

R4

BEYOND THE BLAZE

**THANK YOU
FOR YOUR
SERVICE**

*Advanced Decontamination Technology for
Fire & Soot Remediation*



THE
R4 CLEAN ✨
PROCESS



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There were 1,345,500 fires reported in the United States in 2015, according to National Fire Protection Association. These fires caused 3,280 civilian deaths, 15,700 civilian injuries, and \$14.3 billion in property damage.

Sadly, the danger does not end when the water is dried, walls replaced, and normalcy restored. Fire is a reaction and a process.

Fire itself only spreads when that process is fed with fuel and oxygen. Items and material consumed by the fire are not exempt from the "Law of Matter." Fire's deadly leave-behind, soot, causes serious hazards to first responders, remediators, and those who return to an affected area thinking the danger is over. It is critical to understand the serious, long-term, and negative effects of soot.

SOOT: A LINGERING THREAT

Soot forms during the fire and it is an incomplete combustion from molecules. These precursor molecules such as acetylene are all nanoparticles, smaller than 6 nanometers. As these soot particles are created they can become mixed with metal oxides and with minerals that can be coated with sulfuric acid. These combinations of acids, chemicals, metals, and soils are smaller than mold

and dust particles are truly microscopic dangers, making soot very small and complex.

A common house fire is a good example of the magnitude of this remaining toxin. A house contains a wide variety of materials, from wood and paper, to plastics and other synthetic items. This results in soot contamination, and poses a long-lasting threat, that only now is getting more attention.

The particle size of soot is approximately 2.5 microns, a size that is associated with deep lung penetration. Particles that are approximately 10 microns or larger get trapped in the upper respiratory tract. Particles that are 5 microns or smaller can make it down to the lower lung where the gas exchange occurs in the alveoli. In order to offer some perspective on the size of these particles, the dust you see flying in the light coming through a window is about 40 microns in size. Airborne soot present within the breathing zone of workers is too small to be seen with the naked eye and can easily be inhaled.

Breathing these tiny particles can cause coronary heart disease, asthma, bronchitis, and other respiratory illnesses. These illnesses can lead to a general decrease in one's quality of life and even premature death.



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As a nation, we all saw the results of micro particles similar to soot impacting first responders and recovery workers who responded to the Terrorist Attacks of 9/11. These heroes are now facing chronic illnesses. According to an Article published in the New York Post in 2015, 3,700 ground zero responders have fallen ill. The numbers of premature deaths that could be linked to this attack are inching closer to 1,000.

While the attacks are far from everyday events, first responders and fire remediation companies are constantly working in similar atmospheres. These community servants are often unaware and woefully unprepared of the dangers to soot, creating liability to municipalities and private companies.

With health on the line, there are steps which can be taken now, with advanced technology which can eliminate the stress of soot in our communities.

SOLVING SOOT: TECHNIQUES AND TECHNOLOGIES IN COMPLETING SOOT CONTAMINATION

It is impractical and implausible to avoid soot. However, the technology does exist to manage soot challenges. That technology is SteraMist™ and when implemented with proactive techniques, it can protect those who service our communities and clients trying to move on from disaster.

SOME SIMPLE AND COMMON-SENSE TECHNIQUES INCLUDE:

- Wearing a PAPR during entry and reentry until soot is contained.
- Continuous use of an air purifying respirator post soot containment including CBRN (Chemical, Biological Radiological, and Nuclear) canisters where the risk of chemical laced soot is a worry, or an N95 respirator where particulates are only concern.
- Not eating or drinking in the area where the soot contaminated items are stored or being restored.
- Wear nitrile gloves.
- Do not bring your hands to your face while your gloves are on.
- Wear safety glasses.
- Wash your hands thoroughly after removing gloves.

While good practice of common sense techniques allows for front-line protection in a fluid environment, the time is now for advanced technologies to be incorporated into soot response.

With the presence of hydrogen cyanide (a byproduct of burning wool) and manganese and benzene (a byproduct of burning wood) and Formaldehyde (one of the most pervasive toxic chemicals) the need is now, and the danger is real.

Current use of HEPA vacuums do not address the molecular makeup of threats that lurk within soot. However, in recent field use, and through proof of concept, Steramist Binary Ionization Technology is becoming more and more of a solution when it comes to fighting soot at the molecular level.



