

High Speed Hand Dryer with Cold Plasma Kills Germs on and Around Hands

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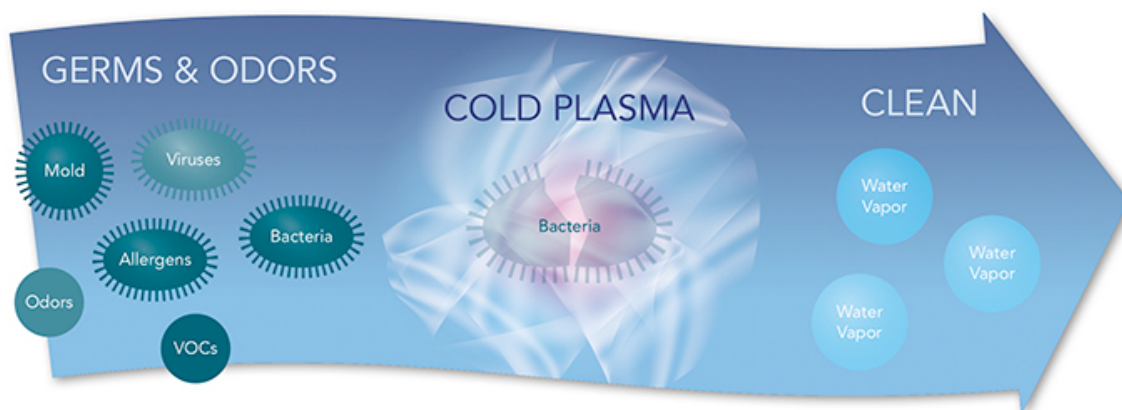
Cold Plasma Clean Technology

Cold Plasma Clean™ technology was developed by American Dryer's team of engineers to create the most hygienic method of hand drying. During drying, CPC kills germs on the surface of your hands and in the air surrounding them. CPC technology is a solid-state, maintenance-free solution.

How does CPC Technology Work⁽¹⁾

Cold plasma, or bipolar ionization, is nature's way of cleaning the air and killing germs. High levels of ionization are found in the fresh air breeze off the ocean or on top of a mountain. CPC technology is natural and safe. It does not create harmful levels of ozone. The cold plasma generator inside the EXTREMEAIR® CPC uses steady-state positive and negative discharge points to split water molecules in the air into oppositely charged hydrogen (H^+) and oxygen (O_2^-) ions. These ions in turn break down gases to harmless compounds prevalent in the atmosphere. For example, ammonia that causes typical body odor breaks down to oxygen, nitrogen and water vapor. Air is made up of millions of molecules, including harmful gases, fibers, mold, bacteria, and viruses. CPC technology breaks down those harmful molecules into simple, safe, naturally occurring molecules.

The bipolar ionization generator creates cold plasma discharge from the outlet nozzle of the hand dryer that consists of positive ions (H^+) and negative ions (O_2^-) from water vapor in the air. These ions surround harmful substances such as airborne mold, virus, bacteria, volatile organic compounds and allergens. The ions are transformed into hydroxyl (OH^\bullet) radicals on the cell membrane surfaces to rob the harmful substance of a hydrogen atom (H), severing the protein walls of the cell membrane inactivating them. The OH^\bullet radicals instantly bond with the removed hydrogen (H), forming water vapor (H_2O), and return to the air.



Animation – For an animation of the physics of Cold Plasma Clean technology click the link below.

<http://www.youtube.com/watch?v=kO-fpyAlcBk&feature=youtu.be>

Effectiveness

Independent studies conducted by EMSL Analytical, a CDC Elite certified lab, determined the efficacy of the EXTREMEAIR CPC hand dryer manufactured by American Dryer, Inc. The studies placed a petri dish with a pathogen placed under the hand dryer nozzle. Tests were conducted in triplicate to determine the percentage of reduction.

It was determined that after hand drying, there were no detectible E.coli from the control sample. Statistically, over 99.6% of E.coli were killed.

