



ATMO sphere





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ARNEG INNOVATION & NATURAL REFRIGERANT BUSINESS CASE SOLUTION

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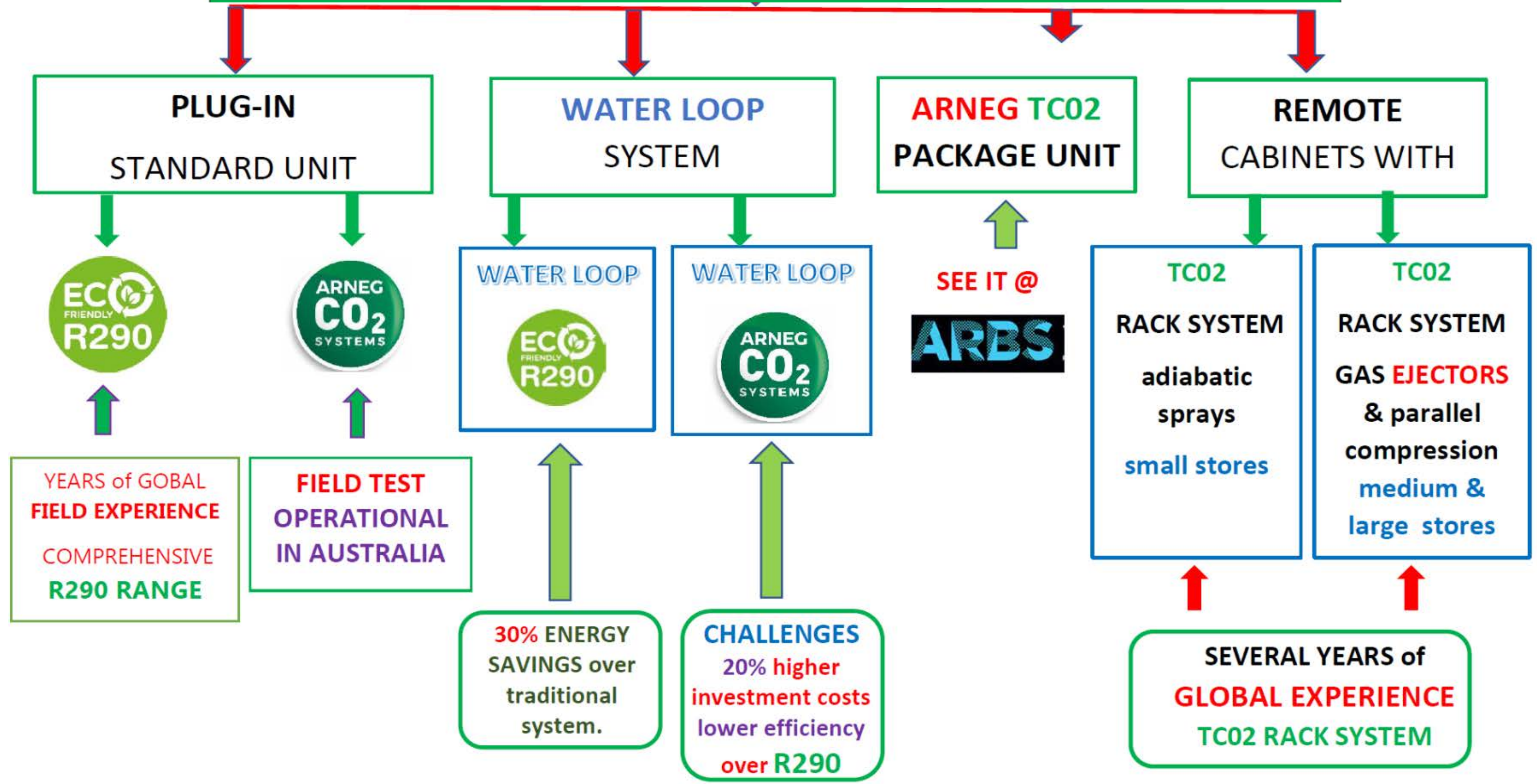
– Arneg Group R&D Director

