

REOPENING

Ionization for Disinfection & Energy Savings

- ✓ **DESIGNED GOAL:** Air and Surface Disinfection and Deep Cleaning
- ✓ **CONSERVATION GOAL:** >35% Reduction in HVAC Energy Spend
- ✓ **FINANCIAL GOAL:** NET ZERO PROJECT COST

- Ozone Free Bi-Polar Ionization for Disinfecting, Deodorizing & Deep Cleaning
- >35% Energy Reduction in HVAC by shifting from 80-100% to <35% Outdoor Air under ASHRAE 62 – IAQP Method
- AI managed cooling infrastructure for an additional 20% energy efficiency

TED FLOMENHAFT
7/21/2020

BIPOLAR IONIZATION EFFECTIVELY DISINFECTS AIR AND SURFACES. FOR THE PURPOSE OF THE COVID19 PANDEMIC IT IS MEANT TO SUPPLEMENT SOCIAL DISTANCING, MASK WEARING AND OTHER MANUAL METHODS, NOT REPLACE THEM.

Ted Flomenhaft – President

- Initial financier of Sonos Communication – among the 1st VoIP platform companies
- Launched EDGE FiberNet in 2015 NYC commercial connectivity/IT Consulting
- Launched EDGE Building Intelligence – **Platform-Neutral MTP Consultant** empowering owner/developers define and implement optimal integrated building system architecture in a normative construction process

Craig Getchell – Vice President Consulting

- Cisco Systems - Led Smart & Connected Real Estate Delivery – authored MTP adopted by Cisco
- Getchell Consulting – Leading Master Technology Planning Consultant
- Platformatics (PoE LED/IoT Integration) managed go-to-market initiative
- Molex Corp. (PoE LED/IoT Integration) managed go-to-market initiative

Dilip Limaye – SRC Global /On-Line Energy Manager Owner and EDGE Partner

- Senior Energy Advisor to World Bank; advised >60 power projects
- Developed USA's largest solar project >700Mw
- CEO/Owner On-Line Energy Manager, Inc. – ECORE patented technology for optimal energy efficiency of large commercial cooling systems.

Experienced Team

100+ Managed Projects

- Georgia Pacific –Atlanta, GA (Office Space)
- Morgan Stanley – New York, NY (Office Space)
- Bloomberg Center at Cornell - New York, NY (Ed.)
- 1000 Continental Drive – King of Prussia, PA (Office)
- Commonwealth Centre – Chantilly VA (Office Space)
- 18 Tremont – Boston, MA (Office Space)
- Floral Vale - Yardley Township, PA (Office Space)
- Alfa Aesar - Sparks, NV (Hazardous Chemical Storage)
- Charlestown HS - Boston MA (Education)
- Delta Hotel – Toronto, ON (Hospitality)
- Bremner Towner - Toronto, ON (Office Space)
- PWC 18 York St – Toronto, ON (Office Space)
- 551 West 21st St – New York, NY (Residential)
- Skybox 186-188 Eleventh Ave – New York NY (Residential)
- Southgate Towers – Miami, FL (Residential)
- CAF Banco DE Desarrollo – Caracas, Venezuela (Office Space – HQ)
- Chicago Lakeside District, Chicago, IL (Master Community Planning)
- MetLife – Cary, NC (Office Space)
- Palmetto Primary Care – Summerville, SC (Office)
- Barbizon63 – New York, NY (Residential)

