



# AirROS

Integrated Air Purification & Surface Sanitation Technology

*REVOLUTIONARY WORLD LEADING PATENTED INFECTION CONTROL TECHNOLOGY*



# AirROS Technology: What does it do?

- **Significant reduction of Bacteria, Moulds & Viruses**

- 90% and above bio-burden through dual impact on air and surfaces
- 80% and above reduction in Listeria, E coli, Salmonella within 4-8 hrs
- 90% reduction of Coronavirus in < 4 min
- 99.99% reduction of Coronavirus in < 15 min
- 99.99997% reduction of Coronavirus in < 30 min
- 100% non detectable in < 45 min

- **Safer & Cleaner Environments**

- 90% and above decrease of coronavirus on surfaces in < 4 min
- Everywhere the air touches is sanitized

- **Effective Odour Reduction**

- Clean smell in healthcare, gyms, hotel rooms, production facilities, common areas, bathrooms

Cleaner Facilities, Safer Foods & Safer People

# AirROS TECHNOLOGY

## Real World Benefits:

- Destroys viruses such as Coronavirus, Influenza, H1N1
- Destroys pathogens such as: mRSA, Botrytis, E.coli, Listeria, Salmonella, Serratia, Marcescens, Candida, and Powdery Mildew
- Reduces HAI Risk (Healthcare-Associated Infections)
- Defend against virus spread and contagion through complete air and surface disinfection 24/7
- Ensure safe sanitized PPE (personal protection equipment) for employees
- Avoid exposure to litigation and related costs
- Provides better sanitation in hard-to-reach areas
- Lowers cost of sanitation with measurable results and lower labour costs
- Increases Marketing and Brand awareness with SAFE environment
- Reduces Cross-Contamination
- Provides Odour Control / smoke removal
- Destroy off-gas odour from rubber mats in facilities & Fitness Clubs
- AirROS by SAGE Industrial provides the latest in science and technology to quickly and effectively sanitize all indoor areas the air touches - including all surfaces

# AirROS TECHNOLOGY *“Raising The Standard”*

- New “GOLD” Standard for infection control technology. Simultaneous air purification and surface sanitation 24/7
- Electro-mechanical devices for industrial and commercial settings
- Will treat / sanitize a space / environment from 7m<sup>3</sup> to over 28,000m<sup>3</sup> cost effectively
- Uses the ambient air already in the room to create ROS. **(Reactive Oxygen Species)**
- Virtually ALL the beneficial characteristics of other air purification devices in one unit without the drawbacks
- UV light from chamber
- Charging of air particles
- O<sub>3</sub>, but at safe levels (30ppb)
- Cleans not only air passing through the internal reaction chamber but employs secondary sanitizing agent Trioxidane-H<sub>2</sub>O<sub>3</sub> in the room to clean/sanitize surfaces
- ROS produced by AirROS purifiers are well documented for their ability to destroy viruses, mould, mildew, bacteria, yeast, odour and other VOC’s in the air and on surfaces
- Once the ROS clean the air, they return to an oxygen state, so they are 100% ORGANIC, leave no residue, and there are no harmful by-products of the ROS generation process
- Continual process with re-contamination from outside sources immediately addressed
- Can operate at high (up to 90% RH) or low humidity, and from 0 to 38°C
- Over 14 years of experience with many independent tests in over 1200 companies and in such uses as agricultural storage, food-production facilities, trucks, containers, grocery stores, meat-packing and poultry plants, health clinics, etc
- Validated by internal and external experts in laboratory and real-world settings
- All units have control measuring – and - monitoring systems to assure effectiveness and safety
- Meets all OSHA and USDA safety requirements
- Patented and unique – there are NO other systems that use the AirROS science and technology
- Made in the USA

# Value Framework All Facilities - in room

<b>Positive Business Outcomes</b>	<p>Reduce the risk of safety related issues that can permanently damage brand reputation and consumer confidence</p> <p>Meet requirements of Government inspectors by implementing a validated safety intervention</p> <p>Staff and customer safety and well-being 24/7</p>
<b>Required Capabilities</b>	<p>System must be validated as consistently attaining a significant reduction on the treated area and product surfaces. Record keeping must also show continued effectiveness of the system</p> <p>Provide additional environmental control to support existing SOP's</p>
<b>Metrics</b>	<p>Lab validation and in plant verification will demonstrate a 35%+ reduction in CFU/m3 in the plant air and/or 1 log reduction of surrogates on product surfaces</p>
<b>How we do it</b>	<p>By installing 4000 series units in critical areas we will see the above reductions without any operator involvement or training; only basic maintenance and record keeping</p>
<b>Differently</b>	<p>AirROS can be applied in different stages of the process without downtime, it is always running in the background</p> <p>Standard ozone systems cannot be used when operators are present, unlike the AirROS system</p> <p>As a site generated sanitation technology, AirROS is very cost effective on a per head basis</p>
<b>Proof Points</b>	<p>Tyson Fresh Meats</p> <p>POM Wonderful</p> <p>Curaleaf</p>