- Arneg Oceania Senior Engineer

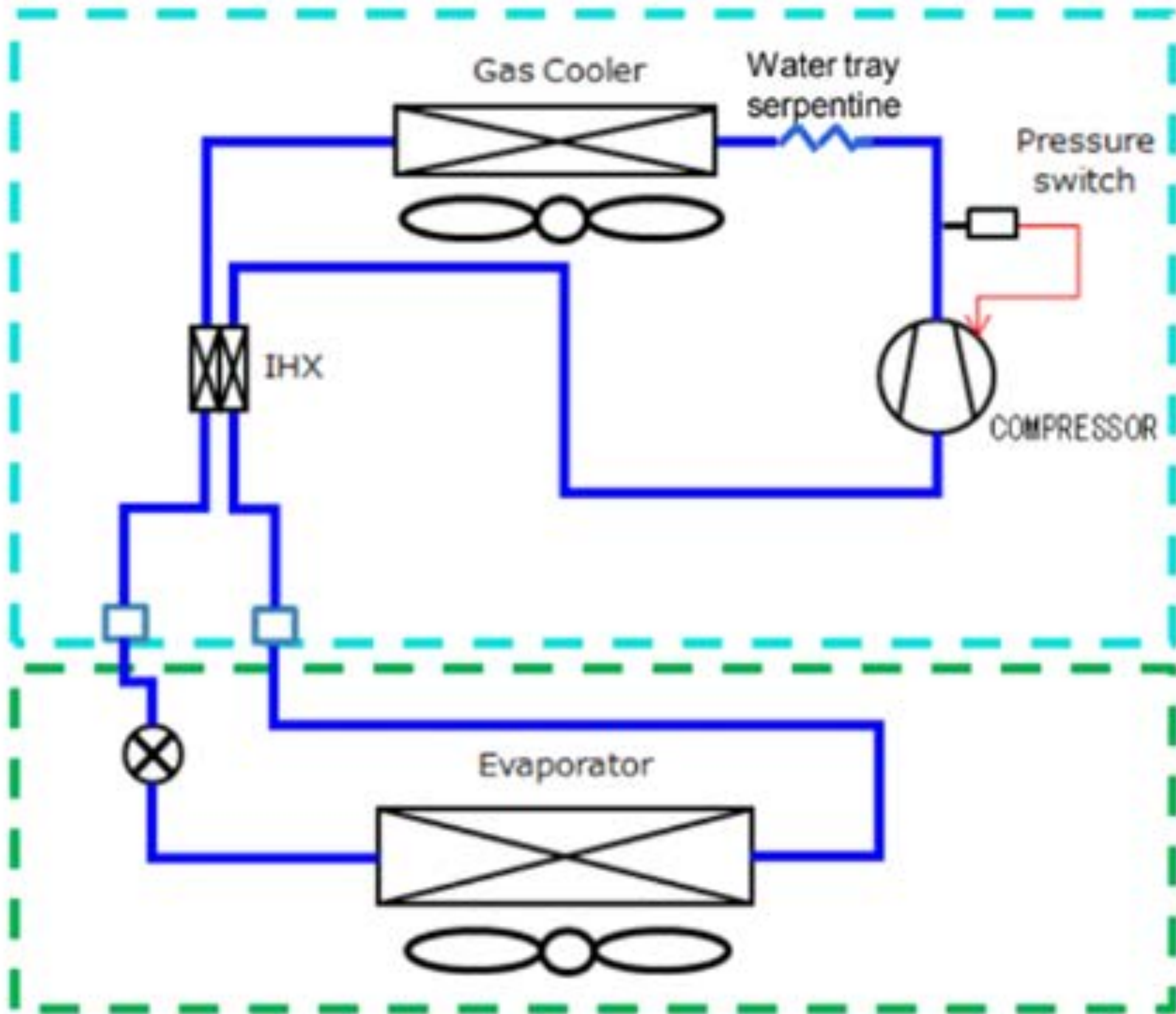
- Arneg Oceania Engineering Manager

- Arneg Oceania National Account Manager

ARNEG INNOVATION & NATURAL REFRIGERANT BUSINESS CASE SOLUTION



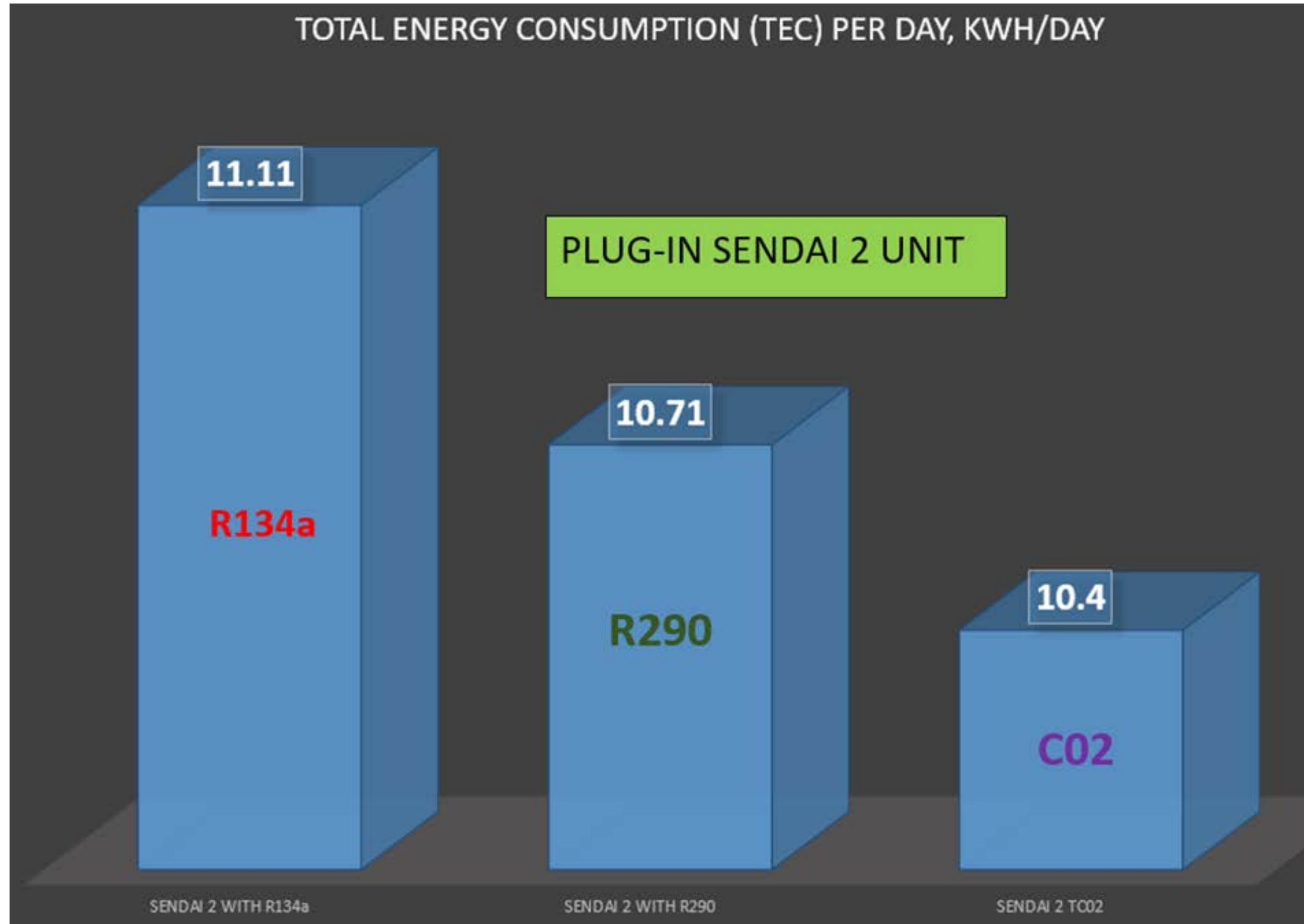
Refrigeration scheme



SENDAI 2 TC_{CO2} at Woolworths Marrickville Metro, Sydney



PLUG-IN SENDAI 2 ENERGY CONSUMPTION COMPARISON **R134a** **R290** & **C02**



Plug-in Cabinet type	Total Energy Consumption (TEC) per day, kWh/Day
SENDAI 2 WITH R134a	11.11
SENDAI 2 WITH R290	10.71