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- Madison Centre – Seattle, WA (Office Space)
- Union Station – Toronto, ON (Transportation & Retail)
- Briar Lake – Houston, TX (Office Space)
- 100 Adelaide – Toronto, ON (Office Space)
- Devon Tower – Calgary, Alberta (Office Space)
- Dynamic Funds Tower – Toronto, ON (Office Space)
- 19 West 20th St – New York, NY (Residential)
- Health Education Campus – Cleveland, OH (HC & Ed)
- Oxford Properties (Portfolio Standards – Master Planning)
- Bank of Canada (Office Space)
- Neuberger Berman – New York, NY (Office Space – HQ)
- San Manuel Band of Mission Indians - Highland, CA (Community Planning)
- South Centre Mall - Calgary, Alberta (Retail)
- TD Tower – Edmonton, Alberta (Office Space)
- Humber River Regional –Toronto, ON (Healthcare)
- Halton Healthcare – Oakville, ON (Healthcare)
- CAMH Mental Health Centre - Penetanguishene, ON (HC)
- Regional Mental Health Centre - London, ON (Healthcare)
- Regional Mental Health Care – St. Thomas ON (HC)
- Darlington Refurbishment Complex – London, ON (HC)
- 801 Barton Springs – Houston, TX (Office Space)
- Market Street Landing, Seattle WA (Office Space)
- International Monetary Fund – Wash DC (Office Space-HQ)

RESTORE CONFIDENCE, ASSERT LEADERSHIP & DELIVER
THE CLEANEST, GREENEST & MOST COST-EFFICIENT BUILT SPACES

INITIATIVE DESIGNED FOR POSITIVE/NEUTRAL NET PROJECT COST

LARGE ENERGY
SAVINGS, REBATES &
TAX INCENTIVES PAY
FOR THE PROJECT

DISINFECT
SURFACES & AIR



ASSURES COMPLIANCE
WITH COVID-19 HVAC
FILTRATION
REQUIREMENTS

**COLLECT DATA FOR AI
and MACHINE
LEARNING
OPTIMIZATION AND
ADOPTION OF ECORE-
CI**

BPI VOC CONTROL

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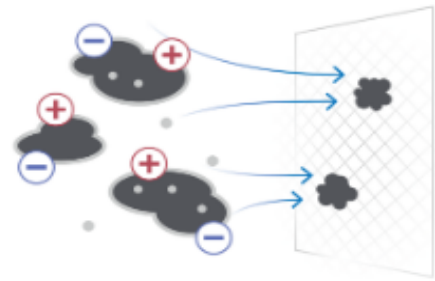
VOCs, Pathogens, Particles:



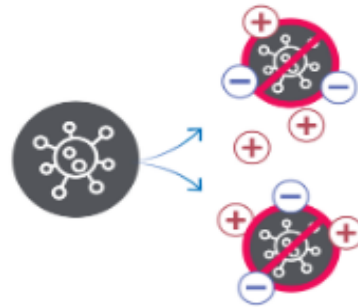
Volatile: vapor at room temperature **Organic:**
contains hydrogen & carbon **Compounds:**
more than one gas

- Natural & man-made
- We come into contact w/100's each day
- Human & non-human sources

BIPOLAR IONIZATION DISINFECTS HVAC IN-DUCT AIR IMMEDIATELY AND DISINFECTS ROOM SURFACES OVER TIME



Airborne particles are charged by the ions causing them to cluster and be caught in filters



As they divide to reproduce, bacteria and virus cells bond with oxygen ions and are



Odorous gases and aerosols oxidize on contact with oxygen ions and are neutralized

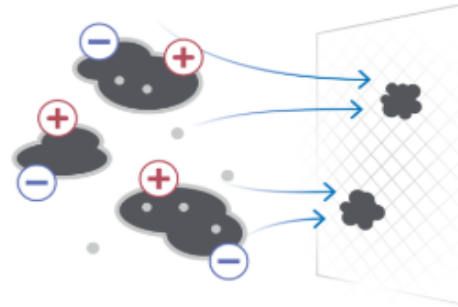


Oxygen ions cause a chemical reaction with VOCs breaking down their molecular structure

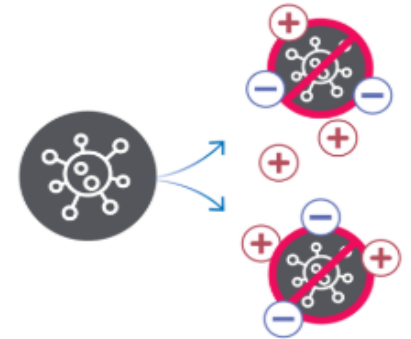
Positive and negative charged oxygen molecules in the air bond and effectively neutralize **particulate matter, bacteria, virus cells, odorous gases, aerosols and VOCs**. Charged particles attract, bond, deactivate and draw together forming clusters, which become heavy and drop out of the air.

