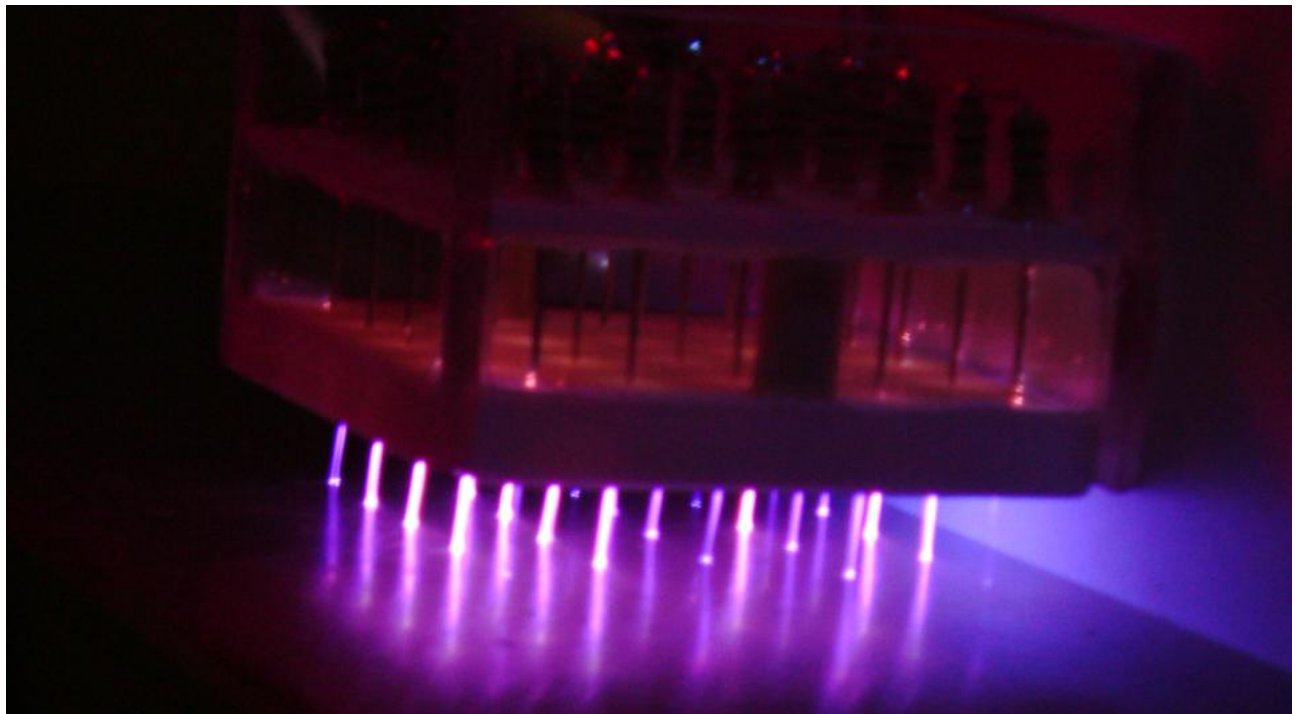


K-Plasma Ltd.

Cold Plasma Portable Large Area Decontamination

**Decontamination of Battlefield Systems
Military and Civilian First Responder**

**Chemical Radiological Biological
Decontamination and Sterilization**



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K-Plasma is designed to eradicate unwanted mold, bacteria, viruses, and other pathogens. It is a safe, efficient and effective method for microbial sterilization and can be utilized in a wide range of applications. K-Plasma has a low operating cost, short dwell times on target area, and causes no environmental damage. This makes K-Plasma the next generation of large-area sterilization and decontamination systems for large scale and portable uses.

Military and Civilian First Responder: Biologic, Chemical and Radiological

Mechanisms of Biological Decontamination

The ability of atmospheric discharge cold plasmas to sterilize surfaces is well established. The combination of electron and ion bombardment, thermal effects, free radical production, and local exposure to UV all act in concert to inactivate bacteria cell membranes, denature proteins, and damage bacterial DNA. The cell walls of bacteria can also be disrupted by electrostatic effects induced by charged particle bombardment.

An example of the sterilization capability of an early technology (1996) cold plasma is shown in figure below. *Escherichia coli*, a human pathogen, were inoculated into three Petri dishes. One dish was left as a control with no plasma exposure; another was exposed for 30 seconds of plasma treatment, and a third was exposed for 120 seconds. The bacterial kill zones are progressively larger with longer plasma exposure times. Improvements in plasma applicator technology have dramatically reduced the required dwell times Effectiveness on Anthrax has been demonstrated by the US Air Force Office of Scientific Research.