SENDAI 2 TC02	10.4

- ❑ **Arneg** plug-in Sendai 2 **TC02** unit is **7.0%** more energy efficient over **R134a** standard plug-in unit.
- ❑ Sendai 2 **R290** **3.7 %** more energy efficient than **R134a**

Arneg water loop FIELD EXPERIENCE

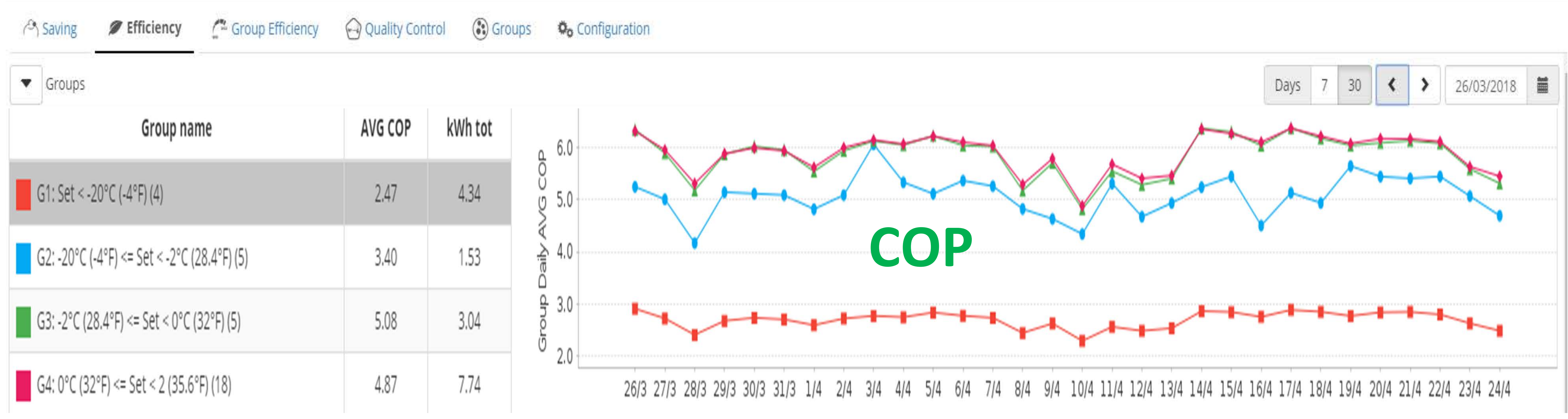


DESIGNED & MANUFACTURED IN AUSTRALIA



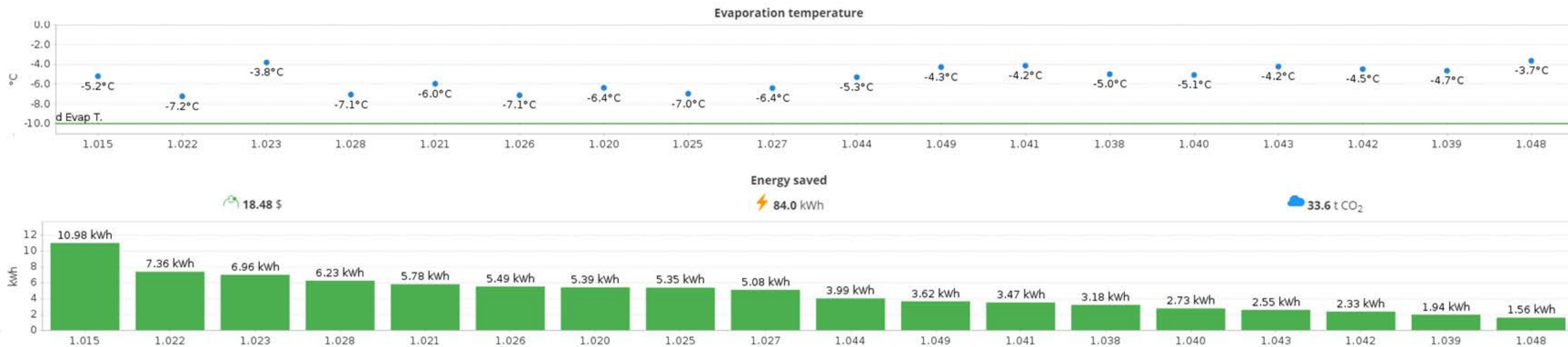
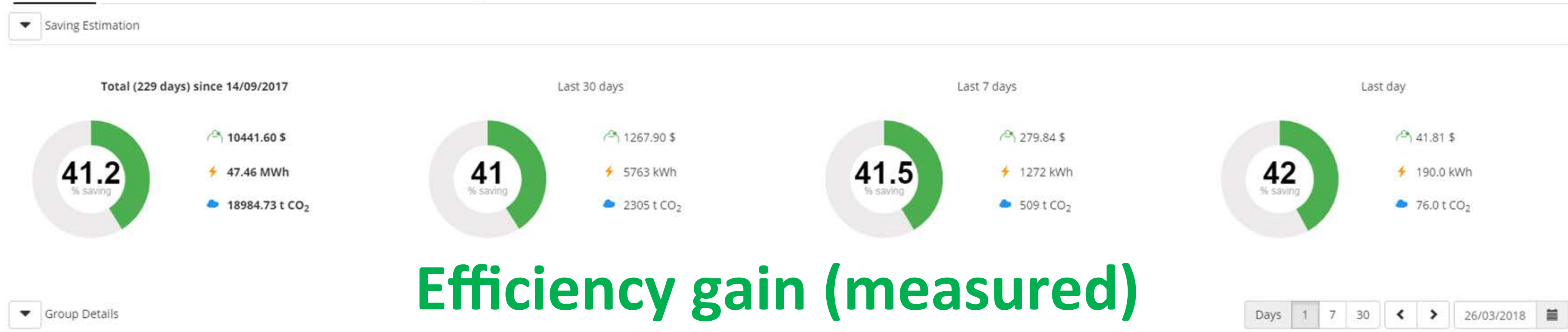
- ❑ TOTAL OF **12 OPERATING SITES (14 BY JUNE 2018) IN AUSTRALIA**
- ❑ TOTAL OF **OVER 500 OPERATING UNITS WITHOUT CHILLER**