**AirROS™**

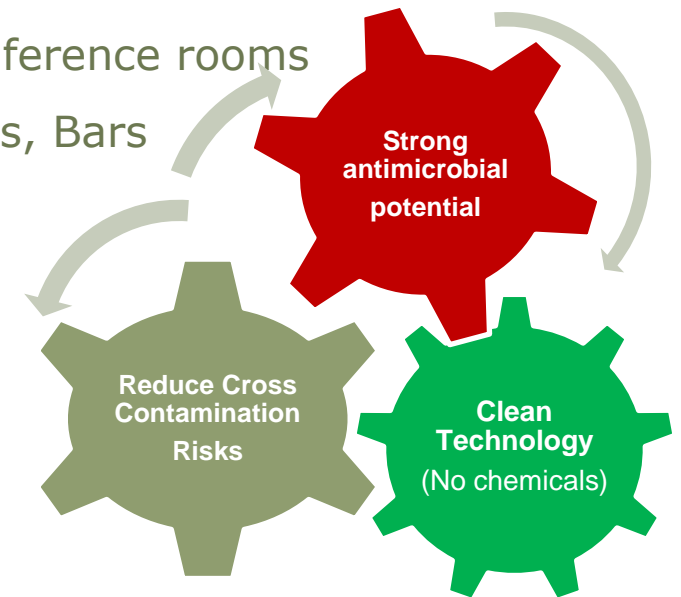
## Environmental applications

The AirROS technology enhances sanitation by generating anti-microbial compounds in gas form allowing the sanitizer to reach every surface in the plant and also eliminate airborne particles as a vector for bacterial contamination.



- ✓ Medical – Hospitals, Doctors, Dentists, Physios
- ✓ Agriculture – Glasshouse, Packhouses, Cold storage
- ✓ Education – Universities, Schools, Daycare
- ✓ Sports – Gyms, Locker rooms, etc.
- ✓ Hospitality – Hotels, Motels, Conference rooms
- ✓ Retail – Malls, Restaurants, Cafes, Bars
- ✓ Offices – Common areas
- ✓ Casinos – Common areas

**CONTINUOUS PROTECTION IN THE  
BACKGROUND, NO DOWNTIME**



# AirROS™

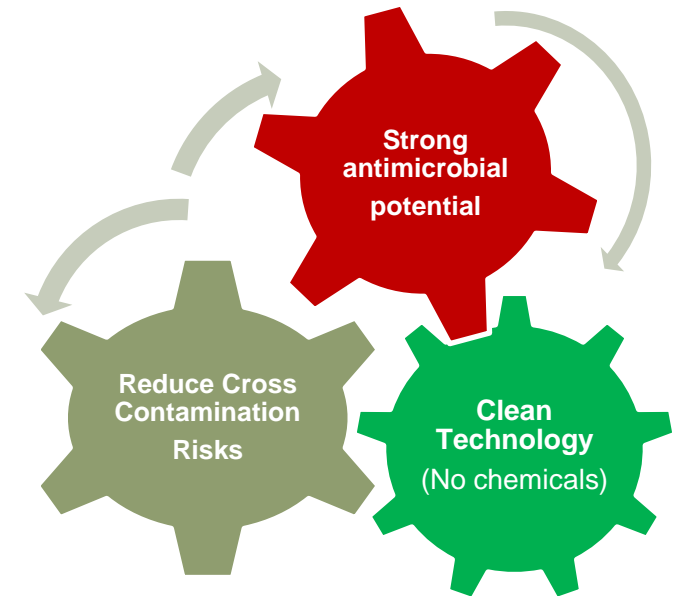
## Food Processing applications

The AirROS technology enhances sanitation by generating anti-microbial compounds in gas form allowing the sanitizer to reach every surface in the plant and also eliminate airborne particles as a vector for bacterial contamination.

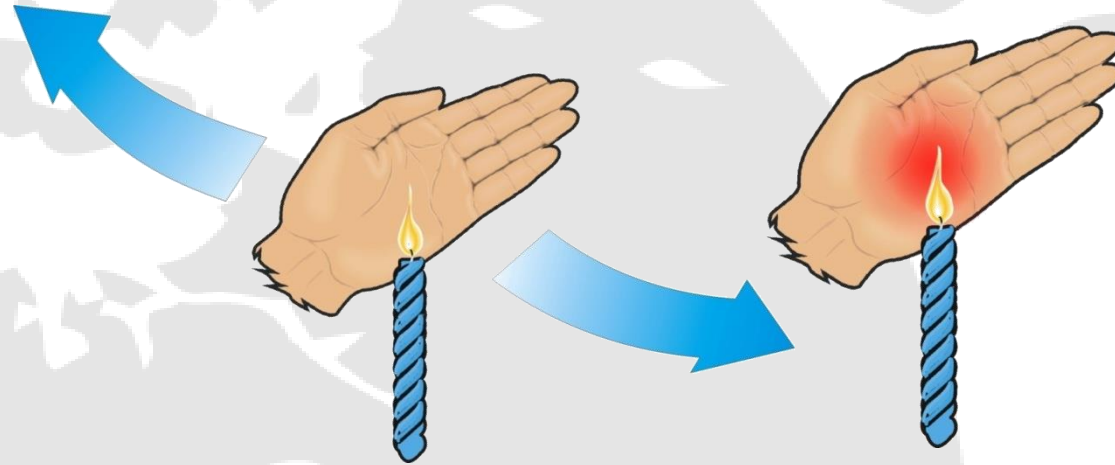


- ✓ Processing and packaging areas
- ✓ Holding areas
- ✓ Rendering areas
- ✓ Slaughter areas
- ✓ Tempering Coolers
- ✓ Dry aging

