
Isolcell
STORAGE

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Global adoption of DCA-CF (Isolcell ISOSTORE ®) and Lessons Learned

HORTGRO
Growing Fruit IQ

Tito Spaldi – Export Area Sales Manager Isolcell

May 2022

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Your Partner for over 60 years

1958 1963 1968 1973 1978 1983 1988 1993 1998 2003 2008 **2022**

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SOUTH TYROL
Europes largest single apple-producing region – 2,9 Mio bins

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ITALIAN Production 2018
Apples 5.7 Mio bins - Pears 1.7Mio bins

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FACTS and FIGURES

- More than 60 years of experience
- More than 70 employees
- More than 25 million Euro turnover
- More than 70 countries worldwide

Makes us the leading company in the controlled and generated atmosphere sector.

BUREAU VERITAS 1828
BUREAU VERITAS

IQNet

PCT

ESQ

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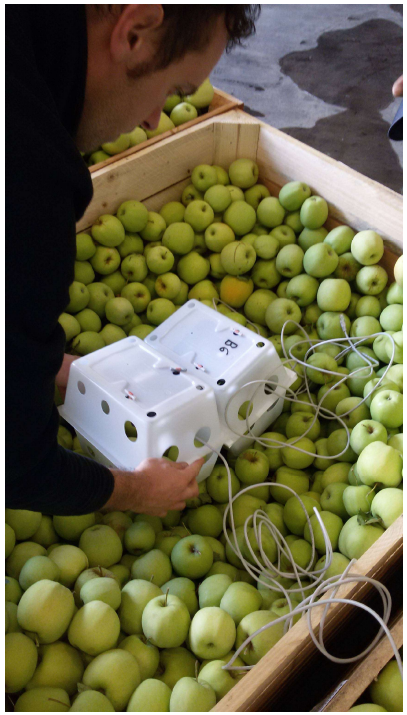
DCA-CF Global adoption



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DCA-CF Global adoption

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Isolcell Italia PRESENCE WORLDWIDE

- **South Africa**
- CIS
- Central Asia
- India
- New Zealand
- South America
- United States
- Europe
- Australia

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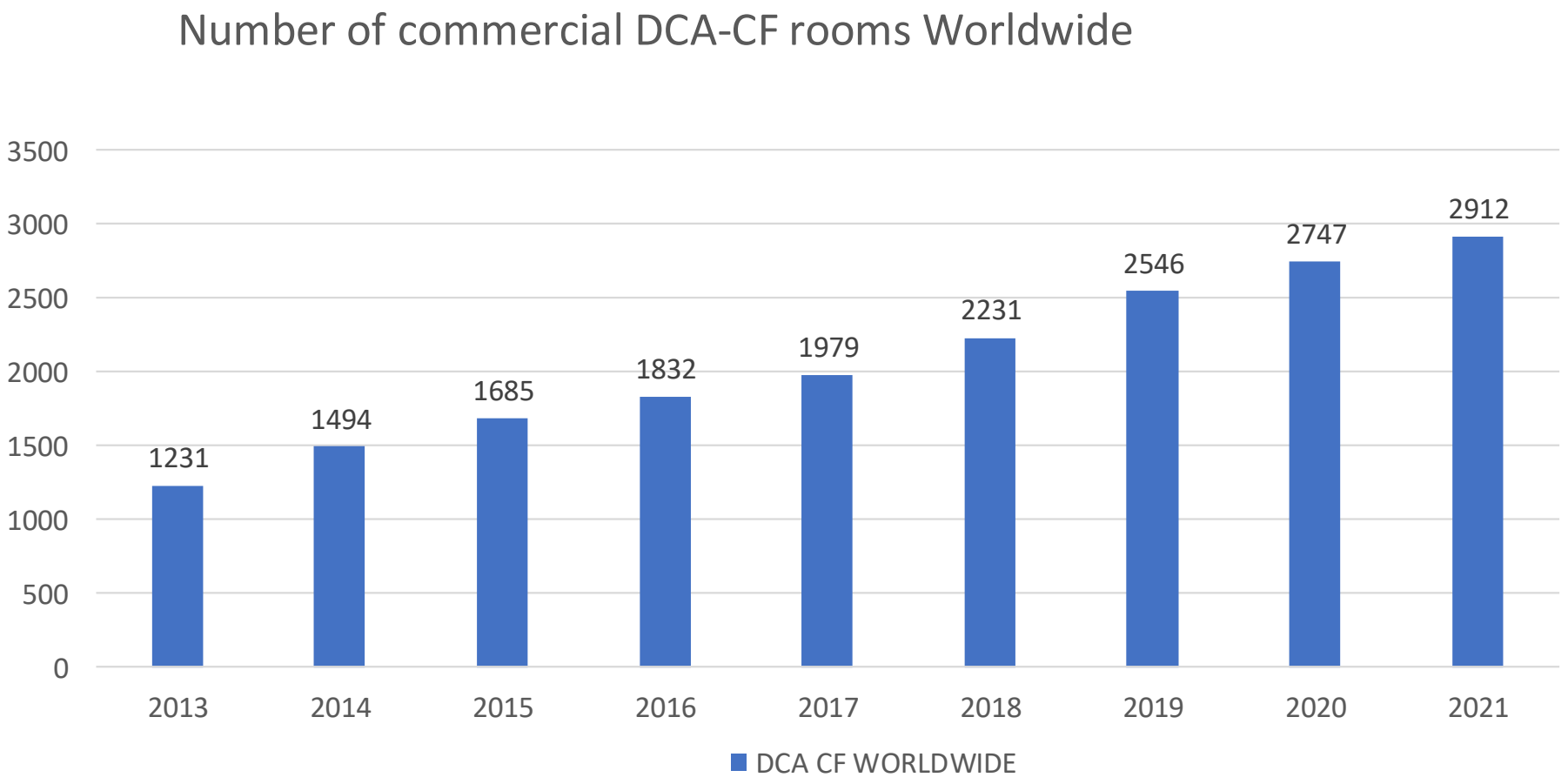
DCA-CF Global adoption



