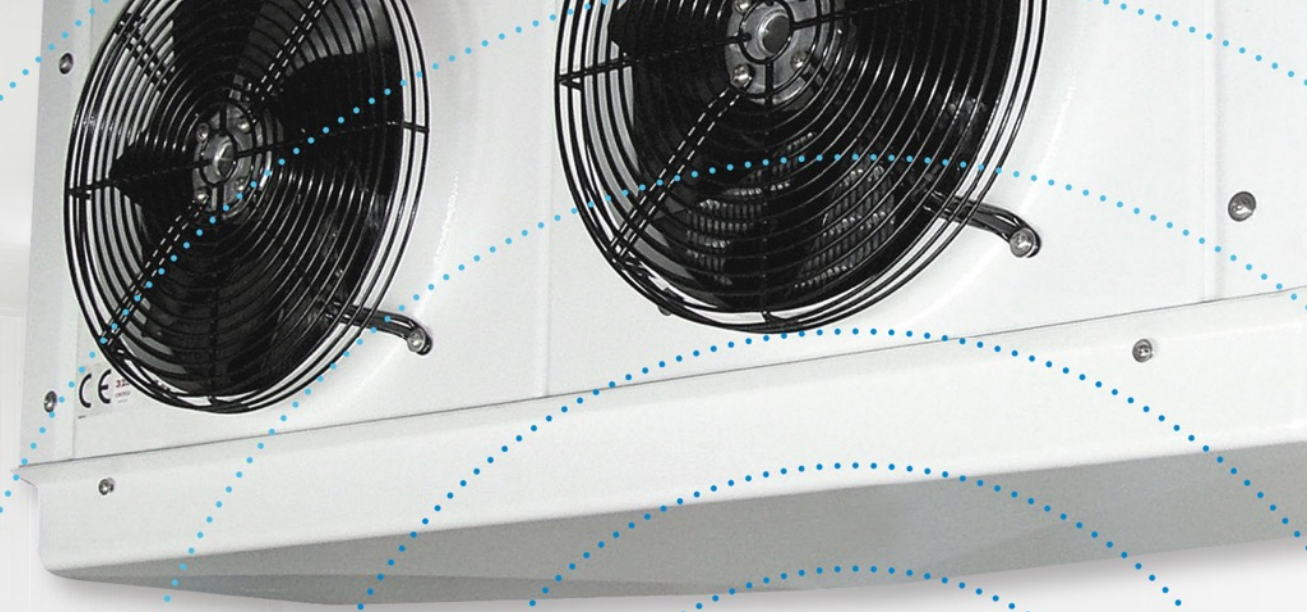
STOP THE ROT!

Add ChillSafe's ULD-HPV® for

better hygiene, less spoilage, better bottom line!



HACCP INTERNATIONAL FOOD SAFETY PROGRAMMEN CERTIFICATION

Certified Allowed Input
ACO CERT. NO. 12371

CERTIFIED INPUT FOR ORGANICS
bio gro NZ CERT
6251

ULD-HPV®
ULTRA LOW DOSE HYDROGEN PEROXIDE VAPOUR

ULD-HPV®

Ultra Low Dose Hydrogen Peroxide Vapour

ChillSafe's ULD-HPV provides **continuous protection** against spoilage diseases, microbial cross-contamination and visible biofouling on surfaces in storage areas, to improve and maintain the quality of your **air**, **space** and **food**.

Air

- Reduce biofouling, spores and cross-contamination
- **Increase asset efficiency**