Staphylococcus aureus was used to test the efficacy against Methicillin-resistant *Staphylococcus aureus*, (MRSA). EMSL Analytical considers MRSA too dangerous to handle with this type of testing. MRSA was tested with the cold plasma generator only and found to be effective.

Cold plasma technology has also been tested and proven to be effective against other pathogens including Clostridium difficile (C.diff), and Tuberculosis (TB).

It is important to note that bipolar ionization utilizes moisture (water molecules in the air) to create the Hydroxyl Radicals (OH*) used to kill the pathogens. Tests conducted at EMSL did not consider the water content in the air. It is thought that the moisture on hands during drying will greatly intensify the creation of Hydroxyl Radicals and therefore improve the performance of the device.

Table 1: Reduction of *Escherichia coli* (E.coli)

Avg CFU	Log10	LR	%Reduction
2.5×10^2	2.40		
ND	ND	ND	>99.6%

ND = Not detectible

Table 2: Reduction of *Staphylococcus aureus* (Used to represent MRSA)

Avg CFU	Log10	LR	%Reduction
4.0×10^3	3.60		
$9.3 \times 10_1$	1.97	1.63	97.64%

Safety

The concern with ionizing devices can be the production of harmful levels of ozone (O₃). The technology behind Cold Plasma Clean technology has been tested under the UL867 standard, which does not allow production of ozone in excess of 0.05 PPM in a closed chamber. The peak level of ozone created by CPC technology was measured at 0.0033 PPM. That is 15 times lower than the standard. CPC technology also passed the stringent CARB (California Air Resource Board) standard.

Bipolar ionization of the air is a natural process. In fact, bipolar ionization is being used in the medical field for the treatment of surgical incisions and wounds.⁽²⁾ Cold plasma technology has also been shown to kill pathogens on food.⁽³⁾

References:

(1) For detailed explanation of the physics of air ionization, read *Applications of Air Ionization for Control of VOCs and PMx* by Dr. Stacy L. Daniels.

(2) Superficial treatment of mammalian cells using plasma needle E Stoffels *et al* 2003 *J. Phys. D: Appl. Phys.* 36 2908. doi:10.1088/0022-3727/36/23/007 Received 21 March 2003, Published 19 November 2003.

(3) Pankaj, S. K., Bueno-Ferrer, C., Misra, N. N., Milosavljevic, V., O'Donnell, C. P., Bourke, P., . . . Cullen, P. J. (in press). Applications of cold plasma technology in food packaging. Trends in Food Science and Technology.

Other Resources:

University Touts 'Superbug' Killing Technology

<http://www.qualityassurancemag.com/texas-am-corpus-superbug-technology.aspx>

Researcher Uses Cold Plasma Technology to Stop Superbugs

<http://www.infectioncontrolday.com/news/2013/06/researcher-uses-cold-plasma-technology-to-stop-superbugs.aspx>

In-package plasma process quickly, effectively kills bacteria

<http://phys.org/news/2013-04-in-package-plasma-quickly-effectively-bacteria.html>

Safer food with cold plasma technology

<http://www.farmersweekly.co.za/article.aspx?id=41140&h=Vaccine-shortages-problematic->

Researcher at Island University Develops "Cold Plasma," Destroys Killer Bacteria

<http://www.kiiitv.com/story/22519698/researcher-at-island-university-develops-cold-plasma-that-destroys-killer-bacteria>

Voices Against Brain Cancer comments on a new study that shows cold plasma's success against brain cancer cells

<http://www.prweb.com/releases/braincancerresearch/voices/prweb10763980.htm>

Bovie's J-Plasma May Slay The MRSA Dragon (And Other Nasties)

http://seekingalpha.com/article/1435201-bovies-j-plasma-may-slay-the-mrsa-dragon-and-other-nasties?source=google_news

IonMed Announces Successful Completion of the First European Cold Plasma Clinical Study for Closure of Surgical Wounds

<http://www.reuters.com/article/2013/05/08/bc-ionmed-idUSnPN5081901+180+PRN20130508>

Cold Plasma: Cure For The Common Cold?

<http://www.redorbit.com/news/health/1112433777/cold-plasma-cure-for-the-common-cold/>