**CONTINUOUS PROTECTION IN THE  
BACKGROUND, NO DOWNTIME**



## NOT a UV Light system

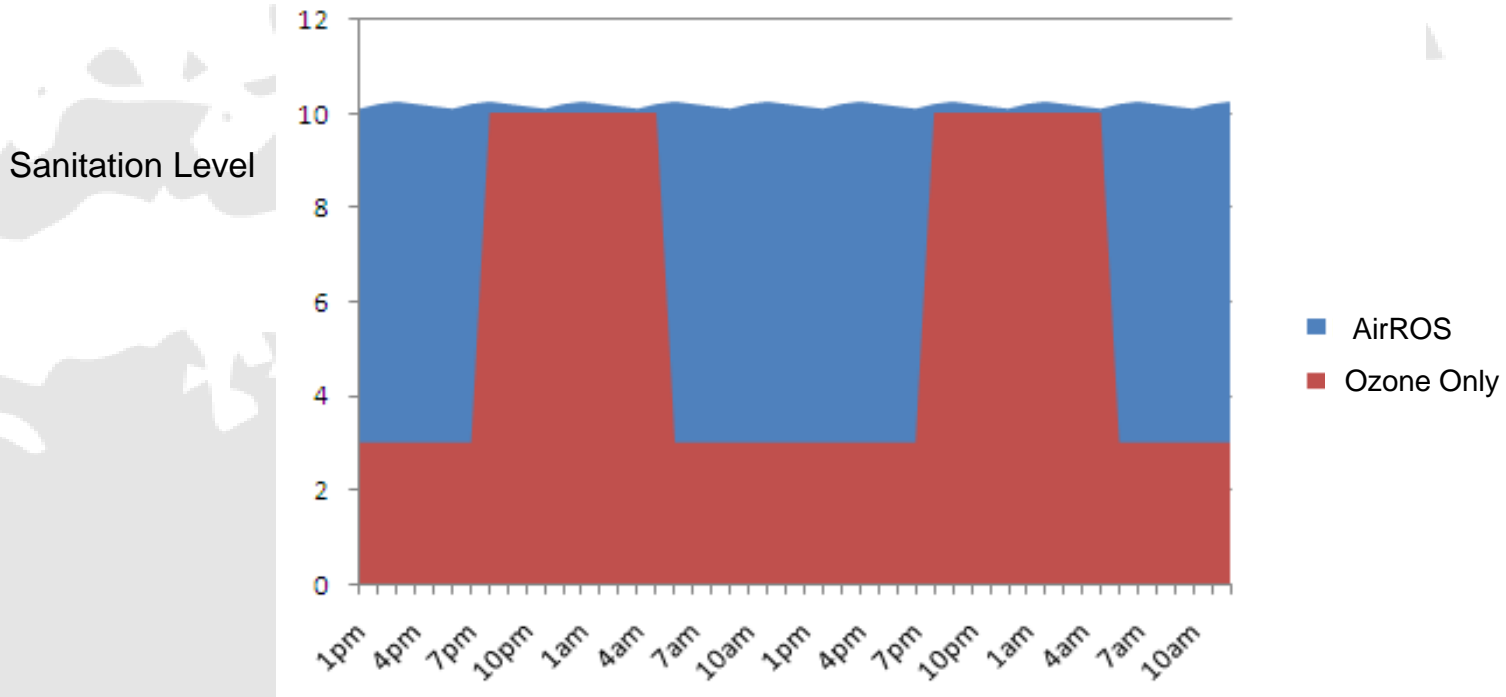


- Common UV technology is a line of sight technology – For it to be effective, the light needs to be in very close proximity to the area being treated and the UV rays need a substantial amount of time to be effective.
- The AirROS purifier utilizes air to sanitize and is effective everywhere air is – e.g. food contact & non-food contact surfaces, product, air, coils, handles, equipment, etc.



How We Do It Different and Better:

