



**CAREL**

# Efficiency and Reliability in food retail business

Matteo Zanesco  
25<sup>th</sup> February 2019

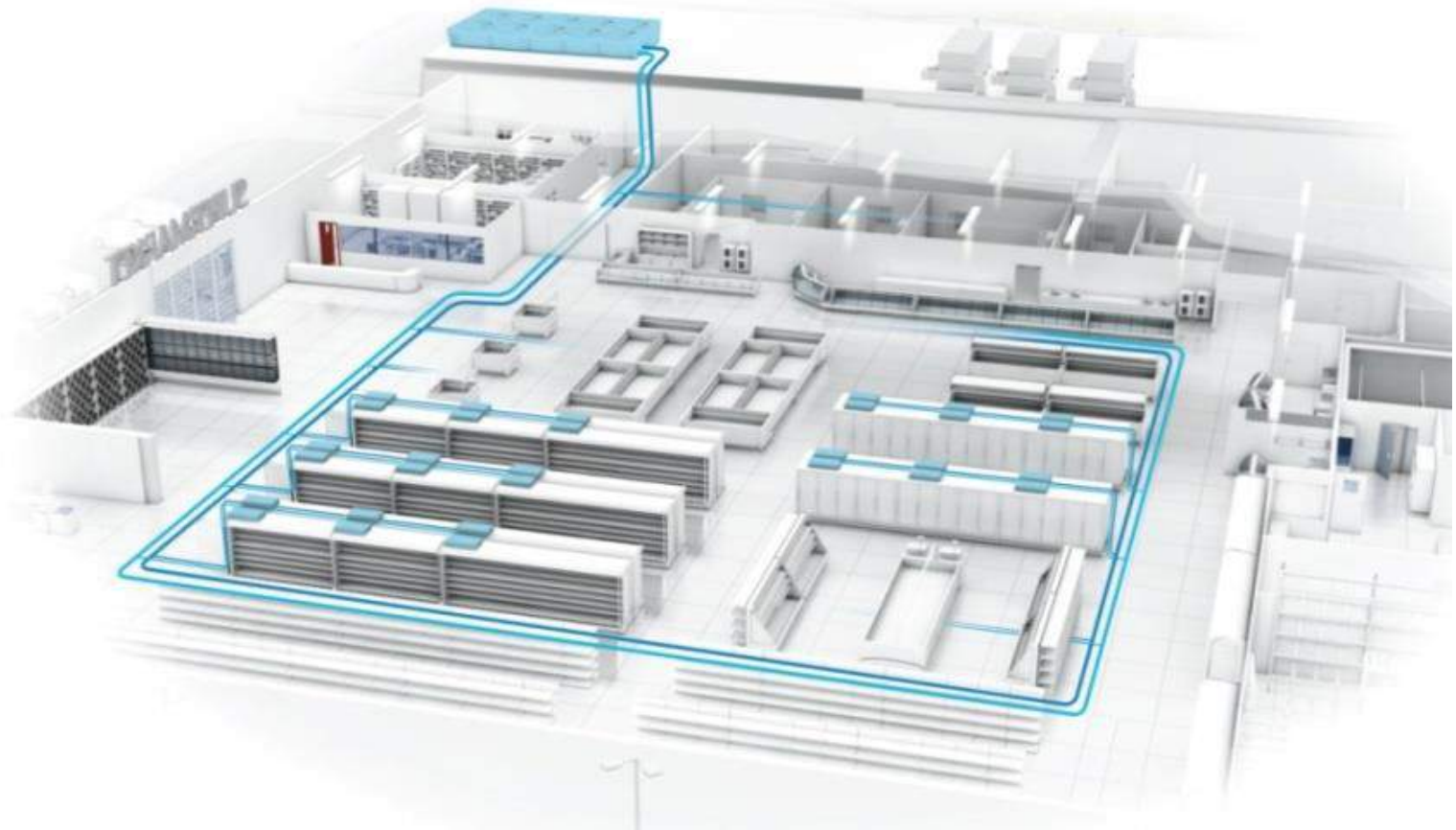
# Contents

- **Solution trends**
- **Drivers**
- **DC Technology;**
- **Food preservation;**
- **Energy saving;**
- **OPEX (operational cost) optimization;**
- **Key Takeaway**