Space

- Reduce mould, bacteria and visible biofouling
- **Increase hygiene**

Food

- Reduce mould, ethylene and odour
- **Increase shelf-life**

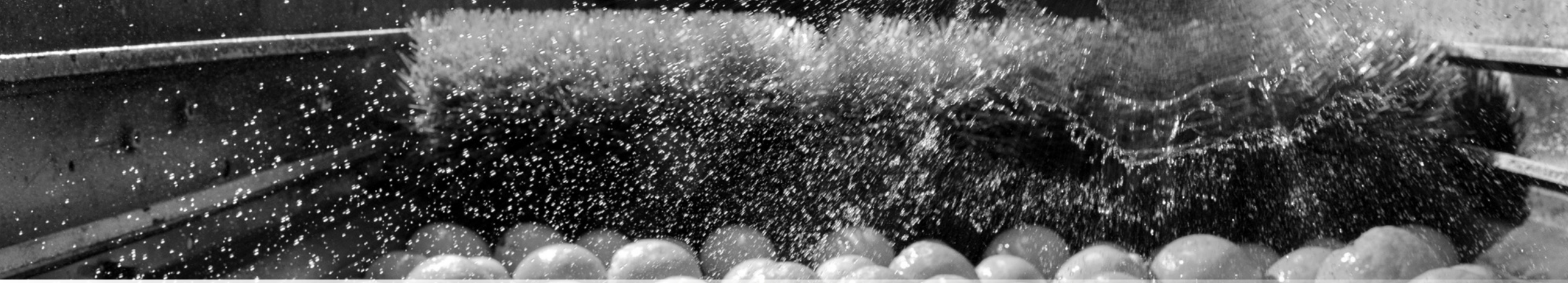
Existing Hygiene Technologies

Slow or reduce microbial growth, visible mould and biofouling on surfaces.

Refrigeration
Slows microbial growth. However, it does not reduce spoilage or pathogenic microbes.

Routine Cleaning
Physical removal of microorganisms and their nutrients (food spills). Does not reach all surfaces or provide long term protection post cleaning.

Vapours and Gases (HPV,ClO_2,O_3)
At higher doses quickly kill spoilage and pathogenic microbes. However, they pose human safety risks.



Existing Shelf-life Technologies

Reduce and slow microbial spoilage and natural ripening of produce.

Chemicals and Washes
Inhibit microorganism growth on produce. However, they do not provide long term protection and can leave residues.

Ethylene (1-MCP)
Absorbers and blockers slow ripening. However, they do not reduce spoilage or pathogenic microbes.

Edible Coatings
(wax, bioproducts)
Might slow some microbial growth. However, coating is retained on product.

Packaging
(CA/MAP, active)
Reduces growth of spoilage and pathogenic microbes. However, they create packaging waste.

Existing food safety and spoilage risks

Microorganisms

They are **everywhere** including air, water, soil, surfaces, people and equipment and contact produce during cultivation, harvesting, processing, transportation and storage.

Bacteria

Fungi (Mould & Yeast)

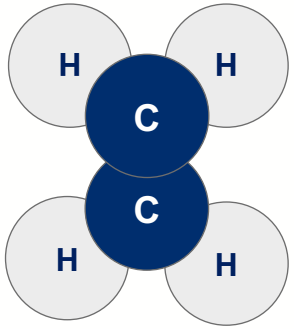
Spores

Highly evolved to survive harsh conditions, grow slowly under refrigerated conditions, spread via tough airborne spores and can be resistant to sanitisers.

Ethylene

Natural ripening hormone produced by fruit and vegetables.

Gas



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Highly evolved to survive harsh conditions, grow slowly under refrigerated conditions, spread via tough airborne spores and can be resistant to sanitisers.

Ethylene

Natural ripening hormone produced by fruit and vegetables.

It accelerates aging causing softening, colour changes, flavour / aroma development and **increased susceptibility to microbial spoilage.**

Biofouling

Caused by biofilm associated with economic losses from food spoilage and food safety issues.

Biofilm is a sticky, protective matrix formed by bacteria and fungi on produce and storage surfaces, hard to clean, resistant to disinfectants, protects against anti-microbials and is a source of cross-contamination.

Ceiling and Fans

FDC Air Intake

Racking

Biofouling

Caused by biofilm, is a major driver of food spoilage associated with economic losses and food safety issues.