Carel data acquisition & monitoring system



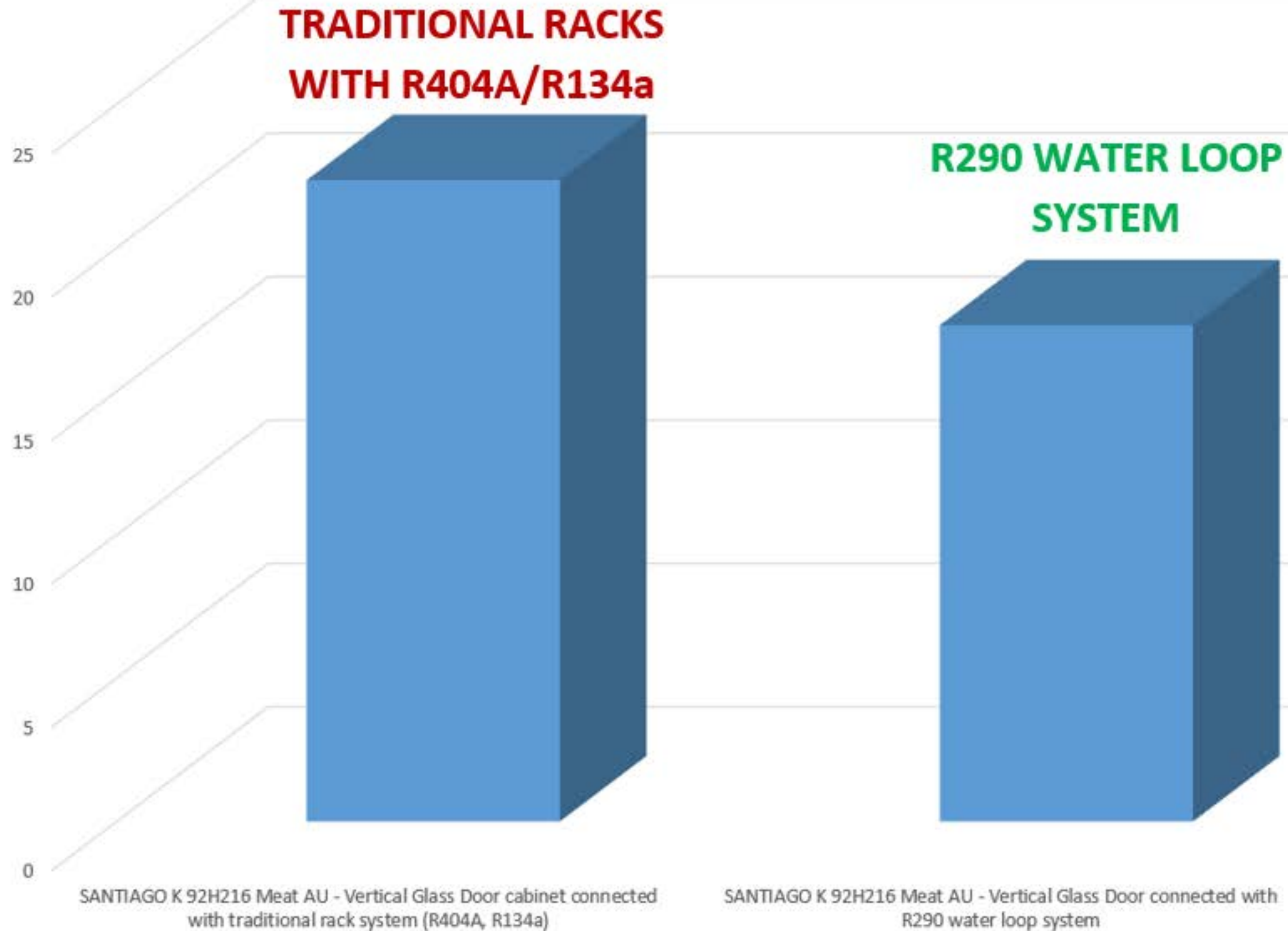
HEOS Dashboards

[Saving](#)
[Efficiency](#)
[Group Efficiency](#)
[Quality Control](#)
[Groups](#)
[Configuration](#)



RELIABILITY

Total Energy Consumption (TEC) per day, kWh/Day



Type of Refrigeration Technology	Total Energy Consumption (TEC) per day, kWh/Day
SANTIAGO K 92H216 Meat AU - Vertical Glass Door cabinet connected with traditional rack system (R404A, R134a)	22.36
SANTIAGO K 92H216 Meat AU - Vertical Glass Door connected with R290 water loop system	17.30