# **Solution trends**

# Semi-plugin units

Semi plug-in units are **self-contained cabinets** with **water-cooled condensing units**, rejecting the heat of condensation by a water loop, thus avoiding an increase in temperature inside the supermarket.



# Semi-plugin units

Semi plug-in units are **self-contained cabinets** with **water-cooled condenser, VARIABLE SPEED COMPRESSOR (DC Technology), Electronic Expansion valve, SMAR CONTROL**



- Excellent food preservation;
- High energy saving;
- Low maintenance;
- Limited refrigerant charge;
- Zero-close Leaks frequency;

**Discounter**

**Supermarket**

**Hypermarket**

# DC Technology





# DC Technology

DC Technology provides to a refrigeration system  
the possibility to modulate the cooling capacity  
according to the real load request.



## Compressors

«BrushLess Direct  
Current» motor  
BLDC or DC.

## Inverter

to modulate the speed  
of the compressor

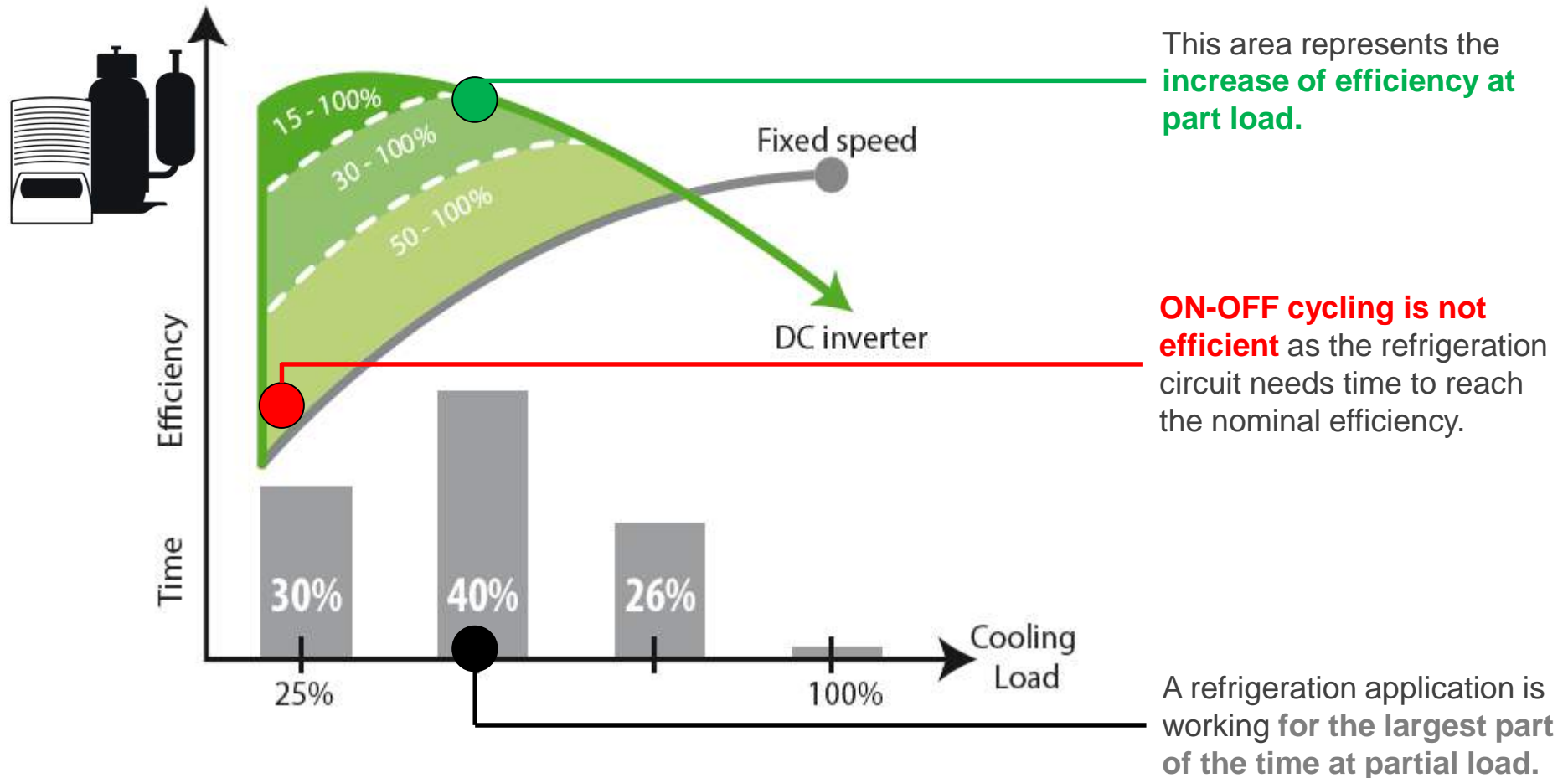
## Electronic

to drive the Inverter and  
guaranteed maximum  
safety to the system.



# DC Technology

**Permanent magnets variable speed compressors** driven by intelligent DC drives allows High Efficiency in **every load** conditions

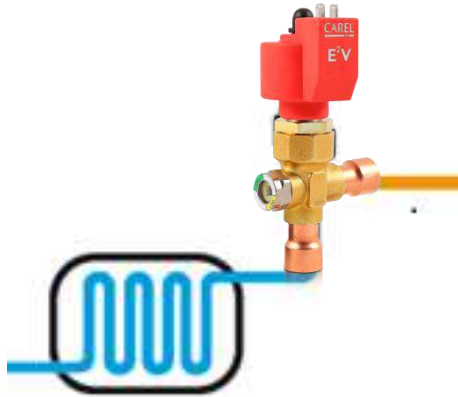




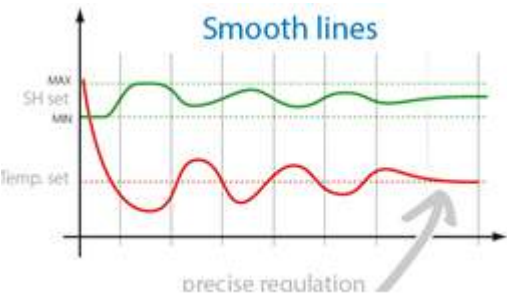
# DC Technology

## Electronic Expansion Valve

for a precise regulation of the evaporator (Showcase, Cold Room)