BPI Air Cleaning and Virus Control

- Floods the air with millions of negatively and positively-charged O^2 molecules (ions) that attract, react and deactivate microbes and bond to particulates
- Particles bond into larger particles because of opposite charges,
- **Enhancing the effectiveness of static filters [MERV 8 -> MERV13]**
- No dependence on humidity levels
- Applied in occupied areas
- **OZONE FREE: Sub 12.00 Electric Control Voltage** [above 12.6ECV corona discharge yields ozone, formaldehyde and other new radicals].



Airborne particles are charged by the ions causing them to cluster and be caught in filters



As they divide to reproduce, bacteria and virus cells bond with oxygen ions and are destroyed



Odorous gases and aerosols oxidize on contact with oxygen ions and are neutralized



Oxygen ions cause a chemical reaction with VOCs breaking down their molecular structure

Ion Deficiency/Enrichment

- According to research conducted by Columbia University, Ion depletion can cause sleepiness, attention deficit, discomfort and headaches. These effects can be controlled by artificially increasing ion levels using needlepoint bipolar ionization.
- Ions are present naturally in the air and are found in the highest concentrations where the ocean meets the shore and high elevation in the mountains.
- The plasma process will artificially create the ions found in these desirable locations and supply them into the building, enhancing the indoor air quality.



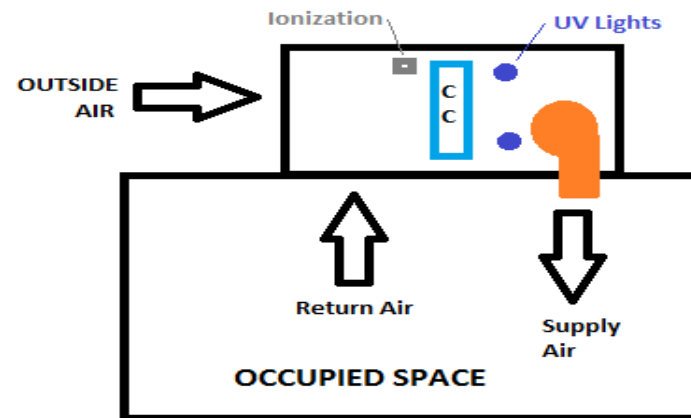
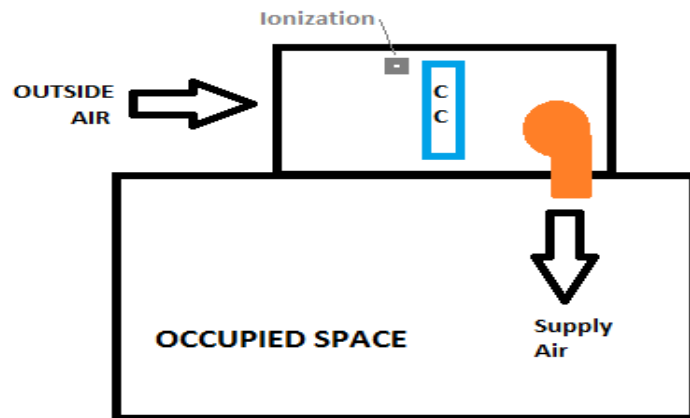
BPI Surface Sanitization Efficacy

Independent testing by world renowned EMSL & ATS Labs

Pathogen	Time Exposed	<u>Surface Kill</u> /Deactivation Rate
E.coli	15 minutes	99.68%
MRSA	30 minutes	96.24%
TB	60 minutes	69.01%
Noro Virus*	30 minutes	93.50%
Human Coronavirus**	60 minutes	90.00%
C.diff	30 minutes	86.50%

*Norovirus is not an enveloped virus and is harder to kill than COVID-19, an enveloped virus.