Tested in Sydney
Arneg R & D Lab

29.25%
EFFICIENCY GAIN

FULLY OPERATIONAL Low & Medium Temp R290 water loop



CURRENT CHARGES UNDER 350 g

Challenges of R290 water loop:

- STANDARDS on R290 charge limit regulations
- TECHNICAL KNOWLEDGE & TRAINING

Water cooled CO₂ units:
UNDER DEVELOPMENT

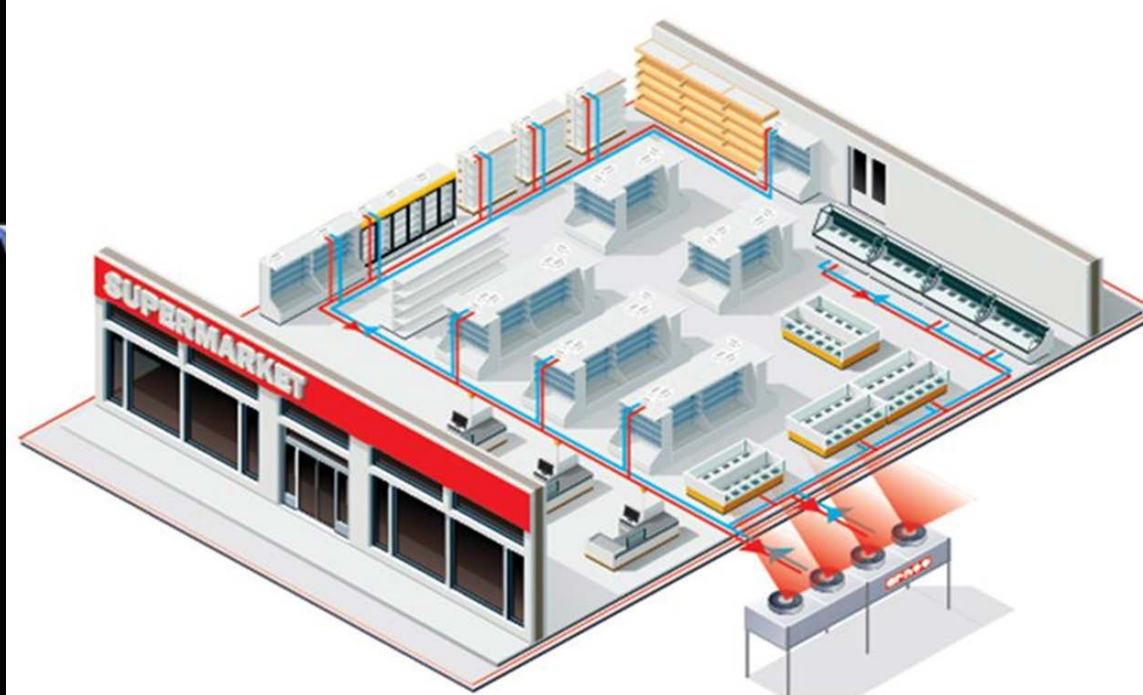


3 Technologies in 1 solution

1) Water Loop advantages

2) Advantages of Variable Speed Compressor + electronic EEV valve

3) Advantages of CO₂ as refrigerant



Challenges of CO₂ as refrigerant

Current technology

- ❑ Chiller warm climates: significant **cost premium** (capital + energy cost) compared to **R290**
- ❑ Component availability is **limited**.
- ❑ Operational **efficiencies lower** than to **R290**

CONCLUSION:

- ❑ **R290 Water loop** is the **CURRENT CHOICE** due to being cost effective & energy efficient..
- ❑ More work required to reduce charge further.
- ❑ **STANDARDS** on **R290** charge limit regulation to be finalised.