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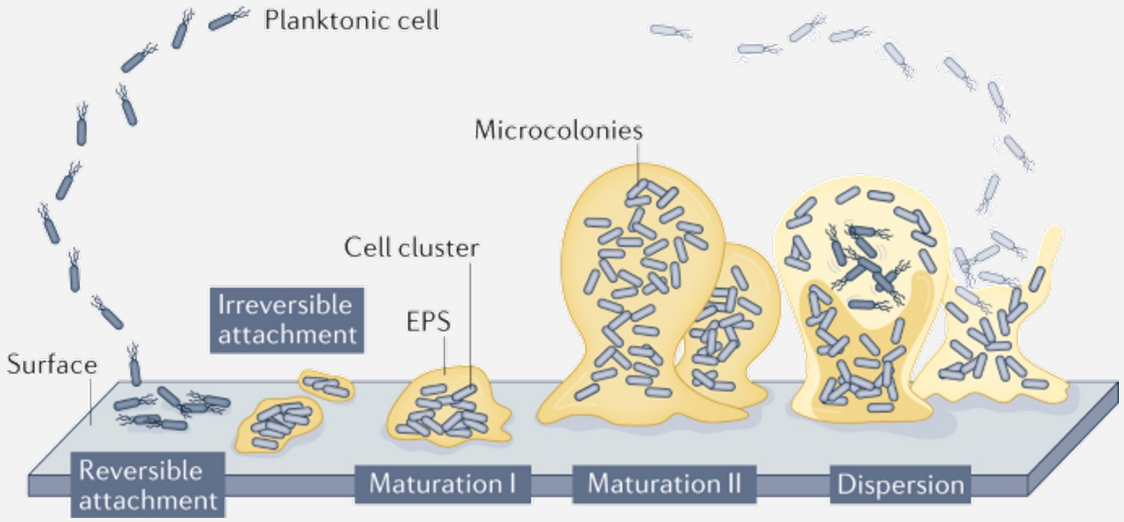


Source: The biofilm life cycle: expanding the conceptual model of biofilm formation K. Sauer et al, The biofilm life cycle: expanding the conceptual model of biofilm formation, Nat Rev Microbiol 20, 608–620 (2022)

Ceiling and Fans

FDC Air Intake

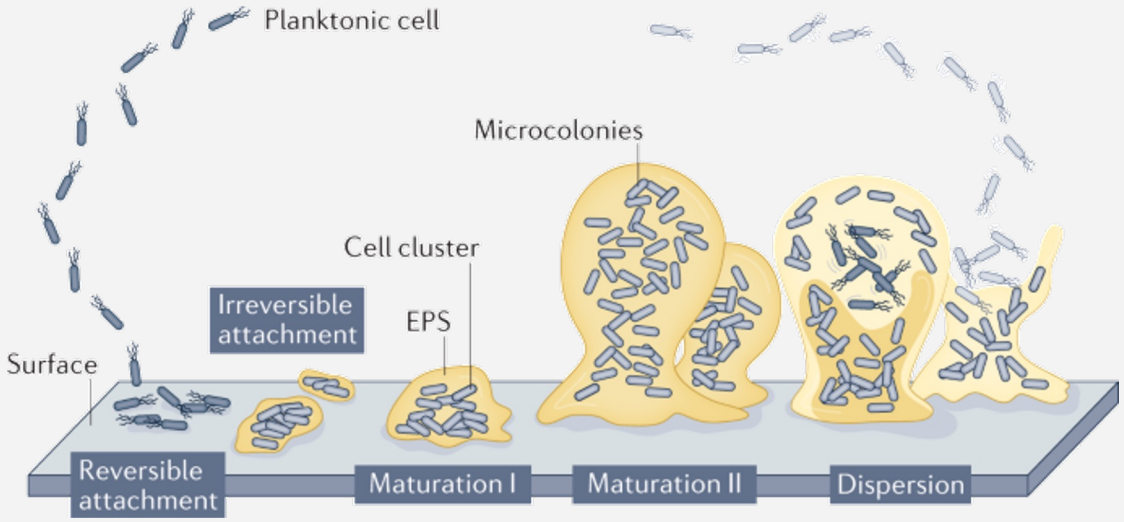
Racking

Biofouling

Negative effects of biofouling

Reduces air handling efficiency, causing biocorrosion, insulating coils, impairing temperature transfer and slowing FDC fans.