Safer and more consistent than an ozone generator

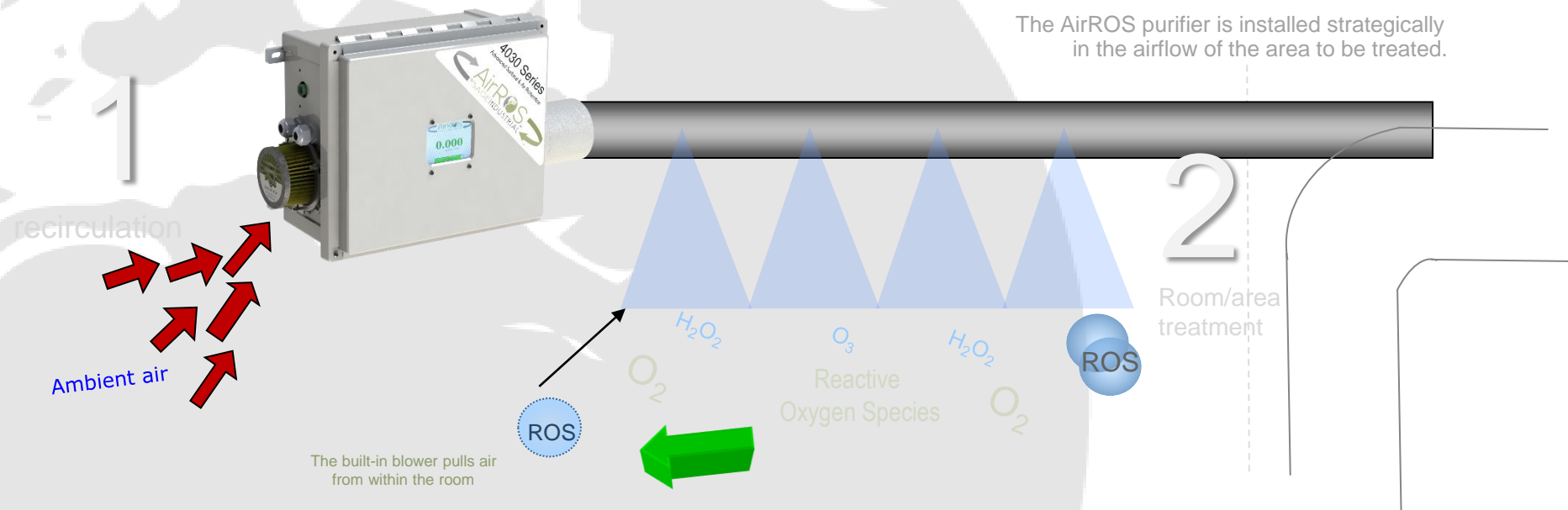


- AirROS provides consistent levels of sanitation over the course of a work day. (7 ROS/sanitizing agents)
- Ozone can only provide the commensurate level of sanitation at unsafe levels for people to work in. (only 1 sanitizer at a high level)

# Environment Management System (AirROS)

## How We Do It:

Using ambient air and electricity, the AirROS Surface and Air Sanitation technology transforms oxygen molecule into ROS (Reactive Oxygen Species) in a non-thermal plasma chamber. These react with organic molecules such as mould, bacteria, viruses, and ethylene inactivating them by breaking down structural molecules.



The equipment draws air in and creates the Reactive Oxygen Species (ROS). Short lived highly reactive ROS react with organic compounds such as bacteria, mould and ethylene inside the reaction chamber thereby inactivating them.

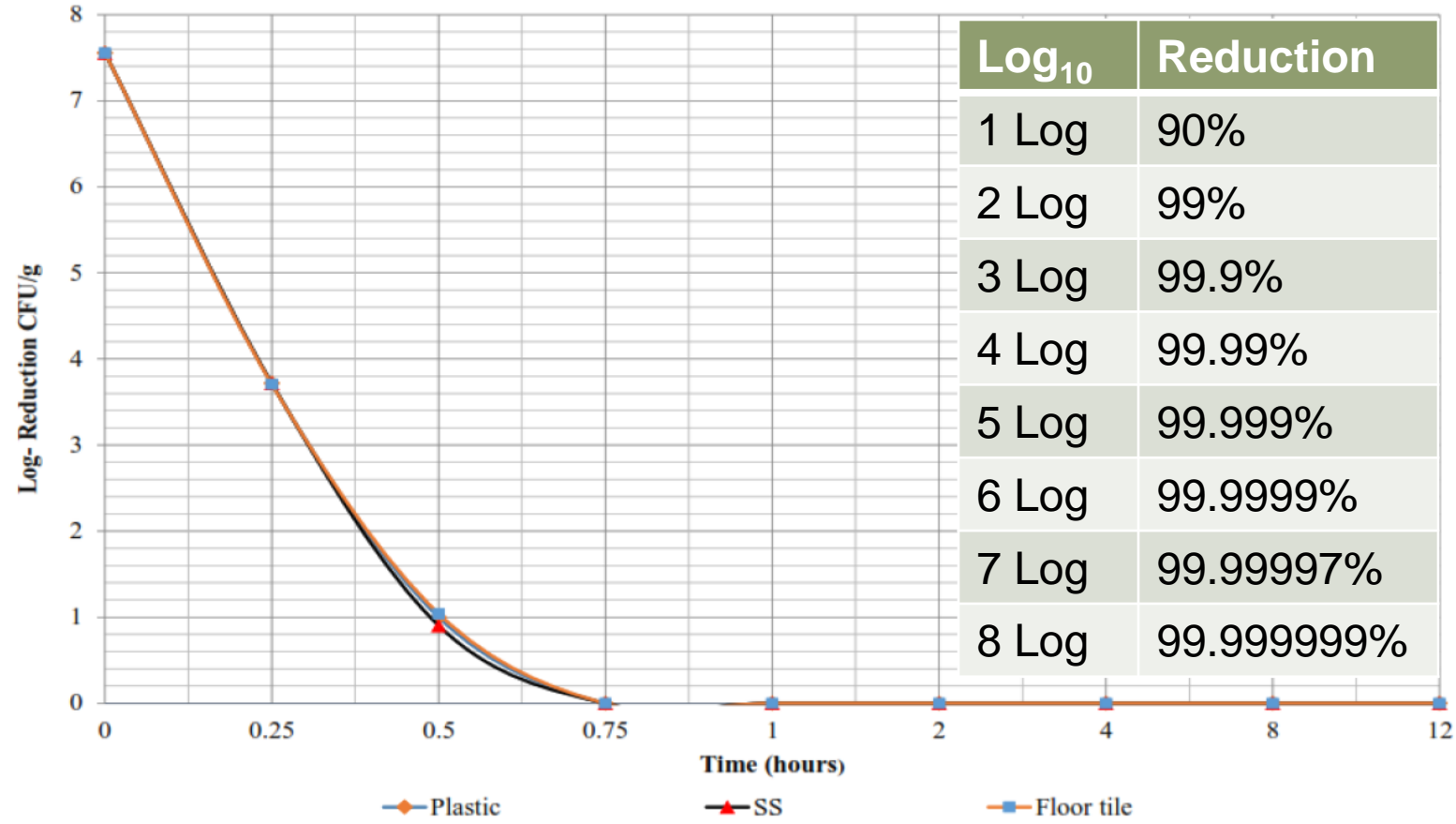
The more stable ROS are distributed into the environment through a diffusion system (working with existing air flow), where they sanitize and treat the air and the surfaces in the area where the equipment is installed.

