

## A breakdown of two pharmaceutical cleaning technologies: Activated Ionized Hydrogen Peroxide (AIHP) vs. Vaporized Hydrogen Peroxide (VHP)

Two high-grade lab cleaning systems may seem like equals at first glance, but a closer look reveals something else. Labs and Pharmaceutical manufacturing facilities are under more pressure than ever to provide clean rooms and equipment, and a safe environment. The goal? Manufacture drugs under as close to sterile environments as possible when producing products that are ingested by human beings. This means the cleaning system you choose needs to get at least a six log (99.9999%) reduction of viruses, pathogens and spores. These days, it is not enough to wash hands, wipe down equipment and control entry and manual cleaning can be tedious and not cover all surfaces when wiped down by humans. Pharmaceutical facilities need a better approach. As a result, competition between hospital-grade cleaning systems has begun to heat up. There are a variety of products that claim to be the best solution for these clean areas. But they can't all be the best - different systems produce different results, with varying degrees of efficacy. In this guide, we'll break down two major technologies and demonstrate which one has the upper hand when it comes to complete pharmaceutical manufacturing room cleaning: Activated Ionized Hydrogen Peroxide (AIHP) vs. Vaporized Hydrogen Peroxide. (VHP).



*Simple manual cleaning procedures  
have been documented to leave  
behind 30%-60% of surface pathogens.*

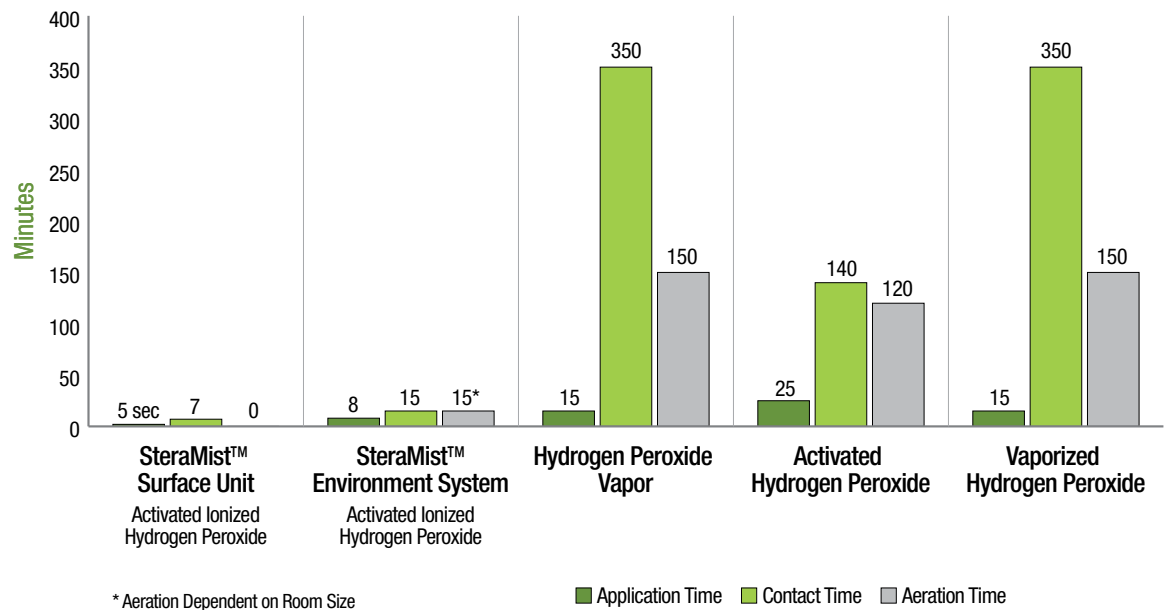
**The Method:** As its name suggests, the VHP technology uses a solution of between 30 and 35% hydrogen peroxide mixed with water as a means of killing bacteria, viruses and fungi. By distributing an even layer of the condensed solution about 10 microns in size, the VHP system is able to deactivate a range of microorganisms. After setting the conditions (temperature and humidity) in the area to clean, a VHP generator, nozzle and fans are needed to effectively disperse the vapor throughout a vacant and sealed room.



*SteraMist™ Environment Unit uses 7.8% H<sub>2</sub>O<sub>2</sub> creating a particle 2 microns in size which acts like a gas penetrating hard to reach areas for complete room decons.*

After the solution moves through the room and the hydrogen peroxide decomposes to water and oxygen, individuals can re-enter the room. In contrast, the AIHP process begins with a low concentration hydrogen peroxide (less than 8%) solution that undergoes a conversion by passing through an atmospheric cold plasma arc creating a high concentration of Reactive Oxygen Species (ROS), specifically the Hydroxyl Radical. The Hydroxyl Radical violently pierces the cell. The now ionized particle is about 2 microns in size and will move around the room like a gas and float into cracks and crevices much more effectively than a larger particle. In this conversion, AIHP is not the same as using a high concentration hydrogen peroxide vapor to fight problem microorganisms – it is much quicker in that it offers a near immediate kill, more effective across all problem microorganisms, and non-corrosive to the room structures and electronics. The Hydroxyl Radical violently pierces the cell wall of all unwanted microorganisms, viruses and molds on contact rendering them inactive. Currently, AIHP comes in two distribution systems – a handheld direct spray Surface unit for high touch surfaces and a complete room fogging Environment system acts in the same manner as a gas, that is configurable to treat multiple spaces simultaneously.