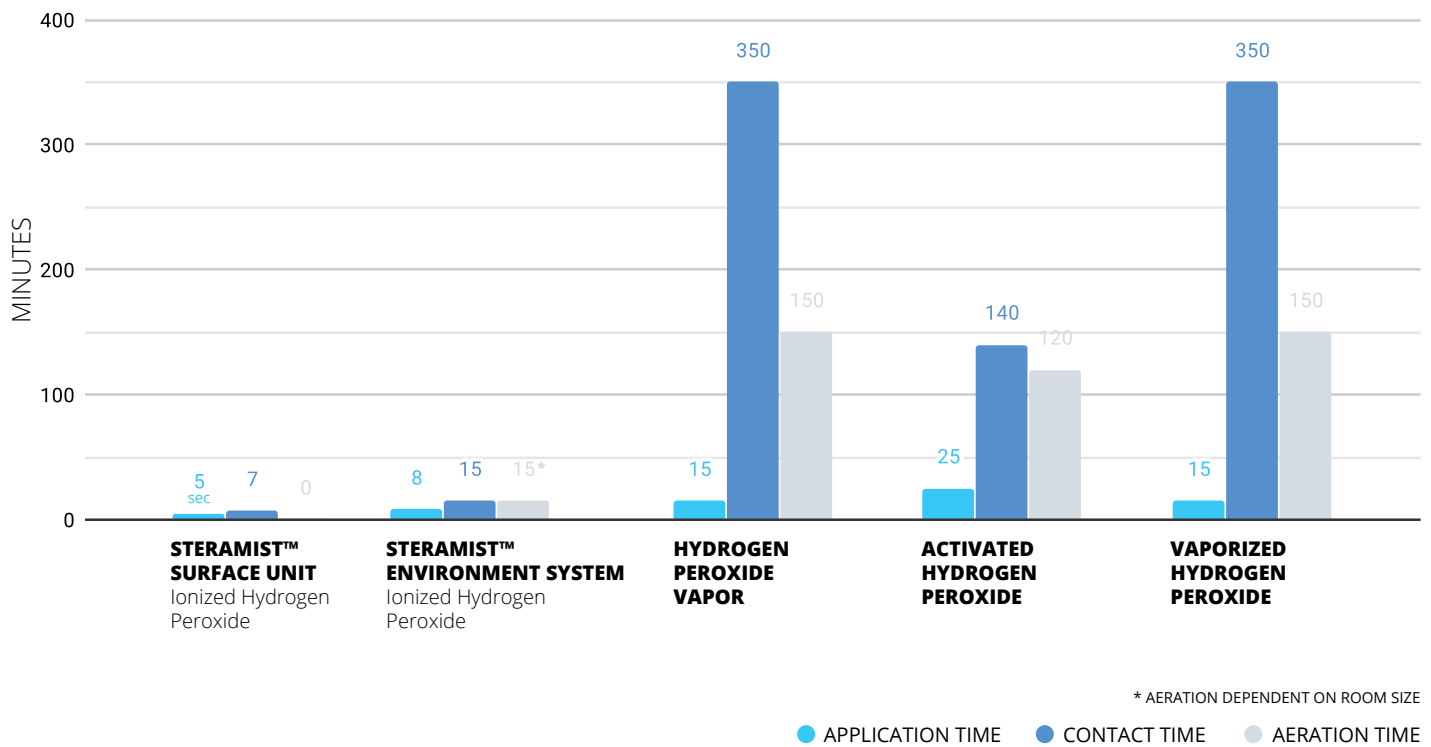
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Steramist technology passes a low percentage (approx. 7.8%) hydrogen peroxide solution through a cold plasma arc, breaking the bonds of the hydrogen peroxide. The resulting hydroxyl radicals are applied to surface either

through direct point and spray and whole room fogging. These diverse applications allow for mobile, rapid deployment.

COMPLETE ROOM TREATMENT TIMES

SHORT TREATMENT TIMES = QUICK TURNOVER TIMES





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SteraMist's high production of Hydroxyl radicals play a key role in the oxidative destruction of organic pollutants. Using a series of methodologies collectively known as advanced oxidation processes OR's or AOP's. The destruction of pollutants in AOPs is based on the non-selective reaction of hydroxyl radicals on organic compounds. This means that the resulting ionized hydrogen peroxide is highly effective against a series of pollutants and organic compounds, including pharmaceutical compounds, dyes, smoke molecules, and even formaldehyde. "The hydroxyl free radical (OH) is the major oxidizing chemical in the atmosphere, destroying about 3.7 Gt of trace gases, including CH₄ and all HFCs and HCFCs, each year," (Ehhalt, 1999).

The above allows for the assertion that since soot is chiefly composed of carbon and carbon is bonded, SteraMist™ will break the bond and reduce carbon, which will reduce soot contamination and smoke odors.

In conjunction with reducing carbon and soot contaminant loads, the Ionized Hydrogen Peroxide (iHP™) process provides a powerful tool, not just when it comes to a structure but also when it comes to the

need to decontaminate response vehicles, equipment and secondary containment areas. According to Surface Compatibility Studies, which measure the effects of SteraMist™ on multiple surfaces, the solution can be used to decontaminate surfaces that may go untouched including computers, calibrated tools, response gear, rubbers and close skin contact surfaces. This compatibility allows further steps to be taken to truly protect first responders and remediators from secondary contamination.

While greater awareness on the dangers of soot is brought to the forefront, the market will drive the need for solution. In truth, it is important as first responders and remediation companies to drive the need for a solution for soot contamination. Soot has been around as long as fire, and while that combination will never be broken, we now have tools and techniques at our disposal which will lessen the impact in our communities. It is imperative that action is taken. Technologies like SteraMist™ allow for a solution that is simple, easy to integrate, and scalable for any response.

References:

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