# ROS (Reactive Oxygen Species)

- Short Lived:
  - $\bullet\text{OH}$  (Hydroxy Radicals)
  - $^1\text{O}_2$  (Singlet Oxygen)
  - $\text{O}_1^-$  (Superoxide)
  - $\text{O}(3\text{P})$  (Atomic Oxygen)
  - $\text{ONOO}^-$  (Peroxynitrite)
- Long Lived
  - $\text{O}_3$  (Ozone)
  - $\text{H}_2\text{O}_2$  (Hydrogen Peroxide)
- Bonus:
  - $\text{H}_2\text{O}_3$  (Trioxidane / Hydrogen Trioxide)

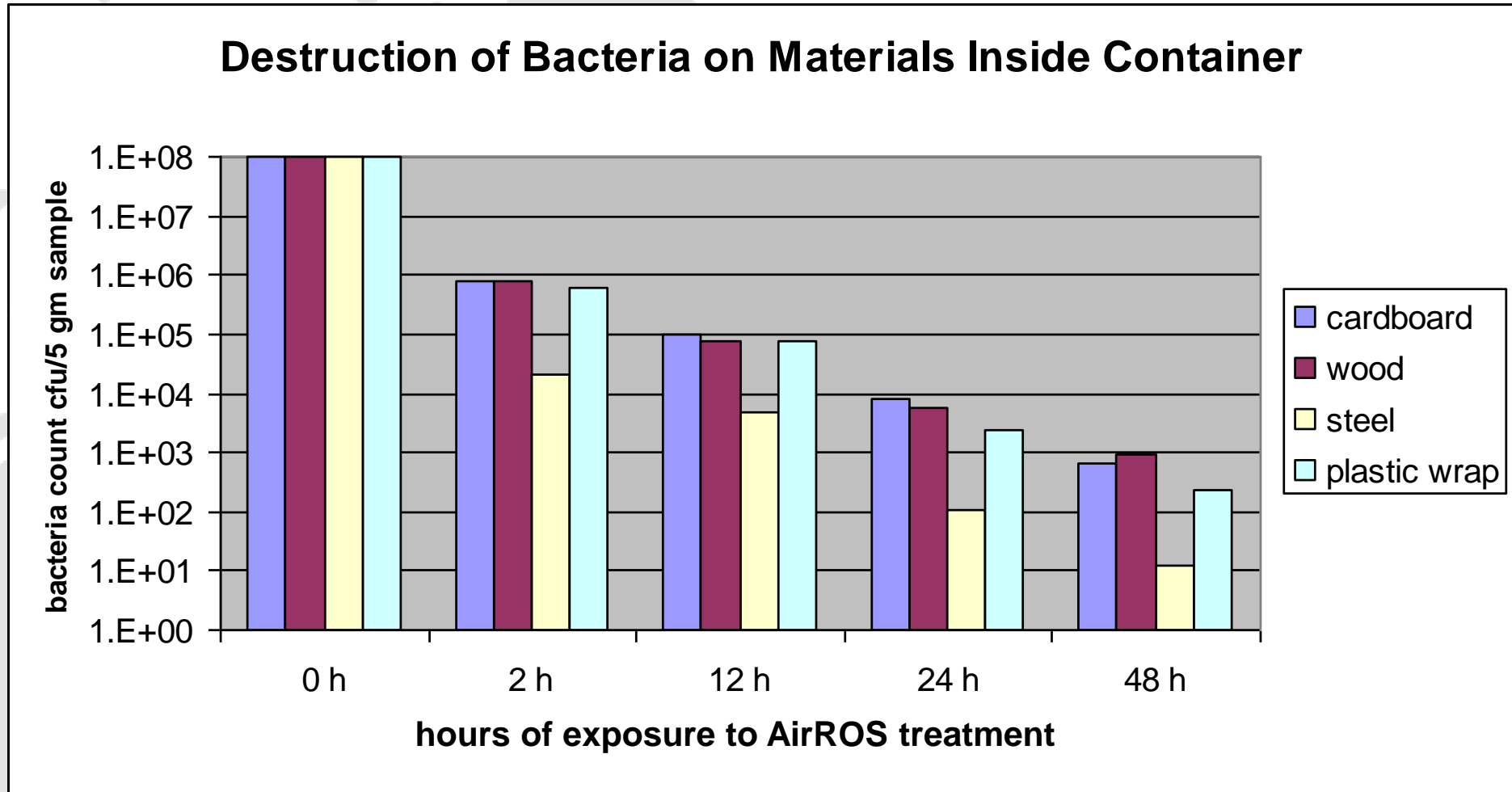
# Multi-Surface Effectiveness

*Human Coronavirus OC43*  
On Various Coupons Over Time  
AirROS Series 4000



90% reduction in virus count in <4 minutes

# Multi-Surface Effectiveness



99% reduction in bacteria count in 48 hours

# Bio-Burden\* Reduction Analysis\*\*

Area	Microbe Count					Total Reduction
	Day 1	Day 10	Day 17	Day 23	Day 30	
Produce Cooler	290	130	80	20	8	97%
Dairy Cooler	513	40	16	13	5	99%