These effects lead to increased costs of electricity as fans and compressors need to work harder to maintain temperature. Reduced temperature control increases microbial growth, increasing repairs and maintenance downtime.



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Ceiling and Fans

FDC Air Intake

Racking

Sources of biofouling contamination

Air handling/FDC

Evaporator fins

Air intake

Compressor

Fans

Coils

Personnel/Staff

Clothing

Shoes

Hair

Hands

Mouth

Skin

Facility

Shelving/racking

Grills & drains

Ceiling/vents

Processing equipment

Floor/wall

Pallets

Incoming sources

Forklifts

Pallet & sack trucks

External equipment

Produce/goods

Contractors

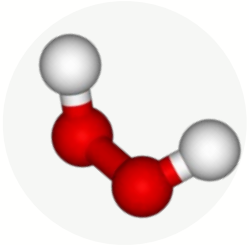
Our solution is ChillSafe's ULD-HPV

6251

Add **ULD-HPV** to your regular cleaning as an additional layer of preventative maintenance.

ULD-HPV is compatible with other technologies offering long term preventative maintenance and improved produce quality.

Why Hydrogen Peroxide?



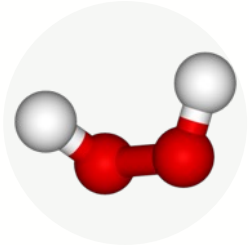
Extensive use

Consumer and industry sanitisers.

Broad spectrum bactericidal, sporicidal, fungicidal and viricidal activity.

Reacts with volatile organic compounds (ethylene gas, malodourous chemicals).

Decomposes to water and oxygen leaving no chemical residues.



High dose Decontamination

Rapidly sterilise spaces such as operating theatres.

Disinfect sealed food storage spaces, requires operator safety procedures and removal of produce.

HPV sterilisation machine

Postharvest aerosol

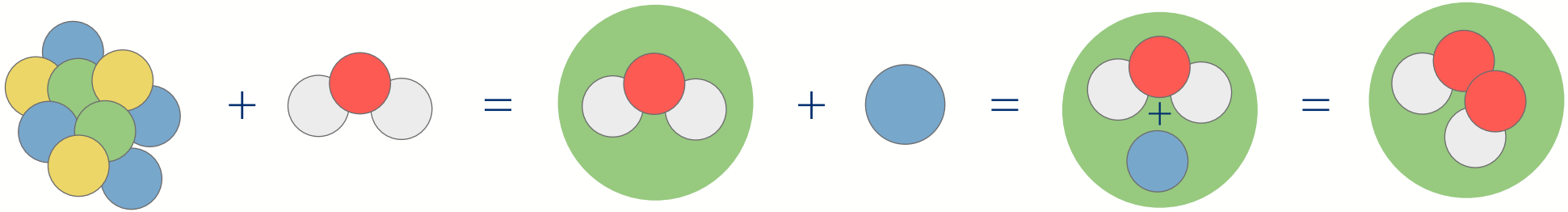
How ChillSafe Works – moisture to vapour process

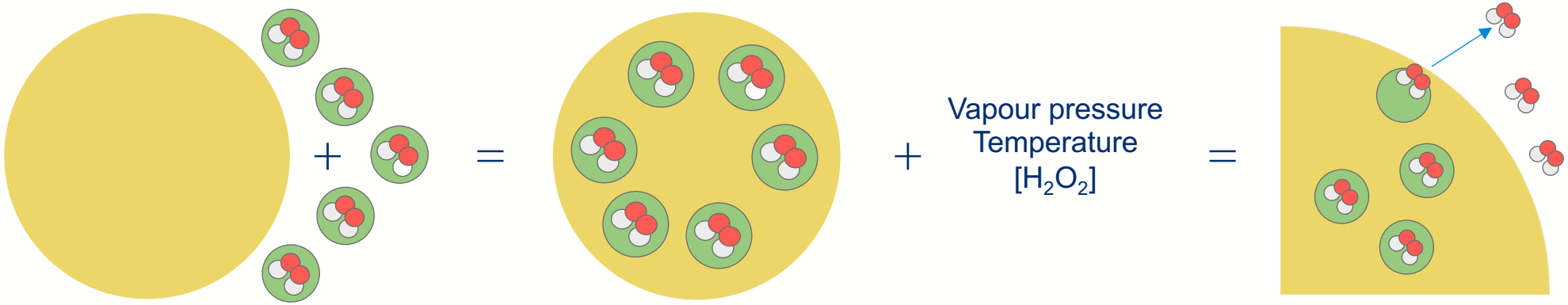
Each sachet absorbs **moisture** from the air, creating a small reservoir of **Hydrogen Peroxide**, which evaporates out as an **Ultra Low Dose Vapour <0.05 ppm**

