

Portable Field Decontamination Unit

PlasmaSol Corporation

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Environmental Problem

The ability to clean organic contaminants from a surface has many applications, ranging from semiconductor manufacturing to homeland defense, where surface decontamination following a chemical or biological attack is critical. Surfaces that potentially need to be cleaned include circuit boards, historical and legal documents, art and architecture, and medical instruments. A convenient method of cleaning surfaces at the microscopic level, however, without damaging them or using harsh, dangerous, or environmentally unfriendly chemicals, is a challenging problem. Plasma cleaning is one method of removing organic contaminants or oxidation layers, but traditional systems are often complicated, capital-intensive, and require exposure to dangerous chemicals.

SBIR Technology Solution

With support from EPA's SBIR Program, PlasmaSol Corporation developed a surface contaminant destruction system that sterilizes surfaces in an affected building following a chemical/biological attack. PlasmaSol's technology is scalable and portable—it can be transported throughout a building to decontaminate flat and odd-shaped surfaces. In contrast to traditional plasma cleaning systems

that require vacuum systems, PlasmaSol developed a decontamination system that operates at atmospheric pressure and is lightweight, portable, nondestructive to the contaminated substrate, and eliminates the need for exposure to harsh and dangerous chemicals.

PlasmaSol's decontamination process replaces current complicated and capital-intensive systems with a low-cost, low-maintenance system providing rapid, nontoxic, low-temperature performance. The modular design of PlasmaSol's nonthermal plasma technology permits the installation of only the desired capacity, with the option of adding functionality or capacity at a later time. This greatly reduces the footprint, allowing such decontamination to be located in remote and challenging locations.

The man-portable plasma cleaner weighs approximately 15 lb. The handle is a telescoping pole that can extend out to 5 feet and has a swivel attachment that allows the user to adjust the angle of the plasma emitter. This approach has numerous advantages over conventional decontamination methods, such as no exposure to toxic chemicals, and it leaves contaminated substrates intact and reduces/eliminates the need to dispose of hazardous wastes. The power supply and gas delivery system are located on the handle of the device.

Commercialization Information

The nondestructive nature, combined with the sterilization performance of this innovation, makes it an excellent candidate for use as a decontamination technology for sensitive items in which the use of harsh solvents or autoclave sterilization is unfea-

sible (i.e., circuit boards, historical and legal documents, art and architecture, medical instruments). PlasmaSol is developing approaches to use its technology against not only routine bacteria, viruses, and allergens, but also terrorist-released chemical



Demonstration of the plasma cleaner to treat horizontal and vertical surfaces.

and biological pathogens. The technology application is being pursued in collaboration with various government agencies in addition to EPA.

Company History

Based in Hoboken, New Jersey, PlasmaSol Corporation was established in 2000 to develop processes and applications for a unique low-temperature, room-pressure plasma invented by scientists at Stevens Institute of Technology. Starting with an exclusive license to this technology, PlasmaSol has developed additional intellectual property for effective surface treatment, engine emissions, and air control quality as well as sterilization.

PlasmaSol builds on successful research and development in the field of air cleaning, sanitizing, and sterilizing. Notable clients and collaborators include EPA; the National Aeronautics and Space Administration; Defense Advanced Research Projects Agency; U.S. Army Research, Development and Engineering Command; National Institute of Justice; the Oklahoma City National Memorial Institute for the Prevention of Terrorism; Stevens Institute of Technology; the University of Medicine and Dentistry of New Jersey; and others. In 2003, the company developed a process for medical instrument sterilization using the plasma as a gas generator to produce a transient biocide based on active chemical radicals. The system was designed around the conventional medical tray container used to hold instruments during sterilization, storage, and transport to the area of final use, such as an operating room.

SBIR Impact

- Cleaning contaminated surfaces at the microscopic level without using environmentally unfriendly chemicals is a challenging problem.
- PlasmaSol Corporation developed a scalable and portable surface contaminant destruction system that sterilizes surfaces in an affected building following a chemical/biological attack.
- The decontamination system operates at atmospheric pressure, is lightweight, and is nondestructive to the contaminated substrate.
- The technology could replace current complicated and capital-intensive systems with a low-cost, low-maintenance system providing rapid, nontoxic, low-temperature performance.