Deli Cooler	140	140	13	8	5	96%
Meat Cooler	464	104	58	26	19	96%
Food Court	450	80	70	20	16	96%
Food Court Cooler	260	100	80	40	5	98%
Flower Cooler	160	160	80	60	20	88%

**Unacceptable**

**Marginal**

**Acceptably Clean**

\* Bioburden is the sum total of the living microbial organisms in a defined space.

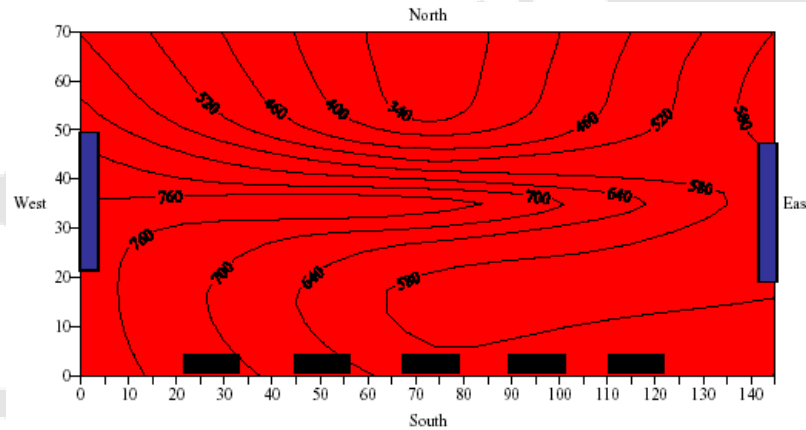
\*\*Combined results from a large wholesale club store

96% reduction on average over various applications

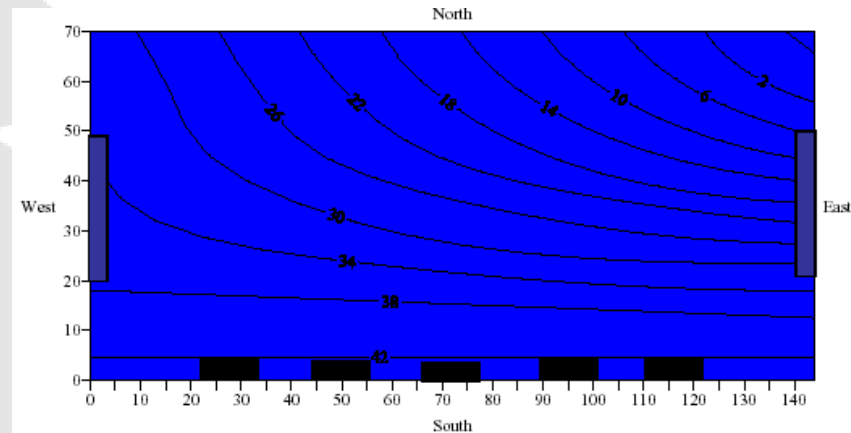


# Cold Storage Impact

## Colony Forming Units / Cubic Meter of Air



Before Installation



After Installation

Sample Date	Activity	Days of Treatment	Average cfu/m <sup>3</sup>	Range	Standard Deviation	Percent Reduction
10-22	Low	Pre-Treatment	509	240 - 880	231.9	-
12-28		28	17	<10 - 80	31.5	96.7

Contamination Level  
HIGH (red)- LOW (blue)