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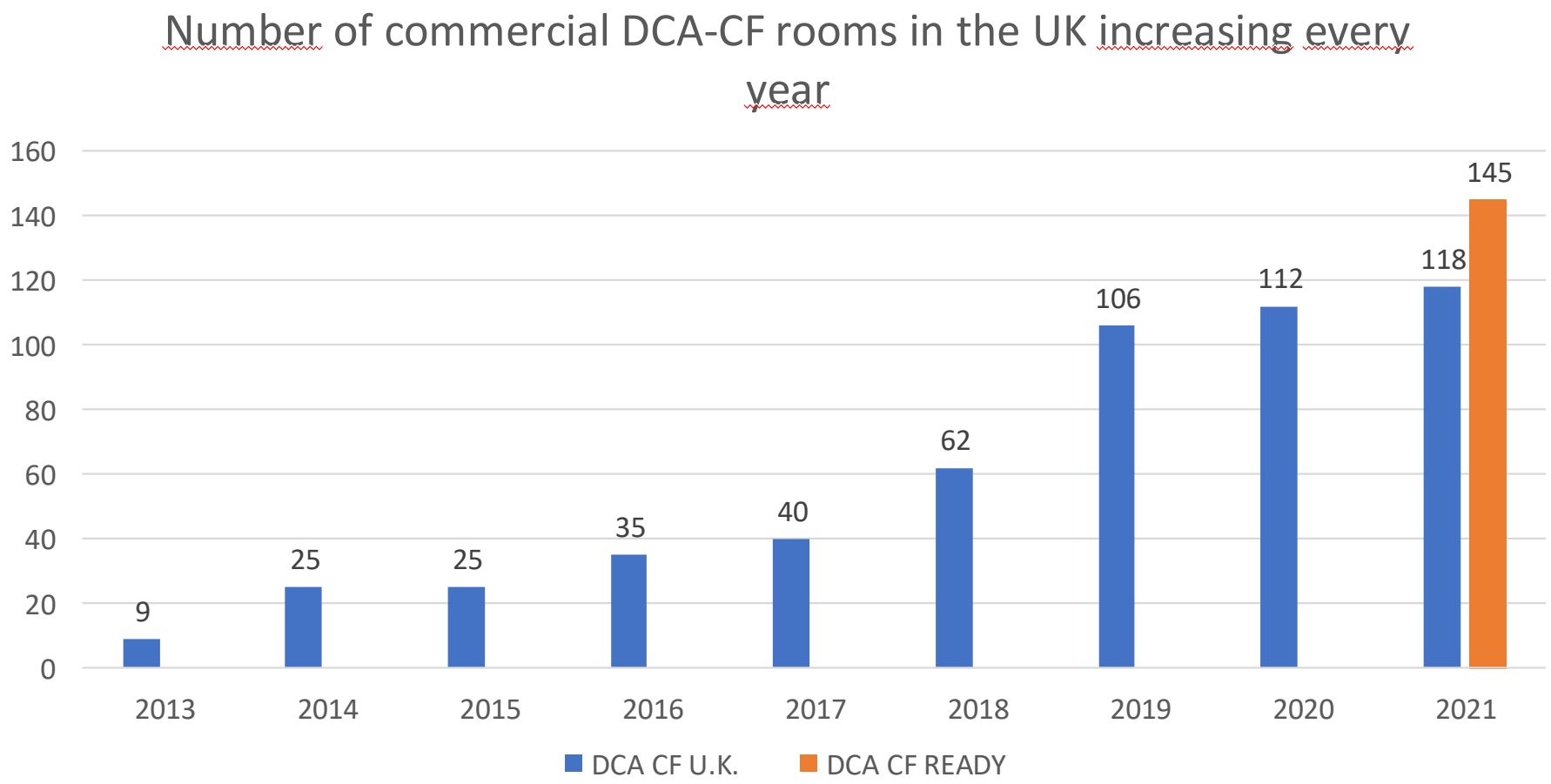
DCA-CF Global adoption



11 out of 13 customers in the United Kingdom equipped with the capacity to run DCA-CF of these some are in their 9th season.

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Kent Then and Now

O2	1 - 3%
C2	5%

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Kent Then and Now

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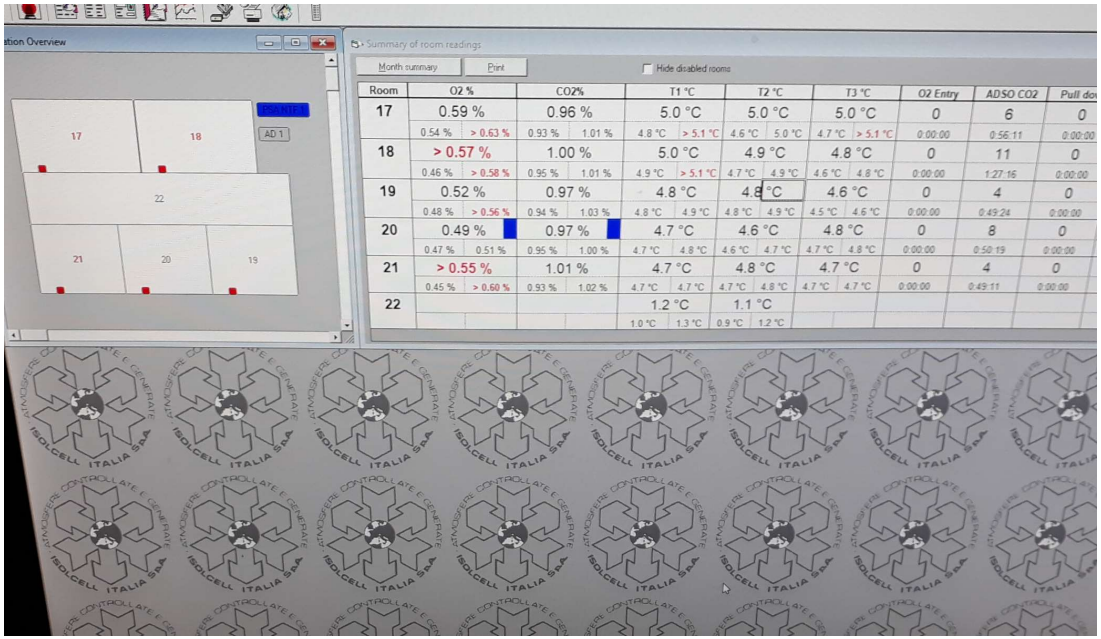
Kent Then and Now