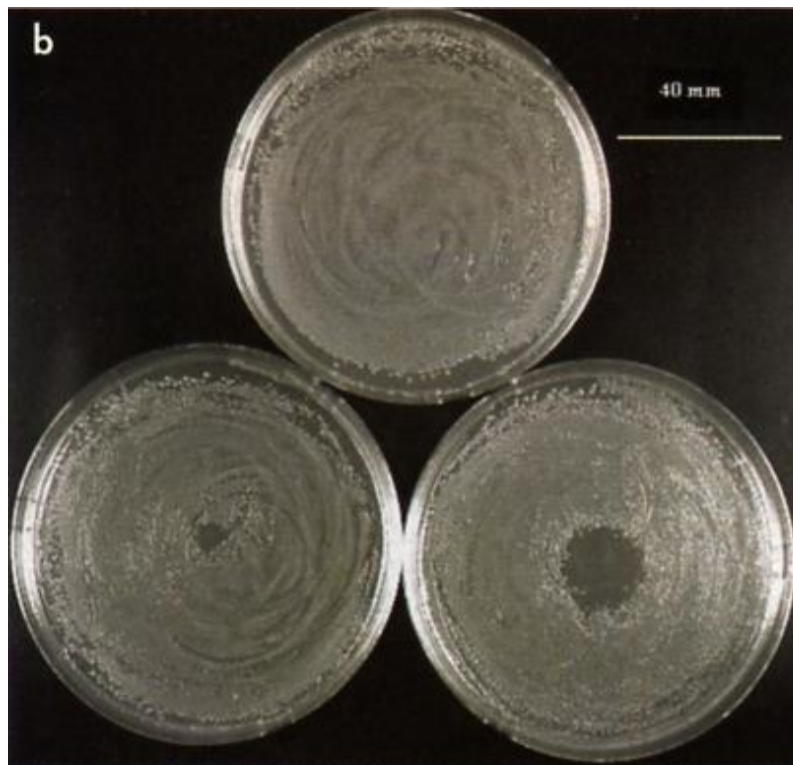


Photo courtesy of Dr. M. Laroussi, Old Dominion University, Norfolk, VA.

Mechanisms of Chemical Decontamination

Plasma discharges have been used to initiate and sustain polymerization reactions by the selective breaking of chemical bonds. The same process has been used to break down the complex chemicals found in nerve gases. For example, cold plasma discharge was used to break down a stimulant (dimethyl-methyl phosphonate) for a nerve gas agent. More than four orders of magnitude decrease in the stimulant concentration on an aluminum surface was observed after 10 minutes of treatment. A time-resolved mass spectrometer monitored off-gas generation during the treatment, and showed only nontoxic fragments were released. This technique also was used to determine when the decontamination was complete.

While this demonstration was useful in verifying the ability of atmospheric discharge cold plasmas to destroy simulated nerve gas agents on a small scale, to be useful in a practical situation, a much larger area plasma applicator must be considered. Multi-Beam large-area cold plasma applicators developed by K-Plasma provide this solution.

Mechanisms of Radiological Decontamination

The ability of plasma discharges to clean surfaces is commonly used in the high vacuum processing industry, typically to prepare a surface for subsequent treatment. Electron and ion bombardment are primarily responsible for this effect, with the advantage of a carrier gas flow to sweep contaminants away from the target application site. Similarly, the clean up of radiological agents released in a “dirty bomb” may be achieved by cold plasma through the breaking of ligand chemical bonds which attach a radionuclide to a surface, neutralizing van der Waals forces, or simple physical entrapment of radioactive particles. Note that once these particles are liberated from the contaminated surface, they must be removed, collected, and otherwise contained.

Plasma & Foodborne Pathogens

Our food supply in the United States is among the safest in the world. Food producers, and the FDA, are continuously searching for new, state-of-the-art technologies that will further improve food safety and quality. Food contamination is a major concern in almost any sector of the food industry. Regardless of whether the agents are introduced unintentionally, or otherwise, the K-Plasma systems are the most environmentally friendly and effective front-end, preventive, and back-end, infected, method of eradication.

With recent attention being focused on several vegetable and currently, Pistachio nut Salmonella contamination, the public concern over food safety in general has heightened. It is seen as a major problem which requires a technology that has verifiable efficacy with 100% benign after-treatment effects.

The Meat and Poultry Industry

Current methods used in dealing with contamination in meat and poultry, and the number of microorganisms associated with these foods might have posed problems with regard to residual food changes, strains of resistant organisms, and most importantly for the owner of the operation is the cost, system operation and facility enhancements.

K-Plasma is the ideal method for pasteurizing foods and controlling foodborne pathogens such as *E. coli* O157:H7, *Listeria monocytogenes*, *Campylobacter jejuni*, and various *Salmonella* species.