**Residential product with 40% less output used for first test



MERV 8 to MERV 13



- **“The ventilation systems need to meet certain standards, such as being at least MERV-13 or greater, to help prevent the virus from spreading”.**
- Gyms, large malls and other property types “at a minimum MERV-13, or industry equivalent or greater (e.g., HEPA), as applicable, and as certified and documented by a certified HVAC technician, professional, or company, ASHRAE-certified professional, certified retro-commissioning professional, or New York-licensed professional building engineer.” https://www.nny360.com/top_stories/impact-of-air-conditioning-circulating-covid-19-delays-reopening-of-gyms-malls-cinemas/article_df0cb870-f769-5784-8772-54e2a5a9f038.html

MERV 8 to MERV 13

NYS Reopening Standard Requires MERV 13 (required for General Surgery):

https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/Malls_Summary_Guidelines.pdf)

TABLE 1: APPLICATION GUIDELINES

MERV Std 52.2	Intended Dust Spot Efficiency Std 52.1 (1)	Average Arrestance	Particle Size Ranges	Typical Applications	Typical Filter Type
1 - 4	<20%	60 to 80%	> 10.0 µm	Residential/Minimum Light Commercial/ Minimum Minimum Equipment Protection	Permanent / Self Charging (passive) Washable / Metal, Foam / Synthetics Disposable Panels Fiberglass / Synthetics
5 - 8	<20 to 60%	80 to 95%	3.0-10.0 µm	Industrial Workplaces Commercial Better / Residential Paint Booth / Finishing	Pleated Filters Extended Surface Filters Media Panel Filters
9 - 12	40 to 85%	>90 to 98%	1.0-3.0 µm	Superior/Residential Better/Industrial Workplaces Better/Commercial Buildings	Non-Supported / Pocket Filter / Rigid Box Rigid Cell / Cartridge V-Cells
13 - 16	70 - 98%	>95 to 99%	0.30-1.0 µm	Smoke Removal General Surgery Hospitals & Health Care Superior/ Commercial Buildings	Rigid Cell / Cartridge Rigid Box / Non-Supported / Pocket Filter V-Cells

Note: This table is intended to be a general guide to filter use and does not address specific applications or individual filter performance in a given application. Refer to manufacturer test results for additional information.

(1) ANSI/ASHRAE 52.1 ranges are provided for reference only. The ANSI/ASHRAE 52.1 Standard was discontinued as of January 2009.

MERV 8 to MERV 13

NYS Reopening Standard Requires MERV 13 required in General Surgery:

https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/Malls_Summary_Guidelines.pdf)

- Changing to MERV 13 from MERV 8 would add 15% to static pressure & HVAC energy spend
- HVAC infrastructure will run harder
- Increase maintenance frequency and cost
- Lower HVAC life expectancy

or...

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MERV 8 + BPI => MERV 13

NO STATIC PRESSURE CONSEQUENCES

Test Results

- 1 It was determined that the 1" MERV 13 Panel filter reduced particle count from 2,730,958 to 808 particles in a timeframe of 34 minutes.
- 2 It was determined that the 1" MERV 8 Panel filter with GPS Technology reduced particle count from 3,645,943 to 745 particles in a timeframe of 16 hours.
- 3 It was determined that the 1" MERV 8 Panel filter with GPS Technology reduced particle count from 2,753,181 to 745 particles in a timeframe of 15 hours - 40 minutes in comparison to the MERV 13 at 34 minutes.