O2 0,4% - 1%

CO2 0,5 – 1,2%

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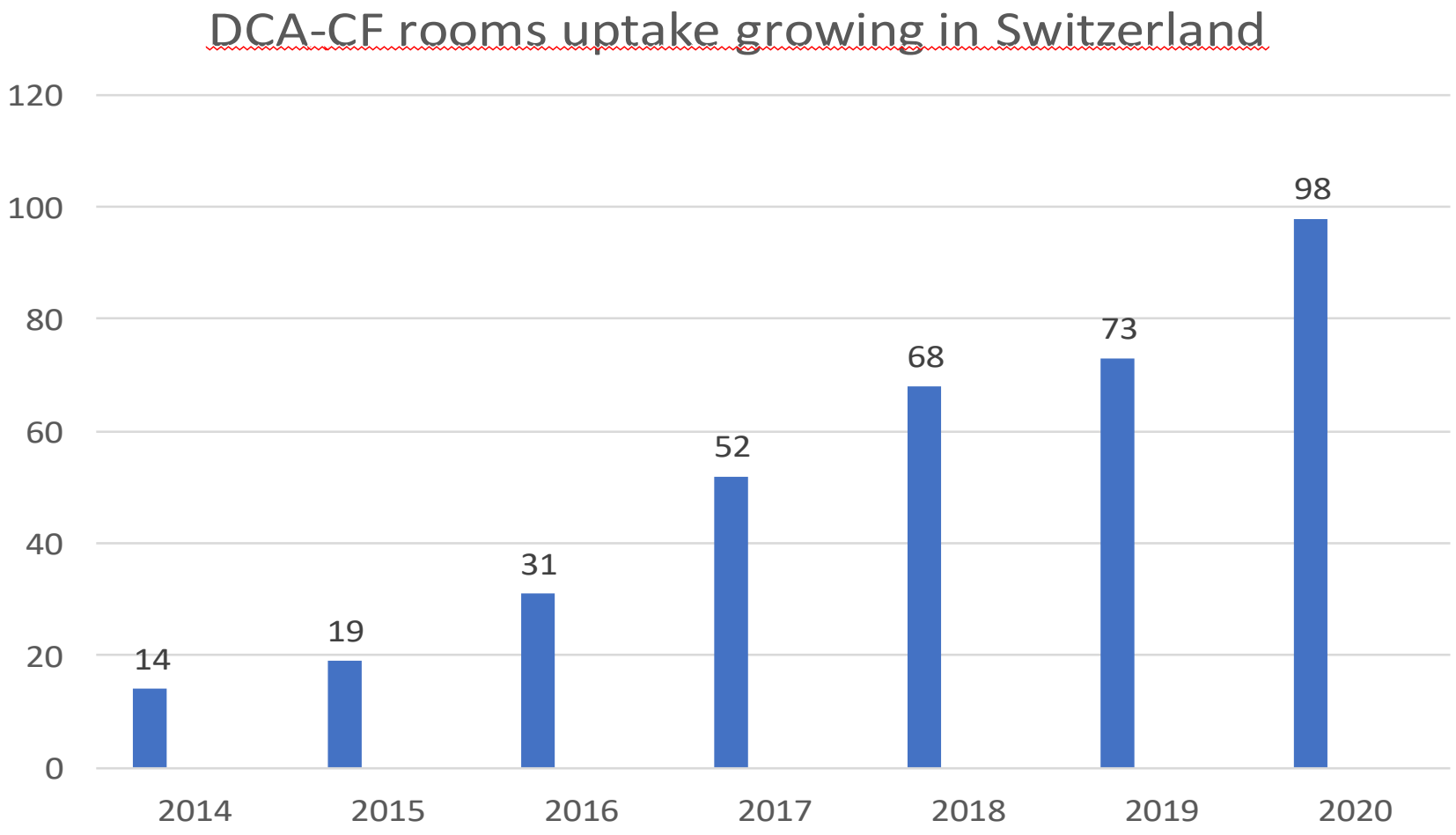