The Chemistry of ChillSafe ULD-HPV

Key

- Sodium Percarbonate (active)
- Calcium Chloride ($CaCl_2$)
- Silica gel (SiO_2)
- Hydrogen Peroxide (H_2O_2)

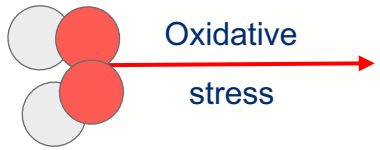




ULD-HPV effects on microbial contamination & VOCs

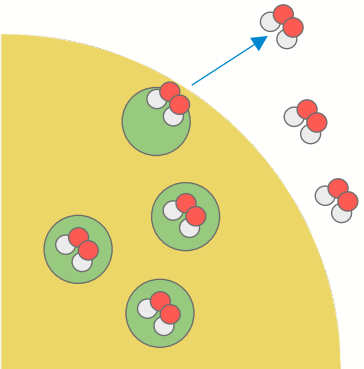
Key — Hydrogen Peroxide (H_2O_2) — Volatile Organic Compounds (Ethylene & Odours)

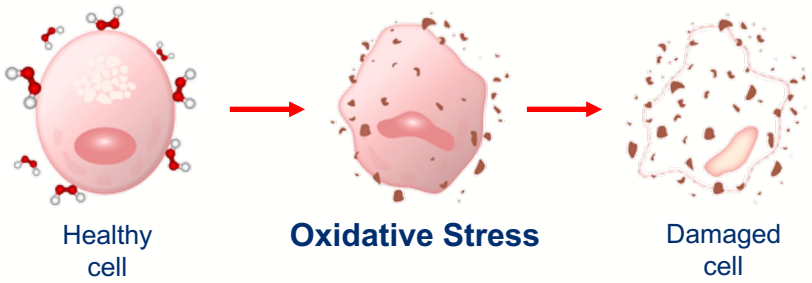
Reduces Biofouling



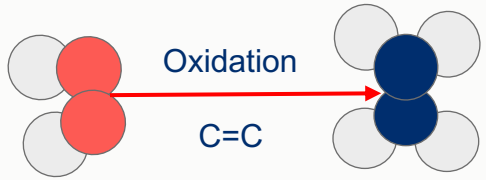
Reduced cell and spore viability by damaging