Experimental data indicates that thousands to millions of *E. coli* O157:H7 cells were killed in as little as 5 to 15 seconds with plasma when the cells were applied to the surface of the test material such as polypropylene. When the *E. coli* O157:H7 cells were embedded in a gel matrix, the exposure time was extended to 2 minutes or less. Such short exposure may have little to no effect in the physical and organoleptic properties of food such as taste and texture, while greatly reduce the bioburden present in foods.

K-Plasma goes beyond the microorganisms listed above and extends to include other microorganisms in general sterilization procedures. Bacteria, bacterial spores, fungi and viruses on non-porous and porous surfaces when exposed to the process were routinely killed in seconds to minutes.

The K-Plasma technology has the potential for a more efficient and safer means of reducing the bioburden in foods and sterilization for industrial and medical industries. The other critical and significant area is in the process to decontaminate military equipment exposed to various biological and chemical warfare agents.

Medical Instruments and Wound Treatment in the Field

K-Plasma has also shown its efficacy in the decontamination process for surgical instruments. K-Plasma can remove microscopic proteins, or prions, that are resistant to traditional cleaning methods and cause rare and incurable neurodegenerative diseases such as Creutzfeldt - Jakob disease (CJD) in humans and mad cow or Bovine Spongiform Encephalopathy (BSE) in animals.

Additionally, many healthcare professionals discard instruments such as neurosurgical scissors after a single use when they are used for procedures likely to leave behind CJD-infected tissue as prions are resistant to conventional autoclave, chemical, or physical decontamination procedures. Patients, however, remain vulnerable to possible CJD infection when instruments -- used on patients diagnosed or undiagnosed with CJD most often retain infected tissue and are re-used. K-Plasma sterilization solves that problem not only for CJD but for many other resistant species, such as those with antibiotic resistance.

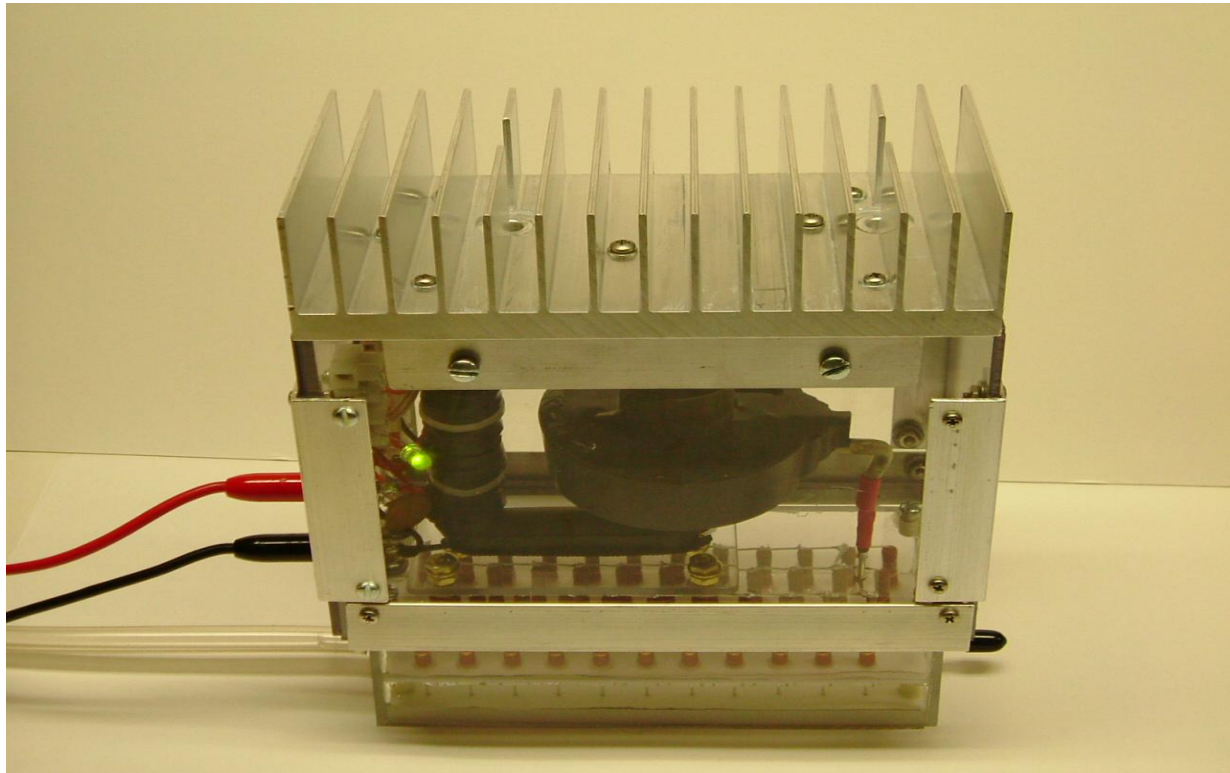
The K-Plasma system is light, 4lbs, and is easy to use. It is an ideal system for first responders. This applies to all domestic emergency unit personnel as well as military. The obvious scenario is a protruding or open wound that becomes immediately exposed to pathogens. Standard treatments are not effective in the field such as cleaning the wound and dressing it. The wound in all likelihood would be a candidate for infection. The idea is to use K-Plasma in conjunction with flushing and dressing. This provides both immediate antimicrobial action and allows for a longer transport time without infection being one of the problems.