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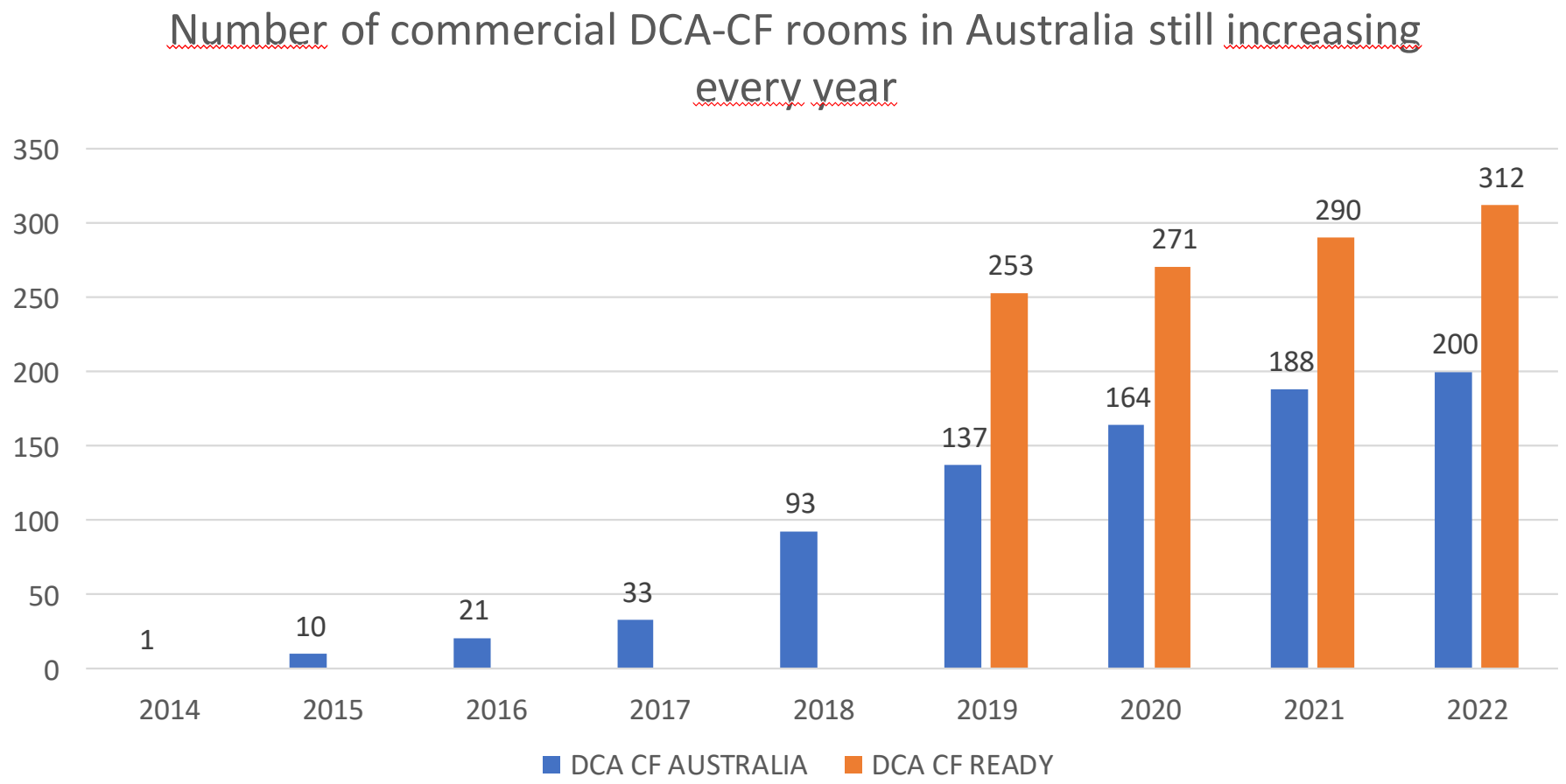
DCA-CF Global adoption



23 customers in Australia (VIC,QLD,NSW,WA) equipped with the capacity to run DCA-CF of these 17 already using the system some in their 8th season for pears and apples.

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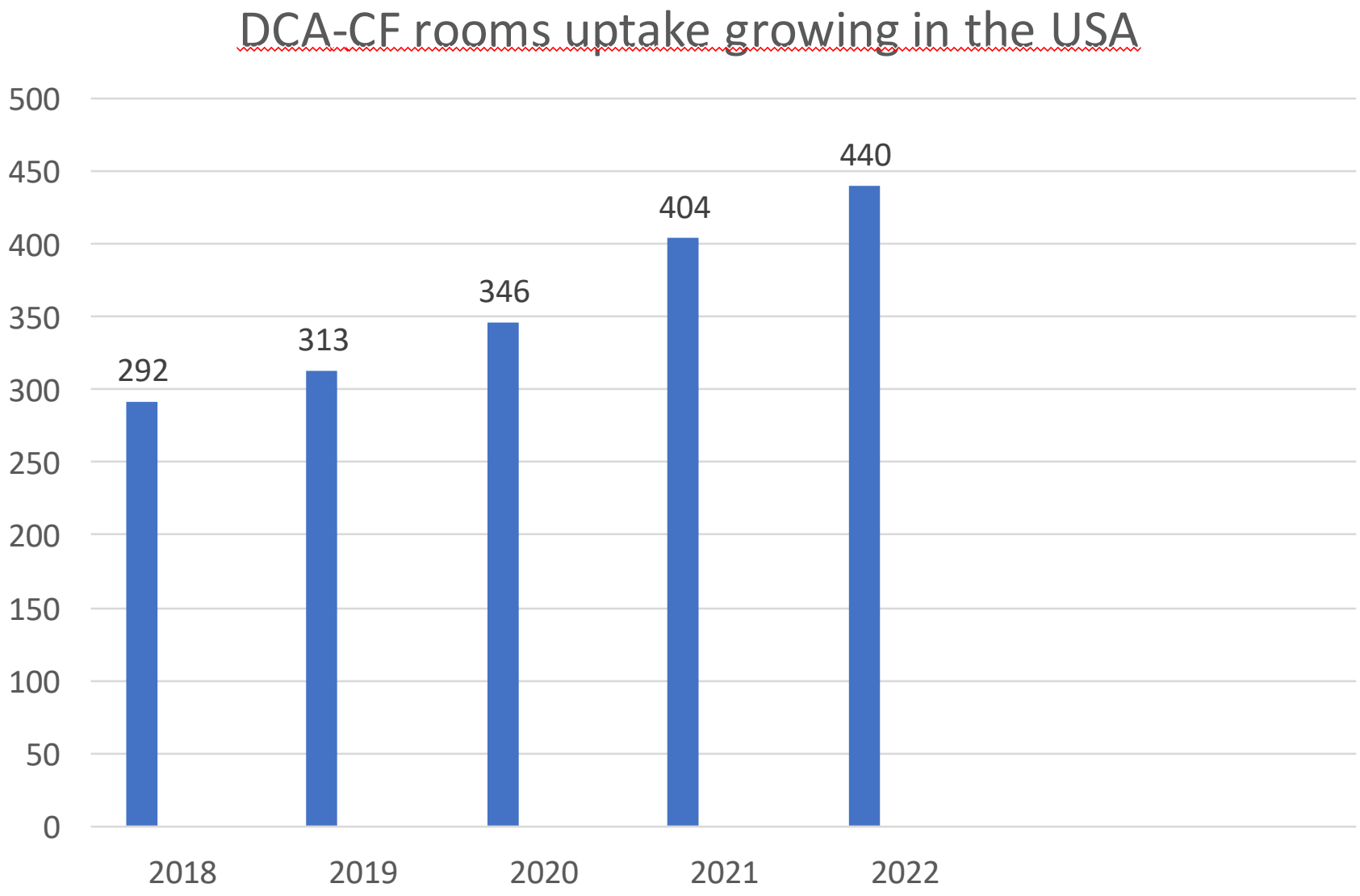

