bottles. Add appearance and health benefits - and long-term cost savings - and professionals can be increasingly confident that hand-held activated water spray bottles may be both cost effective and better for health and the environment than traditional chemically based cleaners. Is it perhaps time to recharge your operation with activated water?

About the Author

David Mudarri, Ph.D., is a former Senior Indoor Air Quality Scientist at the U.S. Environmental Protection Agency (EPA) and the author of the upcoming book, *Clean and Healthy Schools for Dummies* published by Wiley & Sons in conjunction with IEHA.

SIDEBAR

Pilot program confirms ROI

Georgia Tech University recently conducted a pilot program that provided data to show that the reduction in chemical purchases after switching to activated water sprayers will enable paying for each unit during the first six months of operation. The program compared August 2009 to December 2009 versus August 2008 to December 2008. According to Little, the chemical cost savings “gets better as your staff becomes trained and more familiar with the product.”

Listed below are actual cost savings Georgia Tech tracked during the 10-month pilot program.

Chemical Cost Pilot Program (2008 vs 2009)

- August 2008 – December 2008 Cost \$3,267
 - August 2009 – December 2009 Cost \$1,624
- = 50% Savings

Chemical Cost Pilot Program (2009 vs. 2010)

- January 2009 – April 2009 Cost \$2,379.40
 - January 2010 – April 2010 Cost \$453.20
- = 81% Savings