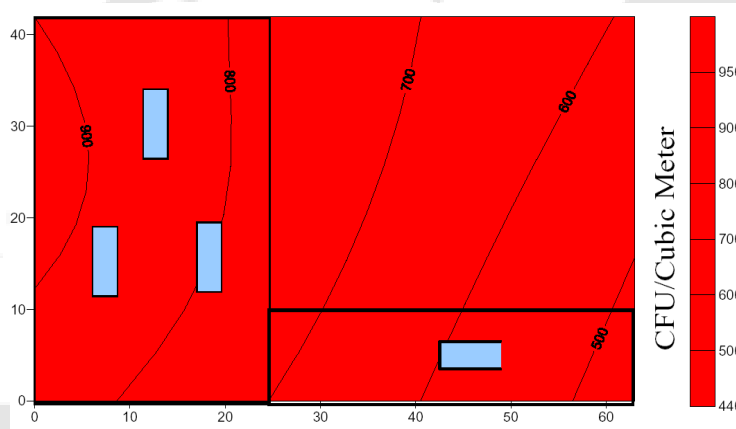


Source: Dec 06 test results with major North American grower-shipper

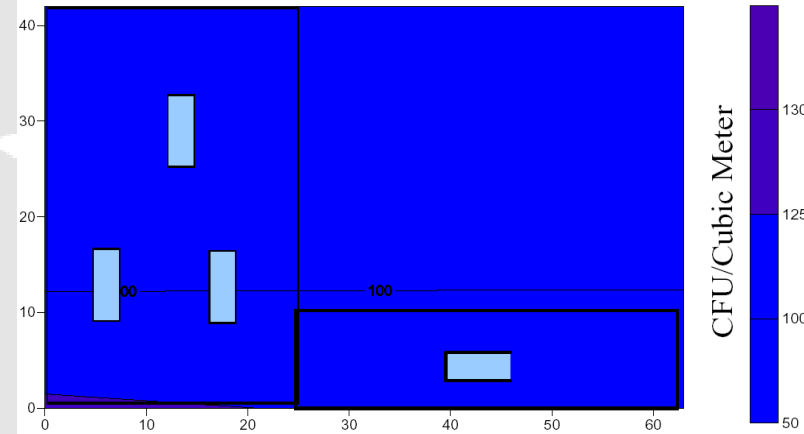
Over 96% Reduction in Contaminants

# Fast Food Restaurant Impact

## Colony Forming Units / Cubic Meter of Air



Before Installation



After Installation

Sample Date	Location	Treatment	Average cfu/m <sup>3</sup>	Range	Standard Deviation	Percent Reduction
2/7/07	Site 1 <small>(See below)</small>	Pre-treatment	242	80 – 480	126.7	-
3/13/07		Post-treatment	84	20 – 180	49.8	65.0
4/3/07			20	0 – 40	28.9	91.7



Source: July 06 test results with major North American retail chain

Over 91% Reduction in Contaminants



# AirROS Technology: 3<sup>rd</sup> Party studies



Research Brief

## Effect of AirROS Series 4000 for Control of Human Coronavirus on Various Inoculated Surfaces<sup>1</sup>

### ABSTRACT

The novel human coronavirus SARS-CoV-2 has become a global health concern causing severe respiratory tract infections in humans. Transmissions, Human-to human have been described, perhaps via coughing/sneezing droplets but also possibly via contaminated hands or surfaces. In a recent review on the persistence of human and veterinary coronaviruses on inanimate surfaces it was shown that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronavirus (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days.

Human coronavirus is an enveloped, positive-sense, single-stranded RNA virus which enters its host cell by the ACE2 receptor. Infection with the virus has been confirmed worldwide and has an association with many common symptoms and diseases. Associated diseases include mild to moderate upper respiratory tract infections, severe lower respiratory tract infection, pneumonia and bronchiolitis. The virus originates from a bat but a small to medium-sized seven known coronaviruses including HKU1, MERS-CoV, the original SARS-CoV, and the virus that causes coronavirus disease 2019 (COVID-19) are also known to be present on surfaces, according to UCLA and Princeton Universities found that severe acute respiratory coronavirus 2 (SARS-CoV-2) was stable for up to three hours on plastic and stainless steel surfaces, and for up to three days on floor tile.

The virus that causes coronavirus disease 2019 (COVID-19) is a novel coronavirus, according to UCLA and Princeton Universities found that severe acute respiratory coronavirus 2 (SARS-CoV-2) was stable for up to three hours on plastic and stainless steel surfaces, and for up to three days on floor tile.

This study will analyze the inactivation of Human Coronavirus OC43 on various surfaces (Plastic, Stainless Steel, and Floor Tile) at 20°C (68°F) and a relative humidity of 20-80% over 12 hours. A self-heating methodology (RSM) in this study will analyze the inactivation effects of AirROS Series 4000 on various surfaces (Plastic, Stainless Steel, and Floor Tile) over 12 hours. The inactivation effects of AirROS Series 4000 on various surfaces (Plastic, Stainless Steel, and Floor Tile) over 12 hours. The inactivation effects of AirROS Series 4000 on various surfaces (Plastic, Stainless Steel, and Floor Tile) over 12 hours.

<sup>1</sup> Mention of trade names or commercial products does not constitute an endorsement or approval by the Food Safety and Inspection Service of the quality or value of the product named, nor does it imply that the products mentioned are necessarily the best available.

