



Atmospheric Glow Technologies

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Enhanced Plasma Sterilized™ Filtration System

DESCRIPTION OF THE TECHNOLOGY

With support from the Environmental Protection Agency's (EPA) Small Business Innovation Research (SBIR) Program, Atmospheric Glow Technologies (AGT) has developed and commercialized a breakthrough air filtration system that destroys all microorganisms—including biological warfare agents such as anthrax and smallpox. In seconds, this system captures microorganisms on standard filter media from indoor air streams, preventing their circulation throughout a building. The Enhanced Plasma Sterilized (EPS™) Filtration System is the first heating, ventilation, and air conditioning (HVAC) filtration system to combine a high-capture capability with an effective sterilization technology. The EPS™ System safely captures, neutralizes, and/or destroys all airborne microorganisms with greater efficacy and at a lower cost than previously possible.

To develop a more practical, economical filtration system that significantly improves indoor air quality, AGT combined the effects of electrically enhanced filtration with the rapid, nonthermal sterilization capabilities of its patented One Atmosphere Uniform Glow Discharge Plasma (OAUGDP™) technology. Unlike other plasma technologies, OAUGDP™ generates plasma in air, under standard pressure and at ambient temperature, without the need for either a vacuum or a non-atmospheric gas, such as compressed helium or argon. EPS™ Systems using OAUGDP™ produce no harmful byproducts and have no deleterious effects on sensitive materials.

The EPS™ System, which works with installed commercial and residential HVAC systems, can be retrofitted to al-

most any HVAC unit. It is placed in the return air stream, and an electrostatic field is used to continuously apply charge across the filter to increase capture of microorganisms. The electrostatic field positively charges the filter and therefore attracts (and traps) negatively charged microorganisms, while consuming less power than the standard night light. The increased capture abilities achieved with the electrostatic field allows a porous, non-high-efficiency particulate, low-pressure drop air filter to provide high efficiency service. This results in less energy consumption for the HVAC unit. Periodically, the electrodes are energized with the power source, creating plasma on the filter surface that kills and destroys all of the captured microorganisms.

SIGNIFICANCE OF THE TECHNOLOGY

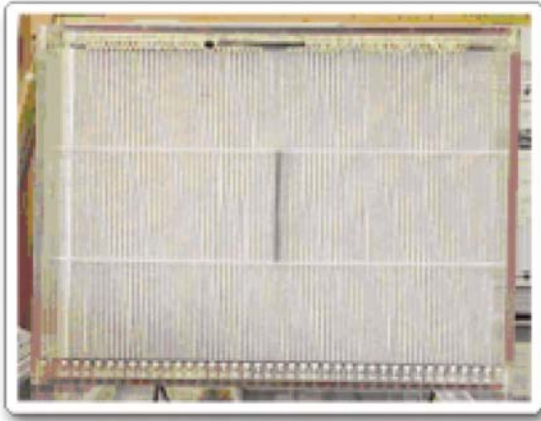
In addition to providing an efficient, cost-effective, environmentally friendly, and safe means of eliminating biological warfare agents, the EPS™ System also provides a healthier environment for commercial buildings and institutions, such as schools and hospitals. Therefore, the EPS™ System offers tremendous economic and social benefits by helping to reduce absenteeism, improve productivity, and provide for the better health of building occupants. With only 30 seconds of exposure to AGT's atmospheric plasma, bacterial cells are destroyed.

Extensive testing by AGT confirmed that:

- ✦ The application of an electrostatic charge to the filter face results in enhanced capture for bacteria (450% increase in capture for *Staphylococcus aureus*) and representative viral particles (900% increase in capture for bacteriophage ΦX174).

SBIR Impact

- ✦ This novel system captures, neutralizes, and/or destroys microorganisms—including biological warfare agents such as anthrax and smallpox—with greater efficacy and at a lower cost than previously possible.
- ✦ It is the first heating, ventilation, and air conditioning filtration system to combine a high-capture capability with an effective sterilization technology. Bacterial cells are destroyed in only 30 seconds.
- ✦ The EPS™ System provides a healthier environment for commercial buildings and institutions, such as schools and hospitals.
- ✦ AGT's technology combines the effects of electrically enhanced filtration with the rapid, nonthermal sterilization capabilities of the OAUGDP™ technology.
- ✦ In recognition of its technical innovation, AGT received one of *R&D Magazine's* prestigious R&D 100 Awards in 2002.



**EPS™ filtration system
in capture mode (presterilization).**



**EPS™ filtration system
in sterilization mode.**

- ◆ Filters loaded with 1 million bacterial cells and viral particles are sterilized with only 15 seconds of OAUGDP™ exposure.
- ◆ The intermittent OAUGDP™ exposure does not result in a decrease in filter capture efficiency or in electrode damage.

COMMERCIALIZATION SUCCESS

Since the initial product offering in November 2001, AGT has been negotiating with federal agencies for incorporation of the EPS™ into highly visible federal buildings and mass transit facilities. The EPS™ System is commercially available in three categories. Category 1 provides maximum protection to sensitive buildings and includes additional features such as ionizers, ports for sensors, and enhanced electrodes for chemical and biological warfare attacks. Category 2 is designed with specialty applications, such as airplanes, schools, and office buildings in mind. The Category 3 EPS™ System is marketed for the protection of high-value equipment and is a simplified version of Category 2.

AGT is initially targeting high-value, indoor air quality sensitive customers, such as government and hospital facilities and the military. These EPS™ Systems will be equipped with highly distinctive features, such as automated controls and superior killing ability. Over time, AGT will broaden its efforts to include more cost-sensitive markets,

such as office buildings, schools, and lastly, residential applications, with the more economical models having fewer features. To execute this plan, AGT is focusing on identifying and recruiting manufacturing, distribution, sales, and product development partners.

The EPS™ System in a fully instrumented version is being monitored in a local area building, and AGT is developing relationships with a utility company for a field test as well as with distributors for hospitals and other medical facilities. In addition, AGT has had discussions with the Tennessee Office of Homeland Security to place an EPS™ unit in a Tennessee State government building. Several EPS™ inquiries have been made by various parties experiencing indoor air problems.

AWARDS AND COMPANY HISTORY



In recognition of its technical innovation, AGT received one of *R&D Magazine's* R&D 100 Awards in 2002. AGT also was awarded the U.S. Small Business Administration's 2001 Tibbett's Award for success in the SBIR Program. Based in Rockford, TN, AGT was founded in 2000, to develop and market an innovative method of generating atmospheric plasma. With 12 employees, AGT has become a leader in developing atmospheric plasma technology for products to solve pertinent environmental and health issues.

What is the SBIR Program?

EPA's Small Business Innovation Research (SBIR) Program was created to assist small businesses in transforming innovative ideas into commercial products. The SBIR Program has two phases—Phase I is the feasibility study to determine the validity of the proposed concept and Phase II is the development of the technology or product proven feasible in Phase I. EPA also offers Phase II Options to accelerate the commercialization of SBIR technologies and to complete EPA's Environmental Technology Verification (ETV) Program. For more information about EPA's SBIR Program and the National Center for Environmental Research, visit <http://www.epa.gov/ncer/sbir>.