Quantitative Results

MERV 13 Filter

Elapsed Time, Min.	Microns								# total Particles	#/cm3 Concentration
	0.30	0.40	0.55	0.70	1.00	1.30	1.60	2.20		
4	1805492	738537	144867	40941	865	153	96	3	2730958	2730
34	636	101	25	23	8	5	2	5	808	0.81

MERV 8 Filter with GPS Technology

Elapsed Time, Min.	Microns								# total Particles	#/cm3 Concentration
	0.30	0.40	0.55	0.70	1.00	1.30	1.60	2.20		
5	1958081	1222632	332433	129698	2610	341	136	6	3645943	3645
19	1876059	736434	117644	22892	116	11	20	5	2753181	2753
16 hours	619	90	12	17	2	1	2	2	745	0.74

- NPBI requires little maintenance
- No replacement parts
- Life expectancy is greater than 10 years

BPI BENEFITS



Particle Reduction – Technology makes particles clump together and a lower efficiency filter can capture them from the air



Odor Control – Odors, volatile organic compounds and the like are oxidized to gases already prevalent in the air such as oxygen, nitrogen, water vapor or carbon dioxide, eliminating the odors



Pathogen Control – Independent testing by CDC Affiliate Labs confirms kill rates as high as **99.9%** of various pathogens and mold spores. Keeps new cooling coils clean and cleans up old coils.



Energy Savings by Outside Air (OA) Reduction – By cleaning indoor air and recirculating it – Less Outside Air is required. **Less OA = Less Load on Cooling/Heating System – ASHRAE 62 & IMC Compliant**



Holistic - According to research conducted by Columbia University, Ion depletion can cause sleepiness, attention deficit, discomfort and headaches. BPI supplies buildings with the same ionized air found in desirable places such as the seashore and atop mountains enhancing and enervating the indoor air quality.

Energy Saving Implications

- ✓ Building air is replaced with outside air (OA) every 10-25 minutes = 2.5-5 times every hour the air volume of a property needs to be cooled or heated to thermostat temperature.
- ✓ Typically 80-100% of intake is outside air (OA)
- ✓ BPI permits lowering OA quotient from 80-100% to 10%-33% depending on occupancy, reducing the amount of outside air that needs to be thermally conditioned by more than one-half, for a minimum Energy Savings of 35%.

BiPolar Ionization, IAQ and Demand Controlled Ventilation

- ANSI/ASHRAE Standards 62.1 and 62.2 are the standards for ventilation system design and acceptable indoor air quality (IAQ).
- The most typical strategy for meeting ASHRAE standard for indoor air quality (IAQ) is the “**Ventilation**” method = 80-100% outdoor air (OA) for all ducted air entering the space.
- By implementing BPI, under ASHRAE 62.2, properties may transition to the **IAQ Method** which results in reducing outside air to <35%
- **Demand Control Ventilation** – creates the opportunity reduce reliance on OA to as little as 10% during non-peak operations.
- **By reducing OA the energy used to cool or heat air is reduced proportionately while meeting ASHRAE’s requirements for IAQ.**

VENTILATION METHOD

35-80% of building air is replaced every 10 minutes – 2.5- 5 times every hour the entire air volume of a property needs to be cooled or heated.



**INSIDE
AIR**

**OUTSIDE
AIR**

IAQ METHOD

Disinfecting the air permits lowering the outside air ratio under the ASHRAE IAQ Method to 35%, requiring 2.2x the volume during peak hours.



**INSIDE
AIR**

**OUTSIDE
AIR**

IAQ w/ DEMAND CONTROL

During off-peak hours, using **Demand Control Ventilation**, outside air ratio may be lowered to 10% or less requiring OA of 1/2x the building's volume.

CO₂ levels are calibrated to assure an oxygen rich environment.