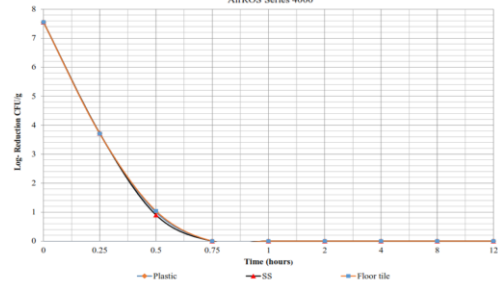


TABLE 1. Human Coronavirus OC43 populations following treatment with AirROS system.

Time	Plastic			Stainless Steel			Floor Tile		
	CFU/g Log <sub>10</sub> CFU	Standard Deviation	Reduction	CFU/g Log <sub>10</sub> CFU	Standard Deviation	Reduction	CFU/g Log <sub>10</sub> CFU	Standard Deviation	Reduction
0	36,000,000 7.56	0.3	-	36,000,000 7.56	0.3	-	36,000,000 7.56	0.2	-
15-m	5,200 3.72	0.1	3.84	5,000 3.70	0.2	3.84	5,100 3.71	0.1	3.85
30-m	10 1.00	0.1	6.56	8 0.90	0.1	6.65	11 1.04	0.1	6.51
45-m	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56
1-h	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56
2-h	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56
4-h	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56
8-h	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56
12-h	<1 0	0.1	7.56	<1 0	0.1	7.56	<1 0	0.1	7.56

### GRAPHIC REPRESENTATION OF RESULTS

Human Coronavirus OC43  
On Various Coupons Over Time  
AirROS Series 4000



Side by Side Spectral test Sativa (South African Rose) using standard cultivation processes and AirROS by SAGE Industrial Corp.

Emerald Metrics Spectral Test

Sage Industrial AirROS 4000

Chris Rushing

Week 11  
3-30-2020

Imager 18 showing spectral and filtered RGB image. The AirROS unit eliminated disease in the room. This image shows no disease or damage which is unusual for a standard operation.

11

# Certifications



## OSHA/WHO/ACGIH

Worker Safety

OSHA 24 hour average exposure limit 0.050ppm  
WHO Ozone 8 hour mean daily max 0.050ppm  
ACGIH Ozone Heavy Work Limit 0.050ppm



## FDA

GRAS

FDA issued (June 26, 2001) a GRAS (Generally Regarded As Safe) statement as to the use and application of ozone in food processing. FDA's FSMA (Food Safety Modernization Act) is transforming the nation's food safety system by shifting the focus from responding to foodborne illness to preventing it.



## UL / CE/ UKCA / RCM

Electrical

Electrical Safety and certifications

# Certifications



**EPA**

Worker Safety

EPA has standards for assuring that any equipment being sold as an Ozone generator for use in the food processing arena have an EPA Establishment Number and that the entity files an annual report disclosing manufacturing and marketing of products in the U.S. and elsewhere.



**Organically Approved**

The AirROS purifiers meet all organically approved regulations.



**USDA**

Safe for Food Processing

USDA followed the FDA publication in December 2001 with its own regulation allowing for uses in meats and poultry.





## Installation and Service



Sustain Performance through Periodic Maintenance

## FAQ:

- Q What is typical Ozone levels outside?  
A. 70-100ppb is normal here
- Q Then why just not let the outside air in?  
A. Ozone is not effective at low levels by itself  
A. The general bacteria levels (CFU's) are high outside. 1000-5000CFU
- Q Is it dependent on the number of air exchanges in the room?  
A. Turning the air is important, but because our purifier has ROS that enter the room, the exchange rate is not critical
- Q What is the CFM of your purifier?  
A. 40-120CFM depending on the model. This is not an important specification as our cleaning is done in the environment regardless of whether the air was exchanged through our unit or not
- Q If it's discharging into the air return in an HVAC system, does it help with or hinder the distribution of the ROS?  
A. It hinders. The ROS has to go through the conditioning system and supply before it enters the environment. The return is typically hotter than the supply and would break down the ROS faster. Our goal is to treat the surfaces and air in the environment, not the ducting

## FAQ:

Q Is there any advantage or disadvantage on this going through a tube for distribution?

A. It depends on the application. The tubing should be non-restrictive and tap into the HVAC supply, or be positioned in front of a fan to ensure even diffusion of the ROS.

Q Once we hit saturation in the room and we have a good solid distribution of ROS in the room and somebody comes in and sneezes in the room what happens?

A. The air surrounding the sneeze would start to attack the pathogens, and any that lands on surfaces would then be sanitized by the ROS.

Q Looking at the ability to turn tables at a restaurant, is it safe to say we can look at the dwell time and tell people you can turn these tables in 5 mins?

A. Having an AirROS system would continually sanitize the table, chairs, etc. Having 5mins would dramatically have better reductions.

Q Do you have the Power factors on paper as a guideline?

A. Yes we have tables if needed.

A. Calculation for what Power Factor % (PF%) to start at is easy. Take the volume of the room and divide by the adjusted capacity of the purifier.

# AirROS Australasia



Contact: Kerry Grimshaw (Director)

Ph: +64 21 1108527

Email: [kerry@airros.com](mailto:kerry@airros.com)