- Proteins
- Cell membrane
- DNA
- Enzymes
- Lipids
- Polysaccharides
- EPS



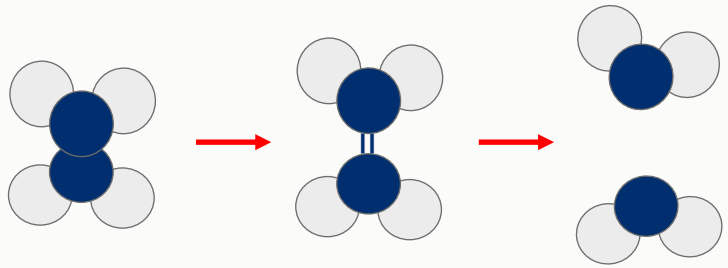


Volatile Organic Compounds



= **Degrades**

- Ethylene
- Odours



ULD-HPV continuous use outcomes*

Day 0-7
Activation & Conditioning

Day 2-30
Active Defence

Day 30+
Continuous preventative control & biofouling defence

Month 1	Month 2	Month 3	Month 6	Month 9	Month 12

Perishables
Optimal value & volume period

- Reduced odour and ethylene
- Reduced microbial counts (TPC/TVC/CFU)
- Reduced produce and food spoilage, improved shelf-life
- Reduced visible mould, reduced spore viability (SARDI)
- Increased FDC fan speed
- Reduced energy consumption
- Improved temperature control
- Reduced biofouling (air handling)
- Reduced microbial contamination detected on surfaces*

Legend: Microbial/VOC | Operational | Microbial

* Catalase positive microorganisms using Biofinder

* The above results were achieved using ChillSafe in combination with regular cleaning and HACCP practices.

Commercial Outcomes

Min ROI 4:1

Orange Packhouse
4 months treatment

ROI 4:1
On average $4 was saved for every dollar spent on ChillSafe®

5%
Reduction in waste

Up to 25 tonne
per 1000 bins more to market

Up to 47,500kg*
Less emissions from waste

*For every kg of food not lost or wasted, almost 2 kg of greenhouse gases are not emitted. Greenhouse gas calculator developed by "watch My Waste" project at RMIT 2013-2018.

National Hotel Chain
3 months treatment

ROI 4:1
On average $4 was saved for every dollar spent on ChillSafe®

67%
Improved hygiene with no visible mould or odour

$600
Average monthly reduction in food waste

100%
Reported improvements in fresh produce shelf-life

Global Supermarket Chains
3 months treatment

ROI 11:1
On average $11 was saved for every dollar spent on ChillSafe®

100%
Reported less TPC, mould and yeast

US$3,100
Average monthly reduction in food waste

100%
Reported less visible mould

27.5%
Average reduction in fresh produce waste

100%
Reported less odours

Commercial Bakery
12 months treatment

300%
Increased shelf-life

Up to 13%
Improved temperature control

0%
Mircobial contamination detected with Biofinder

19% or greater
Reduced active energy

50%
Reduction in contract cleaning costs

Up to 79%
Improvement in air handling equipment efficiency

Value Proposition of ULD-HPV®

ULTRA LOW DOSE HYDROGEN PEROXIDE VAPOUR

Commercial ROI up to 11:1 on food waste savings alone!

Air

- **Increase asset efficiency**
- Biofouling
- Biocorrosion
- Temperature control
- Electricity, asset wear & repair

Space

- **Increase hygiene**
- Visible Biofouling
- Cross-contamination
- Intensity of cleaning, cleaning chemicals & downtime

Food

- **Increase shelf-life**
- Microbial growth
- Ethylene
- Marketable volume & sales
- Waste, insurance claims & complaints

The ChillSafe System – easy to deploy

Sachet	C50
Treatment space (m^3)	50
Treatment time/sachet	30 days
Installation methods	Hook & Tray system
	Self adhesive backing tape (on sachet)
Packaging	100 sachets/box
	10 bags x 10 sachets
Disposal	Tyvek is 100% recyclable Other ingredients in general waste

Racking	Hook	Tray
Snaplock system	Corrosion resistant magnetic spigot	Plastic sachet holder
Capacity	Daisy chain 5 trays & sachets per magnet	One sachet per tray
Plastic parts	Food grade polyethylene with anti microbial additive	
Performance	Increases airflow	

Recommended Installation

PACK HOUSE & STORAGE	
Installation	Continuous operation, install permanently.
	Seasonal operation, install post fogging or up to 1 month prior to the season.
C50	Racking system, up to 5 trays per magnet.
Location	Place racking system close to the FDC and away from doors.