Arneg TC02 Package Unit

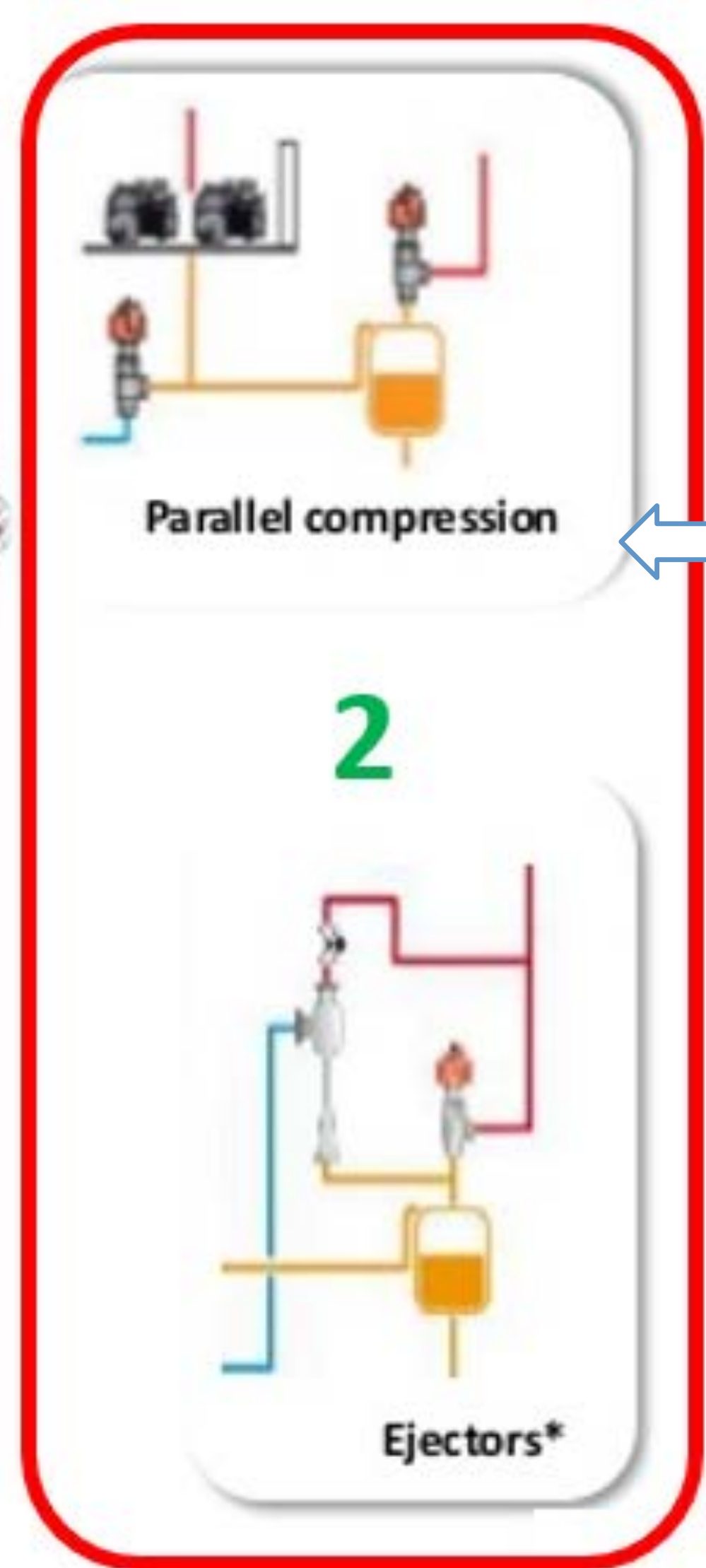
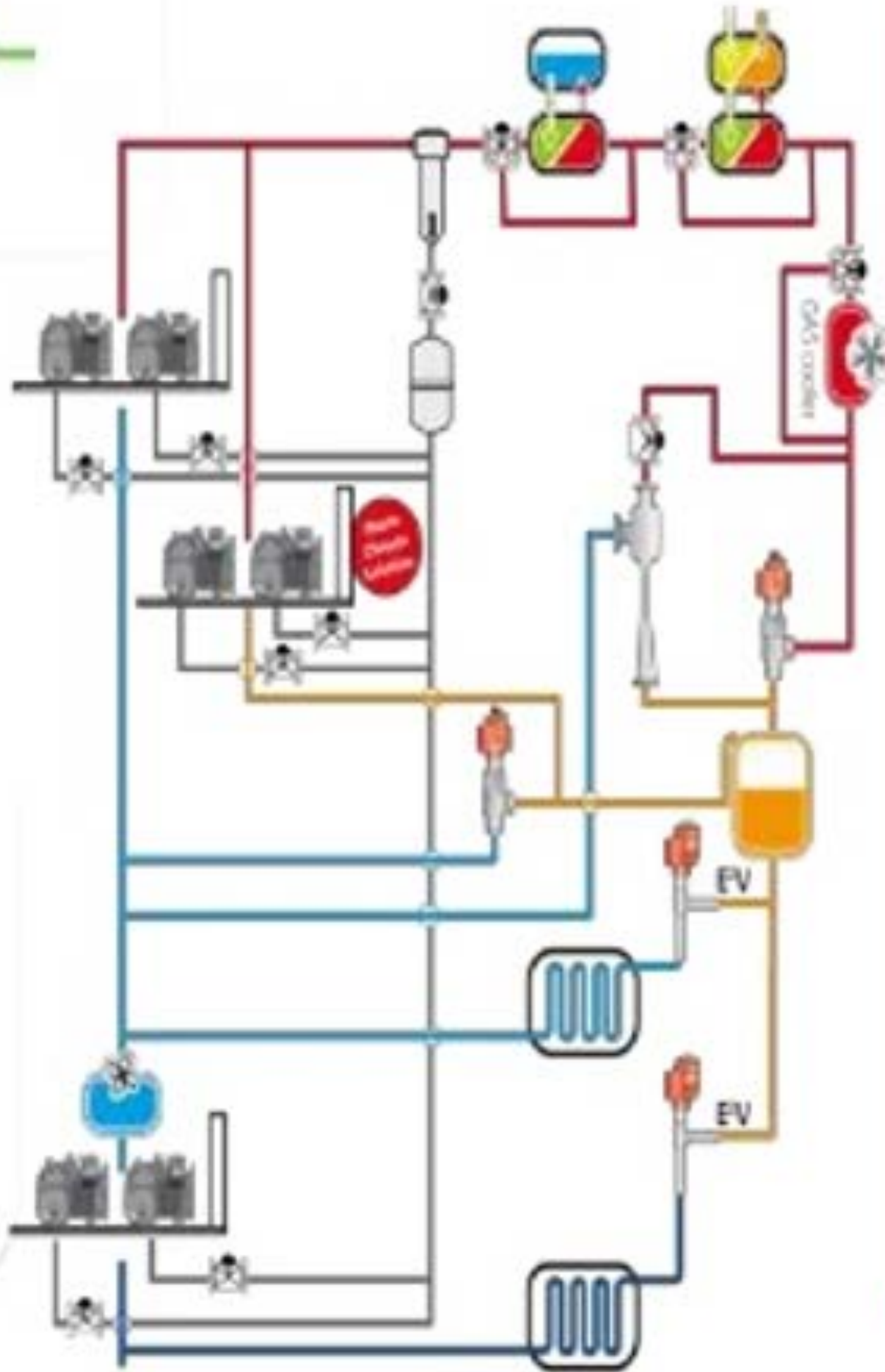
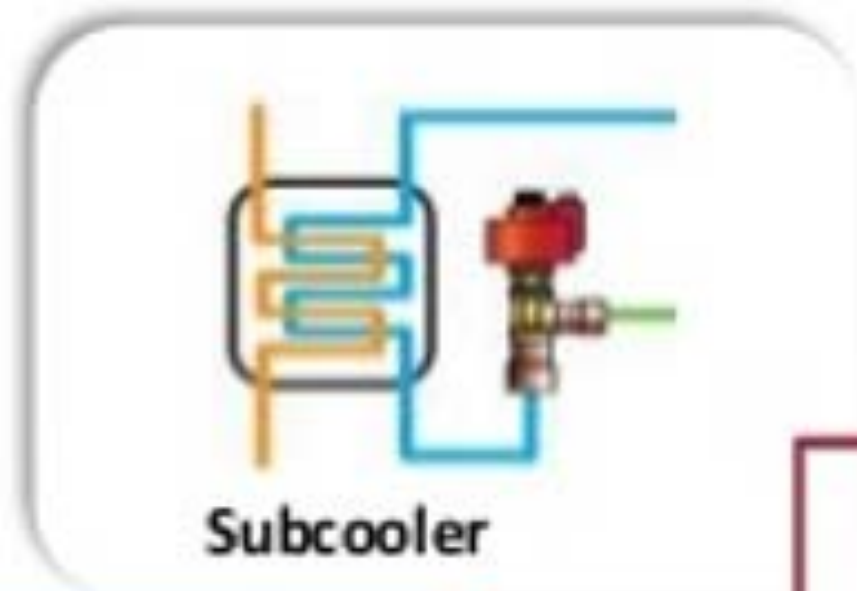
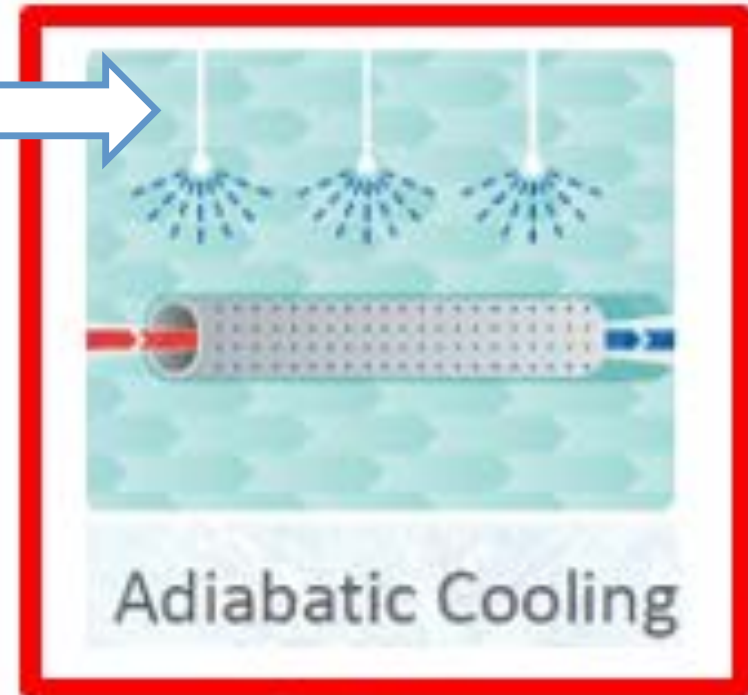