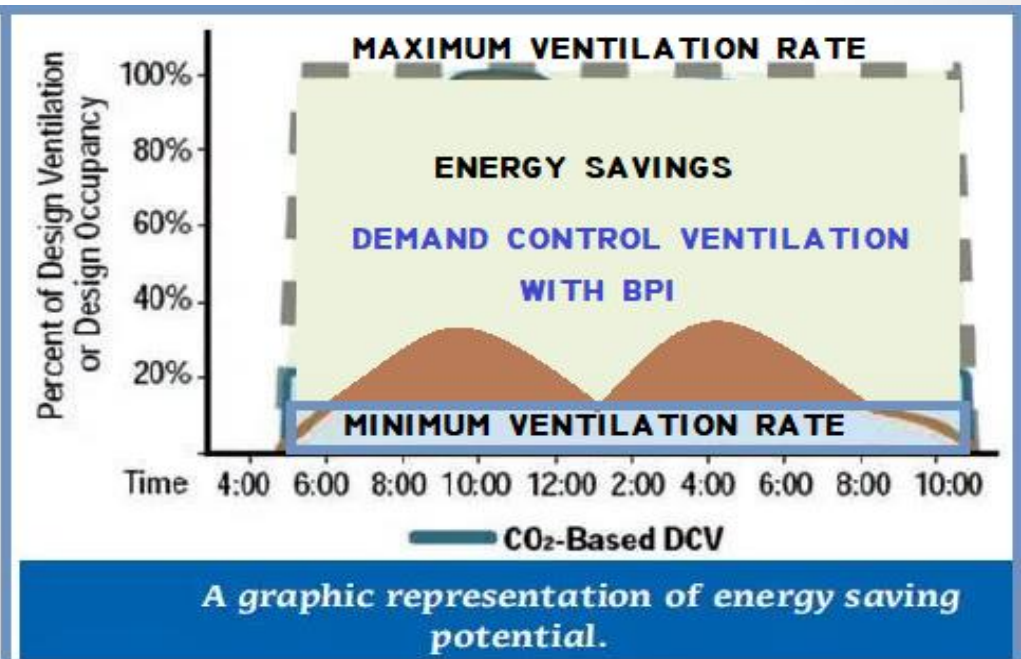
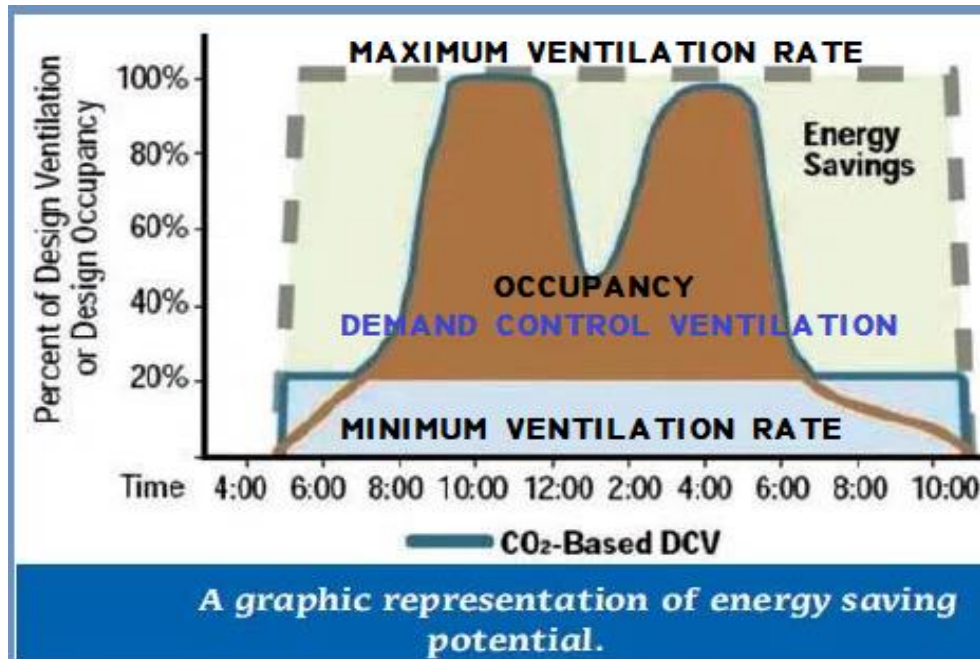


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**OUTSIDE
AIR**

During off-peak hours, using **Demand Control Ventilation** the outside air ratio may be lowered to <10%.