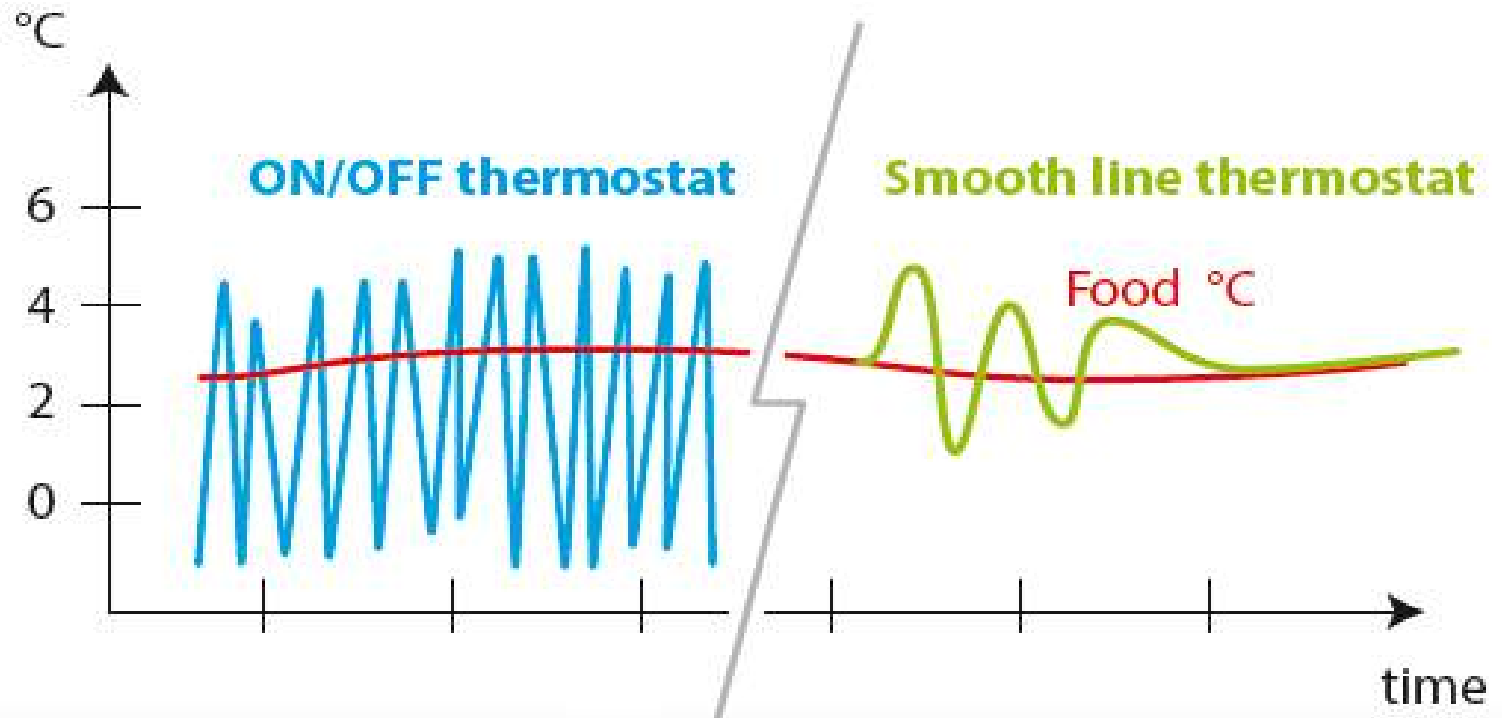
- Stable regulation temperature;
- Fast «Pull-Down» after defrost;
- Dynamic adjustment according to the cooling request;
- Synergy with CDU / Rack (Smooth line);
- Avoid liquid flow back (to compressor);
- System safety (Oil recovery, High Discharge T.);
- No vibration over the pipe (VS mechanical valve);