The effectiveness of K-Plasma in general instrument and battlefield front line care facilities cannot be overstressed. Most deaths are a result of many things but infection ranks at the top. The instruments can be quickly sterilized in "OPEN AIR" in a matter of minutes!

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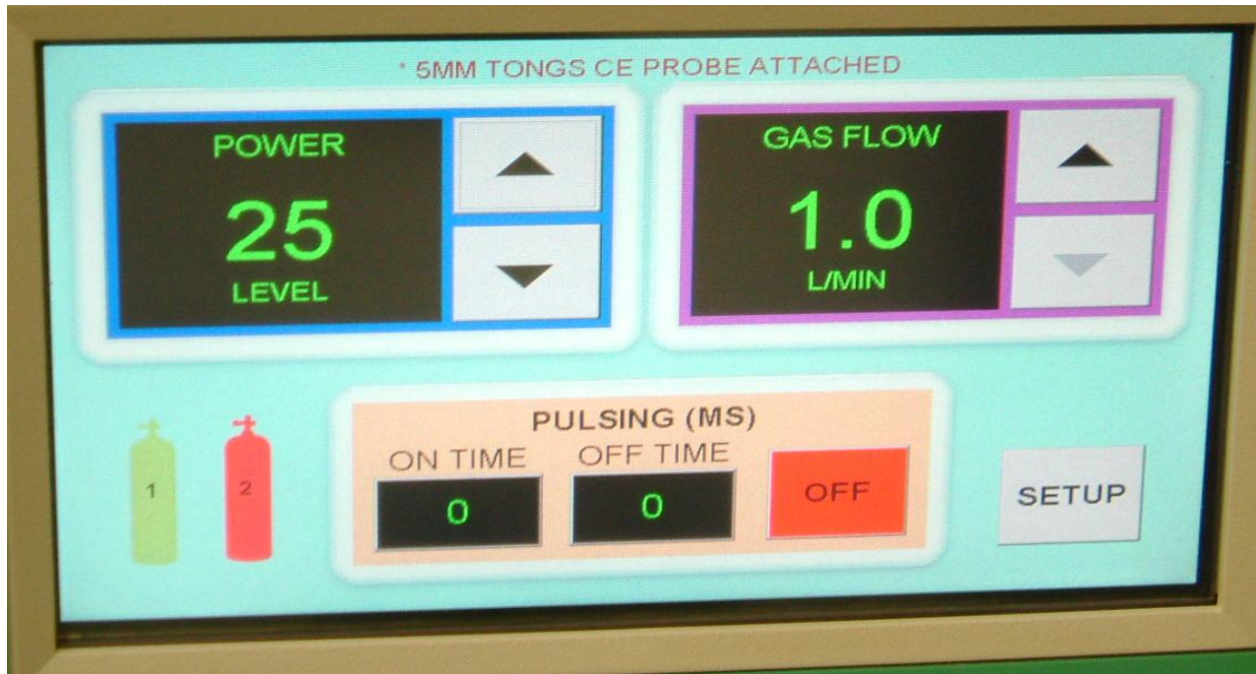
Although there are other plasma based solutions on the market none can compare with the on target dwell time. Speed is critical and our plasma jets provide the most effective full power kill on the target where the others loose a great deal of energy by the time they reach the target. This provides shorter dwell times, and faster rates of coverage.

A picture of the open portable applicator and the discharge is shown below:



K-Plasma Bench Top Systems

K-Plasma systems are also available in many configurations using a highly programmable generator and replaceable head configurations. The images that follow, courtesy of Bovie Medical Corporation, shows the actual generator and the software management of the system.



Manufacturing and product support

Manufacturing of all the components and final assemble will be done by Bovie Medical Corporation at their main facility in Florida. Bovie is a leader in the field of surgical plasma systems and has been involved in the research and development as well as the design and construction of the operating systems. They have been designing and selling electrosurgical generators and associated replaceable attachments for over 15 years.

Bovie will first provide a commercial system and subsequently based on military field specification in conjunction with K-Plasma Ltd. K-Plasma is responsible for design and engineering of the non-surgical systems.