IAQP: *its about the economy...*

BiPolar Ionization & Demand Controlled Ventilation

- First Cost Savings = \$1.00-\$2.50/ft²* (new construction)
- Annual Energy Savings = \$0.40/ft²**
- Typical 5-year amortization @ 5% = \$0.35/ft²
- Energy Rebates can range between ½ of project cost to 1-year energy saving equivalent

**ENERGY SAVINGS WILL COVER ALL, MOST or MORE THAN the FINANCING COST
FOR A \$0 CASH-FLOW CONSEQUENCE**

*First cost savings

**Energy savings

USE NPBI

Hospitals

- ✓ NY Presbyterian, NYC
- ✓ Mayo Clinic, Rochester, MN
- ✓ Children's Hospital, Boston
- ✓ Cleveland Clinic, Westin, FL
- ✓ University of Miami Medical Center
- ✓ Tulane Medical, New Orleans
- ✓ Methodist Hospital, Houston, TX
- ✓ Anderson Medical Center, Houston, TX

BiPolar Ionization & Demand Controlled Ventilation

- ✓ Baylor College of Medicine, Houston, TX
- ✓ Winn Army Hospital, Ft. Stewart, GA
- ✓ Duke Medical, Raleigh, NC
- ✓ Banner Healthcare, Phoenix, AZ
- ✓ Al Dupont Hospital, Wilmington, DE
- ✓ Abbott NW Heart Hospital, Minn, MN
- ✓ Women's Hospital Greensboro, NC
- ✓ Cleveland Clinic, Cleveland Ohio

Healthcare Applications Include:

- Odor Control – BPI can be used as a Substitute for Carbon
- Coil Cleaning – BPI can be used as a Substitute for UVC
- Pathogen Control – BPI can be used to kill* pathogens in the air and on surfaces
- Particle Reduction – BPI will decrease particles in the space due to agglomeration
- Static Control – BPI will reduce static electricity in the space
- Face Mask Efficiency – Increased space ion levels increases face mask efficiency

*Deactivates virus

The White House

BiPolar Ionization



USE NPBI

Valencia College – 3 Green Globes

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Independent Testing Results:

0 Bacteria - 0 Fungi Throughout Entire Depth
Of Cooling Coil

Indoor VOCs < OA VOCs!
No E/A Fans No DCV
No Relief Fans

BiPolar Ionization for Cleaning Coils



Higher Education

BiPolar Ionization & Demand Controlled Ventilation



SMU



HARVARD
UNIVERSITY



THE UNIVERSITY of
TULSA



Yale University

Virginia
Tech
1872



CLEMSON
UNIVERSITY



Tulane
University

USE NPBI

Google Chicago & San Jose

BiPolar Ionization &
Demand Controlled Ventilation



*Throughout
Facility*



USE NPBI

Presidential Palace
Abu Dhabi - \$490M Project –
2M sqft

BiPolar Ionization & Demand Controlled
Ventilation



**277 AHU's with Ion Bars in each, Averaging 4,000-
10,000 CFM 4,000 tons total chiller load**

Airports

BiPolar Ionization & Demand Controlled Ventilation

Phoenix Skyharbor



Orion Jet Center

Design and Delivery

- ✓ Needlepoint Bi-Polar Ionization for rapid, low cost implementation
- ✓ Design & Delivery:
 - ✓ EDGE team designed and led more than 100 projects
 - ✓ 2 EDGE-partnered Int'l MEP firms, including Gannett Fleming
<https://www.gannettflaming.com/> at the ready for rapid ubiquitous deployment
- ✓ Financing available
- ✓ Cash flow neutral implementations + rebate