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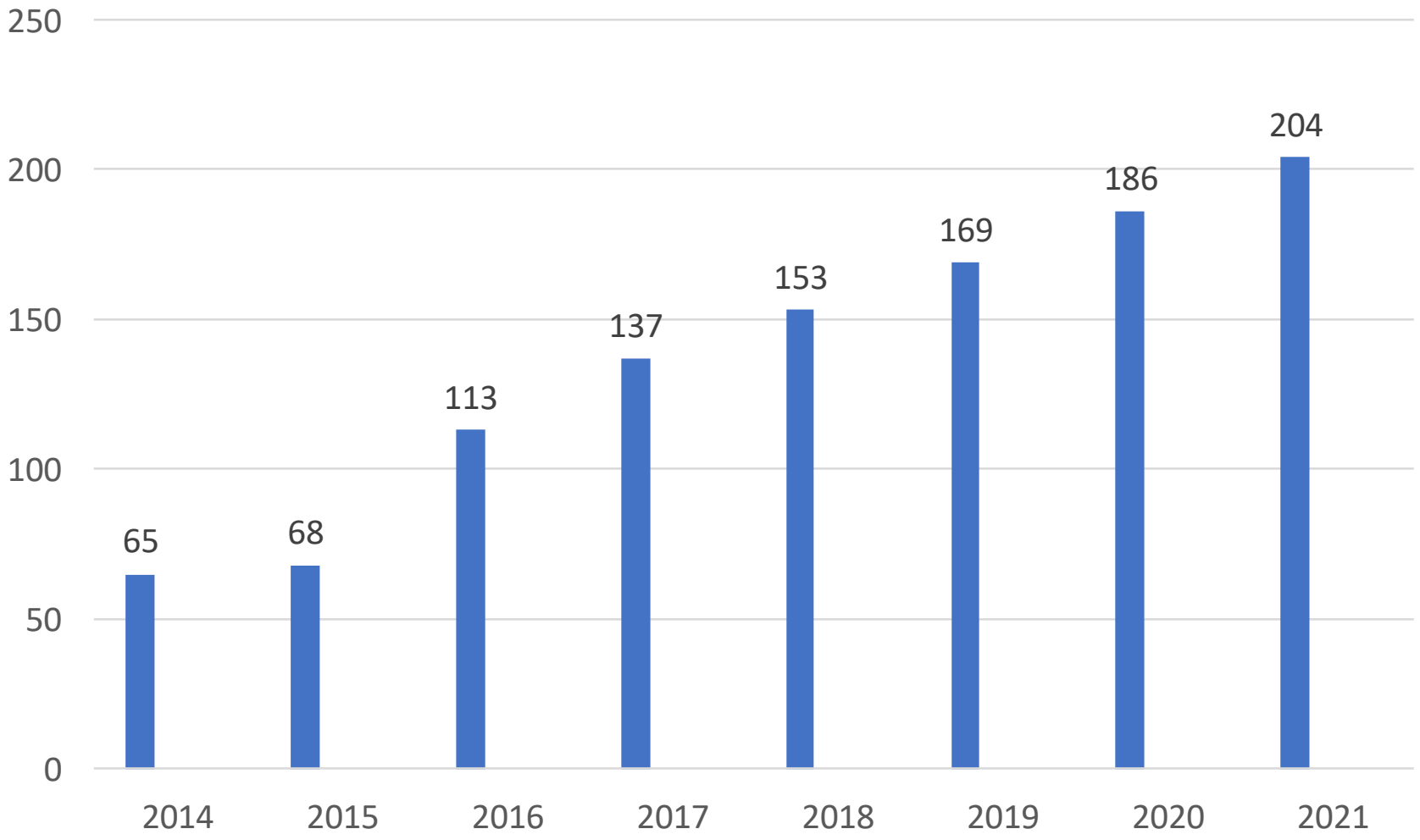
DCA-CF rooms uptake growing in South Africa



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Apple varieties being stored commercially using the Isolcell ISOSTORE® DCA-CF SYSTEM

Bramley	Braeburn	Envy
Cox Orange	Elstar	Jazz
Topaz	Modi	Juliette
Rubens	Fuji	Gala
Golden Delicious	Granny Smith	Joya
Honeycrisp	Idared	Ligol
Jazz	Jonagold	Tentation
Kanzi	Maigold	Winesap
Morgenduft (Rome Beauty)	Red Delicious	Cortland
Pink Lady (Rosy Glow)	Pinova (Evelina)	Ambrosia
Szampion	Semerinka	Belchard

Italy, South Africa, Australia, Argentina, Israel, France, Portugal, Spain, Austria, Germany, Switzerland, Serbia, Ukraine, Slovenia, Greece, Uzbekistan, Azerbaijan, Kazakhstan, Poland, Czech Republic, Morocco, Turkey, India, New Zealand, United Kingdom, Brazil, Chile, Uruguay, Moldova, USA, Canada, Romania, Russia, Hungary.