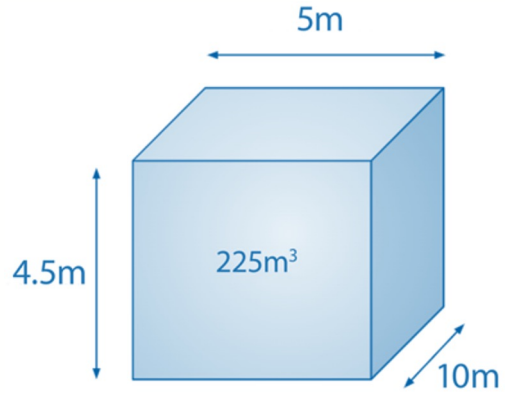
SHIPPING CONTAINER		
Installation	Prior to loading	
Size	20ft	40ft
C50	2	4
Location	Place sachet close to the FDC using the adhesive strip on the back of the sachet.	

REFRIGERATED TRANSPORT	
Installation	Continuous operation, install permanently
Size	$50m^3$
C50	1
Location	Place sachet close to the FDC using the adhesive strip on the back of the sachet or a racking system.

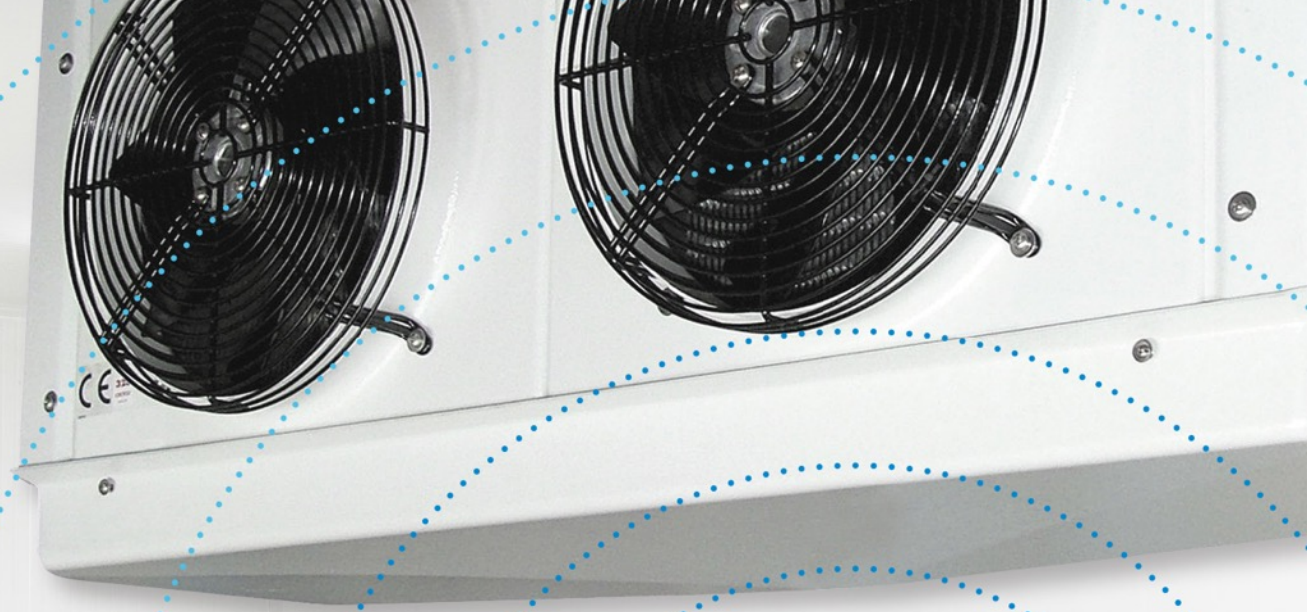
Number of Sachets

Based on the size of the space

- Measure the Length, Width and Height of the storage room in meters.
- Multiply the Length x Width x Height to calculate m^3.
- Divide the total m^3 by 50 for the C50 product.
- Always round up fractions to ensure correct dosage.



Example	
Length (m)	10
Width (m)	5
Height (m)	4.5
Total m^3 (L x W x H)	**225**
Using C50 sachets	225/50
Quantity of 50 sachets	4.5
Total / Month (rounded up)	**5**



ULD-HPV is an innovation that can provide a BIG impact across the food supply chain globally, achieving our mission to get

more **food** to
more **mouths**

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