# Food Preservation

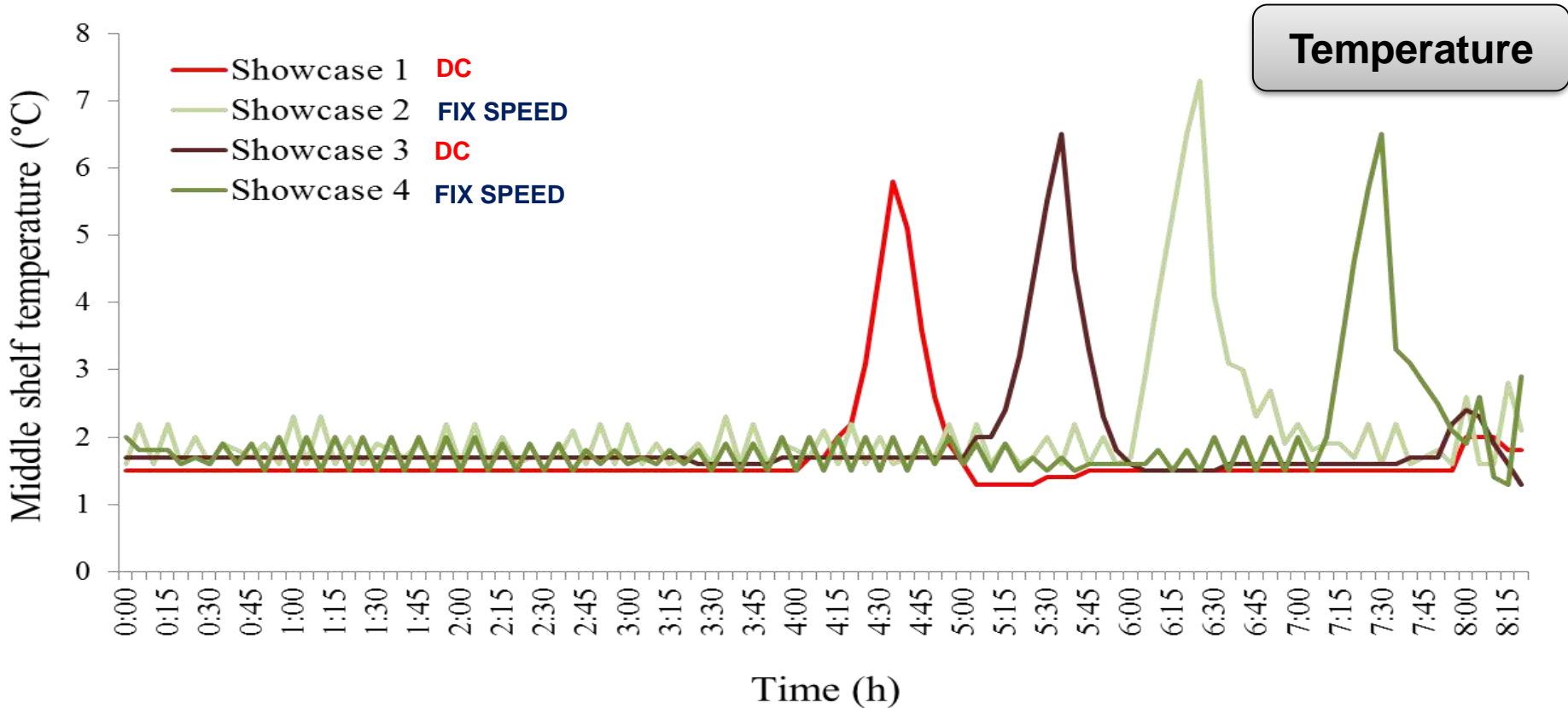
# Food Preservation

The combination of DC Technology (variable speed compressor), together with the electronic expansion valve managed by advanced algorithms inside the e-board provide a stable regulation and optimum food preservation.



# Optimal Food Preservation

Effect of the use of DC Technology on semi plug-in condensate by water.