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Pear varieties stored commercially in DCA-CF

WILLAMS (BARLETT)
PACKHAM'S TRIUMPH
CONFERENCE
FORELLE
BLANQUILLA
ANJOU
LUKAS
ANKARA
KAISER ALEXANDER (BOSC)
LUISE BONNE
RED ANJOU
NASHI
SPADONA
PERA ROCHA
ABATE FETEL*
COMICE
SANTA MARIA

Italy, South Africa, Australia, Argentina, Israel, France, Portugal, Poland, Spain,Turkey

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Some references Worldwide

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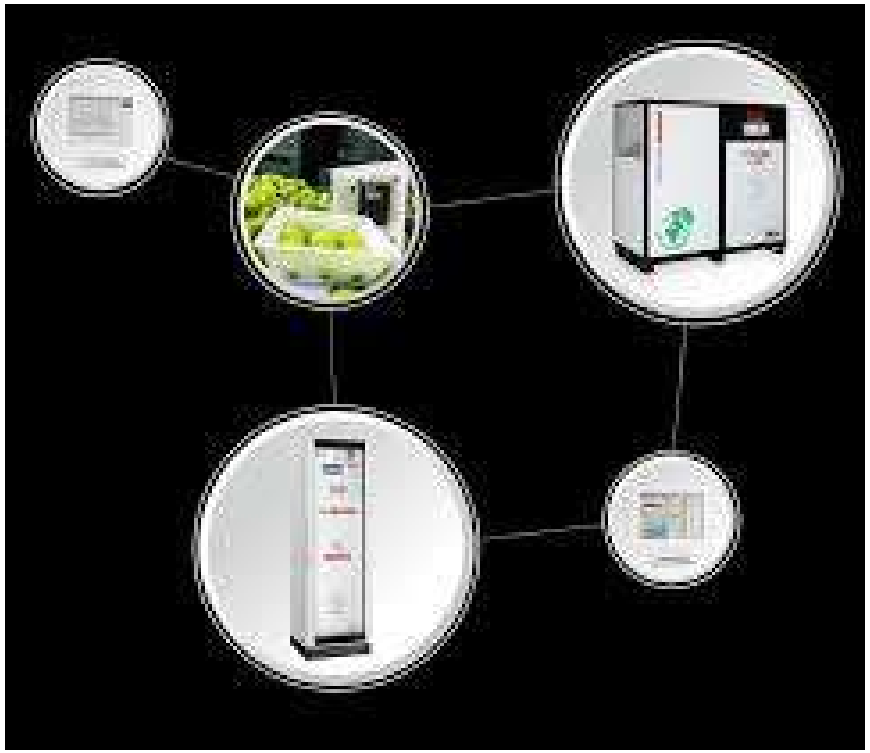
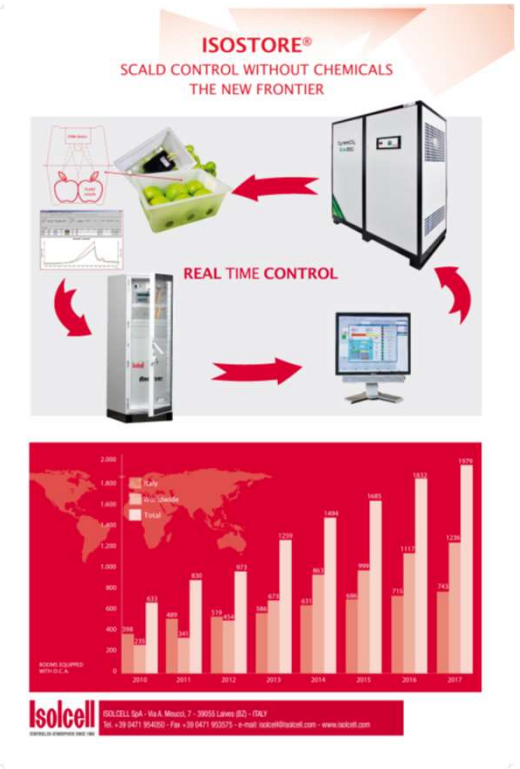
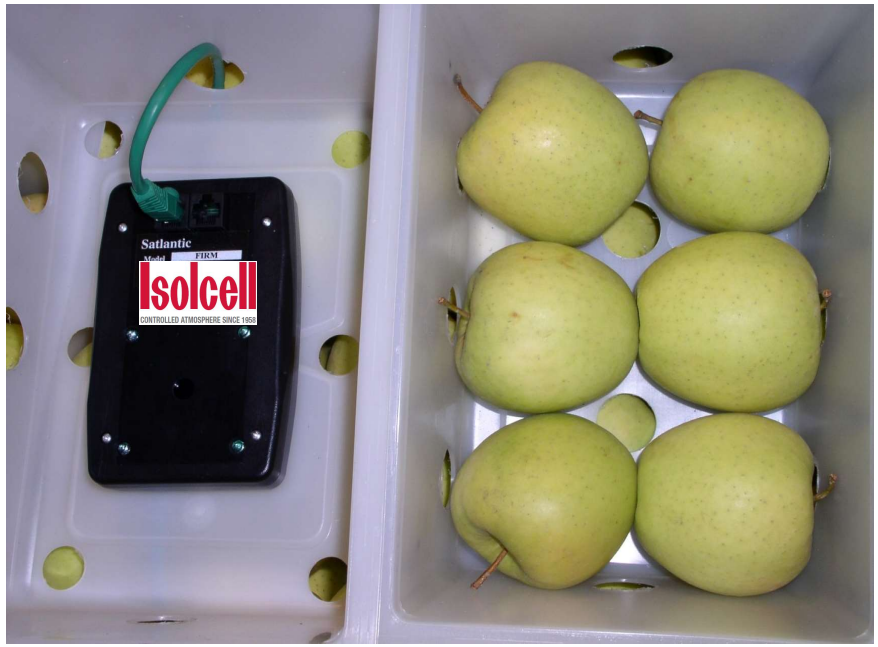
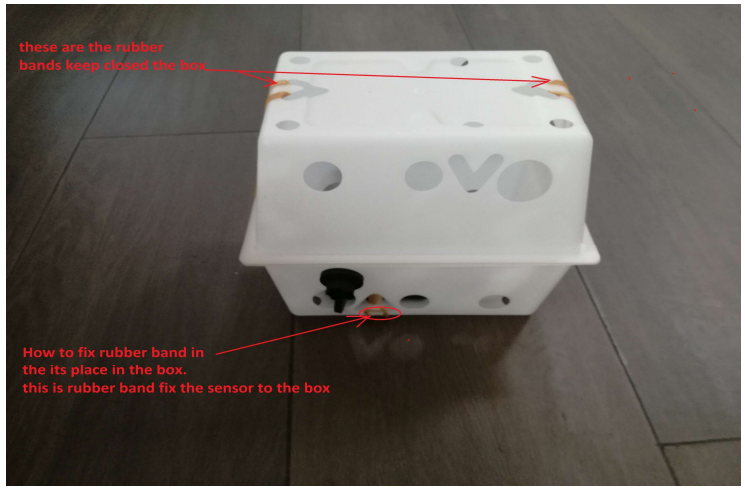
DCA-CF LESSONS LEARNT





Fitting the DCA-CF F.I.R.M fluorescence sensor





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Lessons learnt

Choosing your sample fruit

- The HarvestWatch sample chamber (also called a kennel) is designed to hold an average of 6 fruit of marketable size. The fruit should be representative of the entire lot of fruit.