ARNEG
TC02
PACKAGE
UNIT ON
DISPLAY AT

ARBS 2018

Arneg solution for small stores. Cheaper, simple control & appropriate for low humidity climate zone

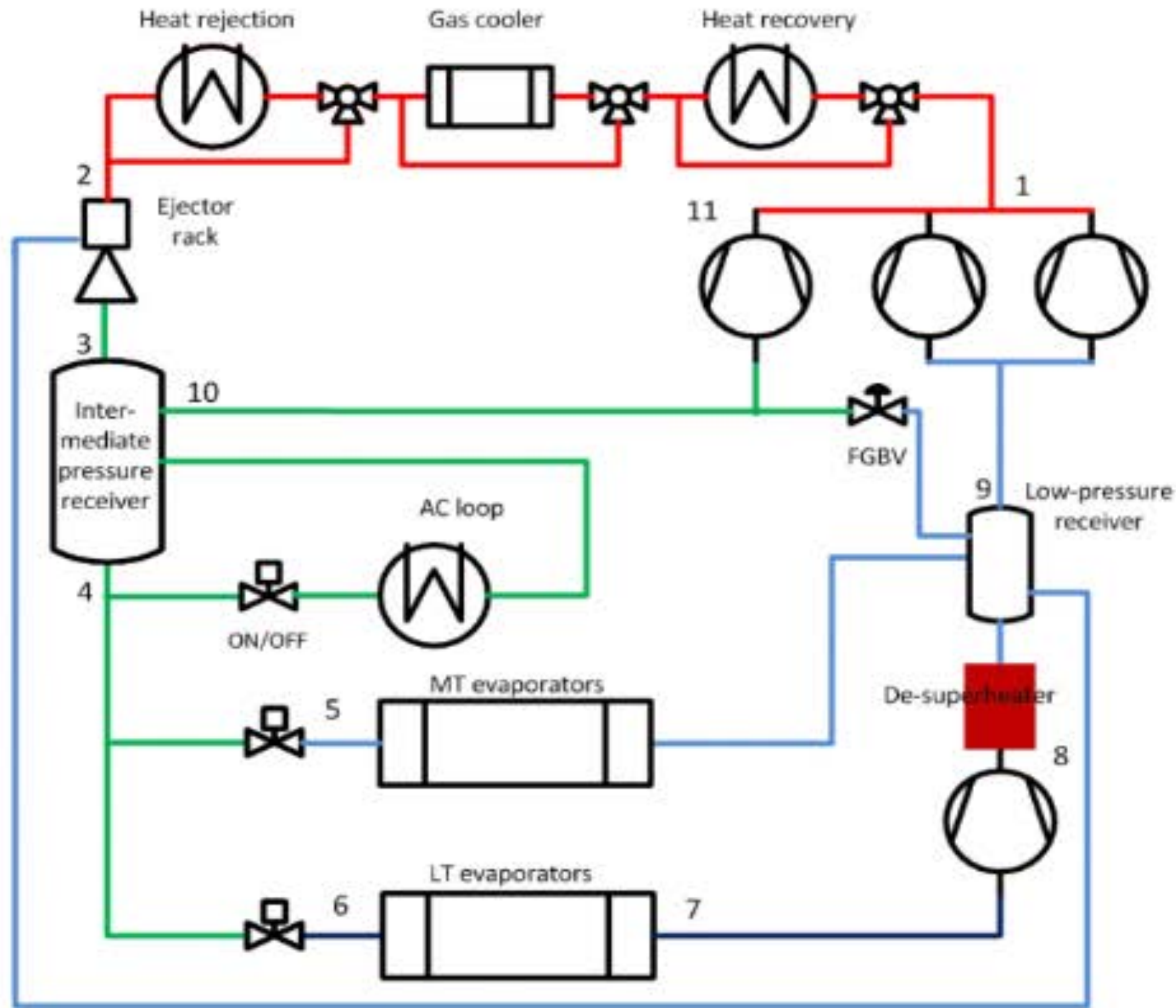
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Arneg solution for medium & large market. High system efficiency