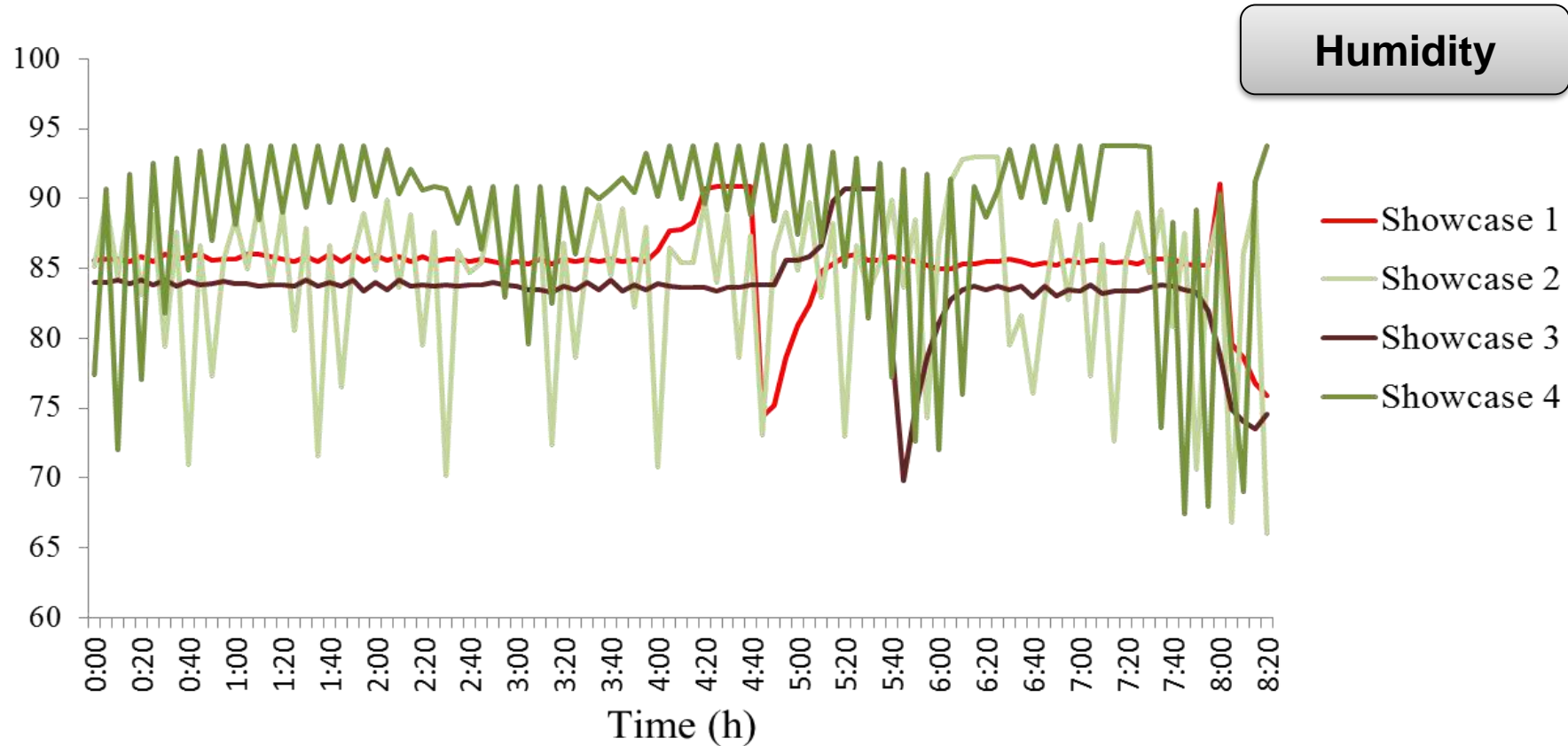


The **variations in temperature** can deteriorate the quality of the food, making it shorter its shelf life.

(Soo Dong, S. et al., 2013)

# Optimal Food Preservation

Effect of the use of DC Technology on semi plug-in condensate by water.



The **effect of humidity on food is very relevant,**  
in some cases even more than the effect of temperature

(Forney, C.F., 2008 ; Lineberry, K.R., 2011)

# Extended Food Shelf-Life



## The user's experience

For Shaun Jericevic there are three stand-out features of the new system

- First, no doubt, are the running costs. The 17 medium temperature cabinets and two cold rooms running on HEOS at Dainfern are similar in size to their multiplex Petervale branch. Yet, it uses some 30% less electricity.
- Second is maintenance. To date they have not experienced an issue with any of the cabinets. "If we do have an issue such as a gas leak it will be just one cabinet that is affected and we might lose 3.5Kg of gas. When compared to the 50 – 60 Kg we lose when the Multiplex system leaks, HEOS is a no-brainer."
- The third key benefit of HEOS for Shaun might well be the fact that they are getting constant cabinet temperature. In fact, a reading on the system shows the variation of cabinet temperature over a 24 hour period was less than 0.5°C.