Lessons Learnt

Sample fruit selection

Lessons Learnt

Sample fruit selection

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Placement of kennels

Kennels can be placed anywhere inside the room.

Typically the kennels are placed in the corner of the room by the door (for easy access also the warmest place in the room) or on a shelf by the sampling hatch.

Kennels and sensors must be kept in the dark. Remember to black out observation windows.

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Lessons learnt

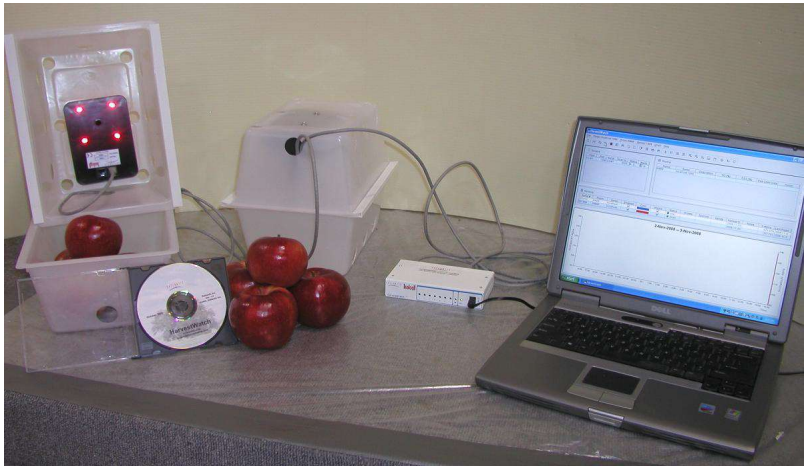
Kennel positioning

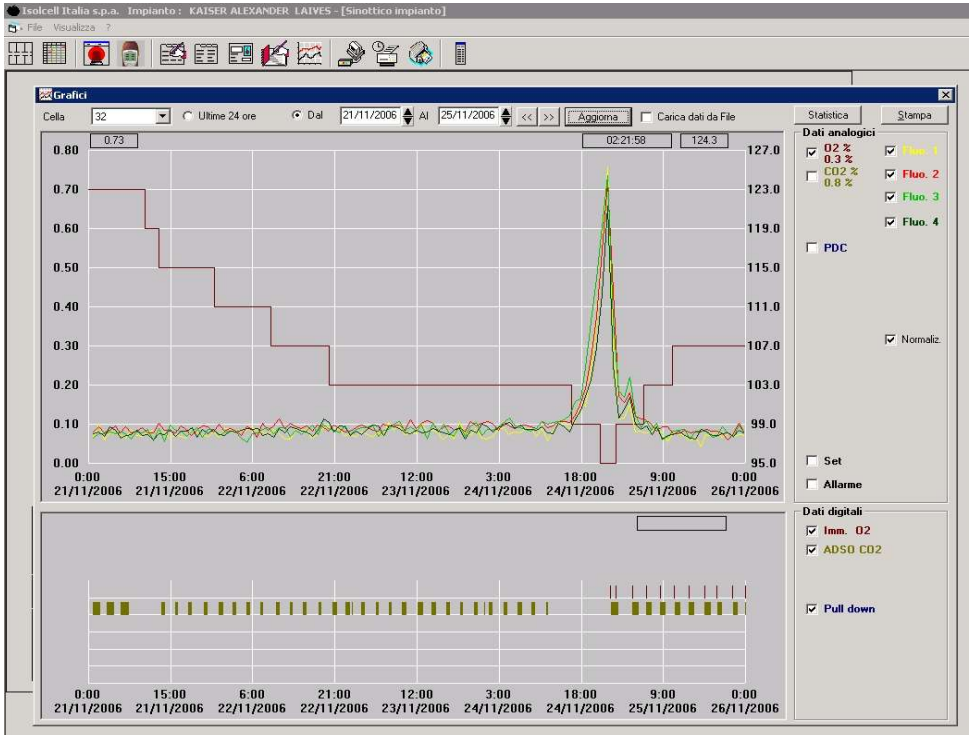
Positioning of the bin containing the kennels

Kennel positioning

Lessons Learnt

HarvestWatch Software for DCA-CF





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Lessons Learnt

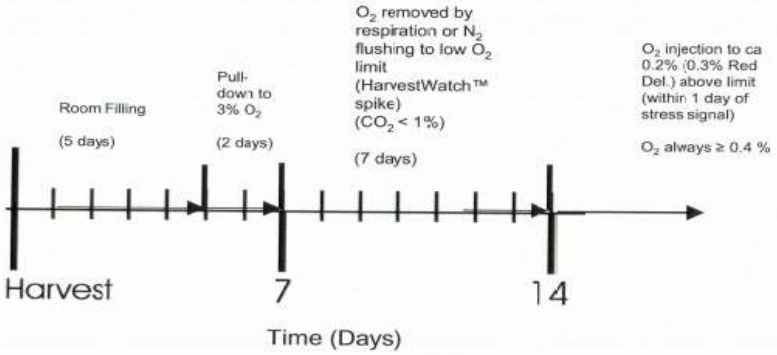
This system detects various physiological stresses

- Lower Oxygen Limit (LOL) → Basis for use of HarvestWatch DCA
- Increased Carbon Dioxide
- Low Temperature
- Ammonia Gas

Lessons learnt

Protocols

Dynamic Controlled-Atmosphere (DCA) Protocol (most apple cultivars)



Notes:

1. This is a generalized DCA protocol, not a recommendation. Only a local expert can provide DCA and temperature recommendations.
2. For suggested O_2 : CO_2 ratios up to 1% O_2 see attached table. For other cultivars, consider a 1:2 ratio for O_2 : CO_2.
3. Fruit must be free of watercore.
4. Using DCA protocol on 1-MCP-treated fruit should not be considered at this time, pending more research.