### Complete Room Treatment Times Short Treatment Times = Quick Turnover Times



**The Efficacy:** As lab-ready cleaning methods, both AIHP and VHP will get the job done. But the two products do have their differences. The VHP application takes effect over the course of a 150 minute exposure and another five hours to aerate before re-entry. For labs and pharmaceutical facilities that need to turn over a room quickly, the lengthy duration



will be problematic. Quicker turns mean less down time which translates to more profit for the organization. This is a major point where the AIHP process has a distinct advantage. Using the comparable complete room fogging system, pharmaceutical facilities can get maximum results in as little as just over 75 minutes, over 75 minutes (including application time, contact time, and aeration time). In pharmaceutical manufacturing time is of the essence - facilities can't be kept waiting while the room is cleaned for hours and days. They need fast access to clean facilities, and AIHP delivers on that ability.

**The Application:** At first glance and to the average person, these two products appear quite similar - both use a mist, spray or fog to ready a healthcare facility or pharma manufacturing suite for use. The differences become clear upon looking at treatment times and the chemical ingredients in the solution used. In terms of best use, more discrepancies are apparent.

In general, VHP requires more room setup and preparation to be effective. In addition to the time required, each room must be pre-treated and post-treated for humidity changes - especially facilities containing sensitive lab equipment. The space must be completely sealed, including vents, prior to use. In some cases, VHP may cause paint blistering due to the concentration of hydrogen peroxide. Not only that, but the VHP system using the high concentration of H<sub>2</sub>O<sub>2</sub>, is considered a hazardous material, which restricts how and where it may be stored and shipped. On the other hand, AIHP requires no shipping precautions and can be stored in a cabinet or on a shelf wherever is convenient. The handheld portable Surface Unit is like no other in the world and provides a direct point and spray which does not require the room to be sealed, though, in order to build up concentration of ROS, the complete room fogging system does. However, both products are safe to use on any surface in any room, including those housing high-sensitivity instruments.

**The Summary:** VHP is an effective system for preparing a pharmaceutical manufacturing facility, under the right conditions. Ultimately, it will reduce the pathogens in facilities. But the lengthy time requirements, stringent shipping and storing regulations and relatively high concentration of hydrogen peroxide limit its capability as a high-volume, readily-available technique. While 30% H<sub>2</sub>O<sub>2</sub> will kill pathogens you need to eradicate it will also degrade, damage and rust the materials and products inside the area being treated. Meanwhile, the AIHP process, SteraMist™ BIT™ from TOMI Environmental Solutions, Inc. doesn't come with those same drawbacks. It is a much simpler, faster system that delivers the same results without the unnecessary precautions. The best part, while using only 7.8% Hydrogen Peroxide to achieve the desired efficacy is that it will not corrode or damage materials, components or even electronics inside your facility. All things considered, between these two products, SteraMist™ BIT™ AIHP delivers a better value. Steramist is quicker, safer, easier to use and will get you the results you need. Pharmaceutical manufacturers need a quick turnaround to bring the core back online and don't want to worry about storing a shipping what amounts to a cleaning product - they just want the results, and fast. TOMI Environmental Solutions, Inc.'s SteraMist™ BIT™ AIHP is state of the art and provides that relief. Contact us today to set up a demonstration of this game changing technology.



*The handheld portable Surface Unit is like no other in the world. It is a fully portable fast-acting, hand-held, point and spray disinfection system. It is the safest and easiest process to make certain that your facilities and assets are disinfected to the maximum extent possible.*



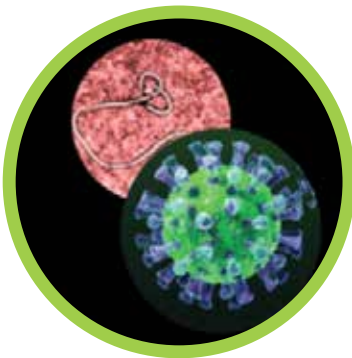
# The AIHP (Activated Ionized Hydrogen Peroxide) Process



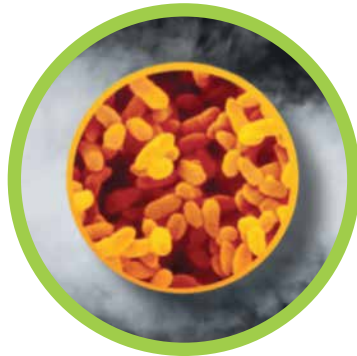
BIT Solution converts to **AIHP** after passing through an atmospheric cold plasma arc breaking the double bond of the H<sub>2</sub>O<sub>2</sub> and creating Hydroxyl Radicals..



**AIHP** mist (containing Reactive Oxygen Species) lyses microorganisms



Microorganisms are rendered inactive



**AIHP** converts to oxygen & water (humidity)

- Replace traditional formaldehyde, vaporized hydrogen peroxide, glutaraldehyde, & titanium dioxide as decontamination solutions.
- 5 second application, 7 minute contact, ideal for mishaps, spills, or quick material/equipment transfer.
- Complete room fogging system for single or multiple suite facilities.
- Easily incorporated into current cleaning procedures and protocols.
- Binary Ionization Technology® (BIT™) and its SteraMist™ platform was developed in conjunction with the Defense Advanced Research Projects Agency (DARPA) and a large U.S. defense contractor, in response to Amerithrax (anthrax attacks) post 9/11/2001.
- Requires no wipe, no rinse, leaves no residues.
- The first EPA Registered Solution+Equipment combination that provides the unique technology of hydrogen peroxide ionization for disinfecting. EPA Registration (no. 90150-2)