*"What this constant cabinet temperature has done," says Shaun, "is given us an extra two days shelf-life across the board on all products in the cabinet. Also, very important, the product colour holds reducing the need for reworking the product."*

Experience on DC Technology  
on semi plug-in condensate by water.

Case Study and article published on south  
african magazine: **Supermarket.Co.Za**

[https://www.supermarket.co.za/flipbooks/Supermarket\\_Retailer/July%2021/6/mobile/index.html#p=23](https://www.supermarket.co.za/flipbooks/Supermarket_Retailer/July%2021/6/mobile/index.html#p=23)

# Energy Saving

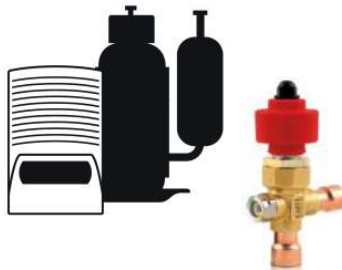


# Energy Saving

**DC compressors and electronic expansion valves**, helps to **reduce the energy consumption** of condensing units.

The store consists in **3 medium temperature walk-in coolers** with a cooling capacity of **3.5 kW each one**.  
The data were collected during 4 weeks for each technology.

Two different solutions were compared, one with condensing units equipped with **DC compressor and electronic expansion valve**, and one with **FIX SPEED** units and thermostatic valve.



# Energy Saving

<i>Solution</i>	<i>Min T [°C]</i>	<i>Max T [°C]</i>	<i>Average T<sub>amb</sub> [°C]</i>	<i>Energy consumption [kWh]</i>
<b>FIX SPEED</b>	22.2	36.7	27.5	2,544
<b>DC TECH.</b>	23.2	39.5	31.7	1,844

Reduction on the energy consumption of **28%**  
with DC Technology

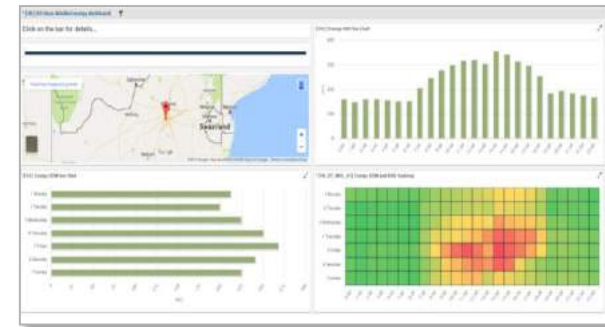
**OPEX reduction**

# Data is king

Equipments with DC Technology daily generate a significant amount of Data

There are opportunities for process optimization by collecting these Data and translate its into **Analytics**: KPI / Benchmark / Reports

Making the refrigeration system **sustainable** and preserve/increase **profitability** of the stores



# Analytics

**Analytics** are possible

just with an adequate information management



## **Proactive analytics:**

automatic implementation of the proposed actions



## **Prescriptive analytics:**

operative/strategic solutions are proposed by the system on the basis of the analysis performed



## **Preventive analytics:**

understand what might happen in the future



## **Descriptive analytics:**

describe the current and past situation, converting the data into information

# Key Takeaway

- DC Technology is real, applicable Food Retail business and available for a wide range of applications;
- Considerable energy saving results can be achieved;
- Further energy saving and better food preservation can be achieved by combining together Electronic Expansion Valve and advanced control algorithms;
- Precise temperature regulation & Shelf-Life food extension;
- High data availability eliminates food waste and increase the overall system reliability (less operational costs).

# THANK YOU



[mirko.travaglin@carel.com](mailto:mirko.travaglin@carel.com)