Prange & Zanella, August 2009

Protocols

Suggested CO_2 : O_2 Ratios 2009-10 [1,2]

$\%CO_2$ / $\%O_2$	Gala	Golden Del. Jonagold	G. Smith Honeycrisp	Red Del.	Braeburn Fuji Empire Cameo Northern Spy	Pink Lady
0.4	1.2 (0.9) [3]	0.9	0.9	0.8	0.6	0.4
0.5	1.3 (1.0)	1	1	0.9	0.6	0.5 (0.4) [3]
0.6	1.4 (1.1)	1.1	1	1	0.6	0.6 (0.5)
0.7	1.6 (1.2)	1.2	1	1	0.7	0.7 (0.5)
0.8	1.8 (1.4)	1.4	1	1	0.7	0.7 (0.6)
0.9	2.0 (1.6)	1.6	1	1	0.8	0.8 (0.7)
1	2.0 (1.8)	1.8	1	1	1	1.0 (0.8)
>1	2.0 (1.8)	1.8	1	1	1	1.0 (0.8)

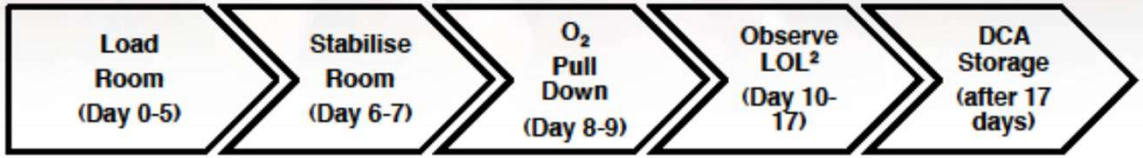
1. DCA can control superficial scald but control can diminish with time above ca. 0.7% O_2.
2. After closing the room and even before O_2 pull-down, the CO_2 concentration should be kept as low as possible (<1%) by ventilation and opening of the door.
3. Values in parentheses should be considered in regions where research suggests that fruit are more CO_2 sensitive.

Zanella (modified by Prange, August 2009)

Lessons learnt

Protocols

Dynamic Controlled-Atmosphere (DCA-CF) Protocol ('Conference' Pear)[1]



Room Temp. (°C):	-0.5 to -1 (continuous)				
Fruit Temp. (°C):	0 to +1	0 to +1	0 to +0.5	0	0 to -0.5
Rel. Hum. (%):	>90	>90	>92	>93	>93
O_2 (%):	>19.0	>19.0	4.0	Record LOL	LOL + 0.2% (not <0.6%)
CO_2 (%):	<0.5 (continuous)				

[1] This is a generalized DCA-CF (chlorophyll fluorescence) protocol, not a recommendation. Only a local expert can provide DCA and temperature recommendations. Adapted from Nardin, 2013.

[2] LOL (Lower O_2 Limit) is the O_2 % at which the HarvestWatch™ fluorescence begins to 'spike'. The O_2 is lowered from 4 % to at or just below the LOL by respiration and/or N_2 flushing.

Dynamics of the Lower Oxygen Limit (LOL)

	LOL (O_2 %)	
Variety	October 10-19	December 1- 4
Red Delicious	0.85	0.47
Golden Delicious	0.92	0.45
Honeycrisp	0.90	0.50
Empire	0.90	0.88

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Lessons learnt

Requirements for DCA-CF System

- CA rooms, tents, bags or containers
- PSA N2 Generator
- New generation CO2 Scrubbers
- Isolcell ISOSTORE© System

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Lessons Learnt

Client testimonial speaks for itself

Individual orchards have individual requirements

From our experience it is clear that different orchards react differently in store and require different treatment/storage regime

Monitor the fruit not the regime

With “traditional” storage you are only ever monitoring the regime, not the fruit

DCA systems give you a measure of the fruit activity, not just the gas regime around the fruit

Shelf-life

Customers have become increasingly aware of fruit quality after purchase

Flavour, texture (pressure)

Adrian Scripps Ltd

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Lessons Learnt

Adrian Scripps Ltd

Client testimonial speaks for itself

2015 crop

- Clear differences between orchards in respiration and maturity
- Stress spikes varied significantly between orchards harvested at the same time
- Regimes were tailored to each store
- We try to monitor each orchard within a store, but also try to limit orchards within a store
- Fruit pressure comparison, same Braeburn Orchard in two different regimes

Store	December	January	February
ULO	9.3	8.1	8.1
DCA	9.35	8.91	9.11

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Lessons learnt

Practical advantages of DCA-CF

Wider picking window

Reduced respiration intensity

Reduce costs, times and post-harvest chemicals

No risk of fermentation

Increased fruit quality

Measurement system operates continously

Very user friendly

Totally computerised

No risk for the operator

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Lessons learnt

Main Advantages of DCA-CF

- Increased pack out
- Reduced rots and damage to fruit
- Reduction of internal browning
- Increased colour retention, firmness and flavour
- Longer shelf-life
- Scald control without POST HARVEST chemical treatments = Advantage in EXPORT and ORGANIC MARKETS .

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Moving forward

envy™

- Energy conservation

- DCA-CF substantially reduces fruit respiration, with the result that equipment works less and also higher storage temperatures are possible; thus saving energy

- More realtime information

- New technologies being incorporated to monitor other quality parameters of stored fruit.

- New varieites and other products

- DCA-CF used extensively to determine storage parameters and regimes of new varities.

- DCA-CF successfully being trialed on GOLD Kiwi.

piqa boo

ROCKIT™

SAVE THE DATE

Interpoma, Bolzano, ITALY

November 17-19, 2022

INTERPOMA

Hope to welcome all of you in November !

Trusted partner for South Africa

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THANK YOU

Questions ?