Arneg is working with **Liquid & gas ejector** technology

Arneg recommend the **"Best Choice"** for large market – **TCO₂** with ejector & parallel compression Technology



System	Energy saving VS. R404a	Compressor saving VS. Booster
Booster	-25%	0%
Parallel compression	3%	19%
Gas ejector	7%	28%
Liquid & gas ejector	16%	35%

ARNEG HAS
24 TCO₂
STORES IN
NEW
ZEALAND
(since 2011)

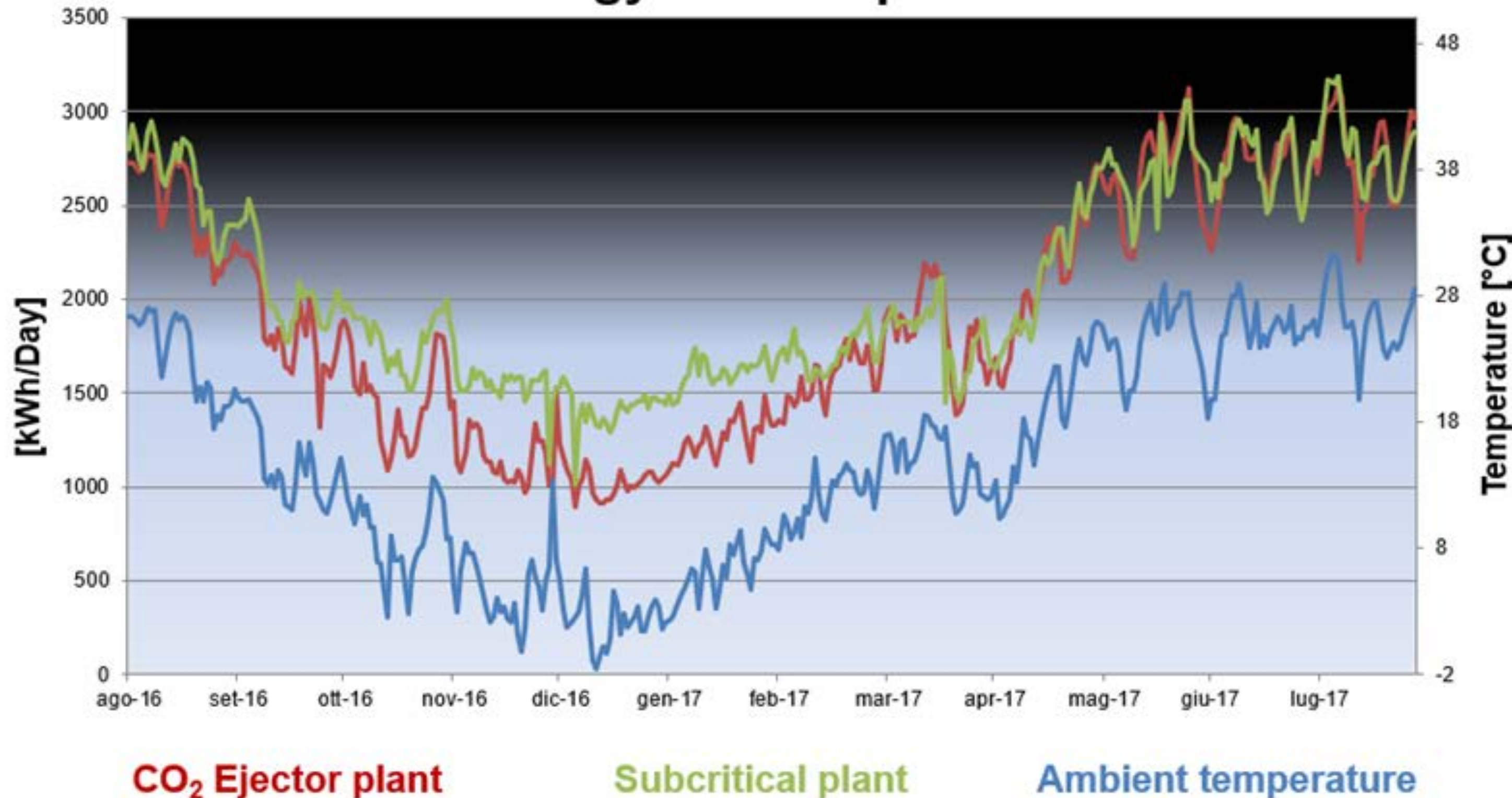
ECOCHILL

Arneg experience

Energy consumption (measured) comparison

TCO2 vs Cascaded CO2

Energy Consumption



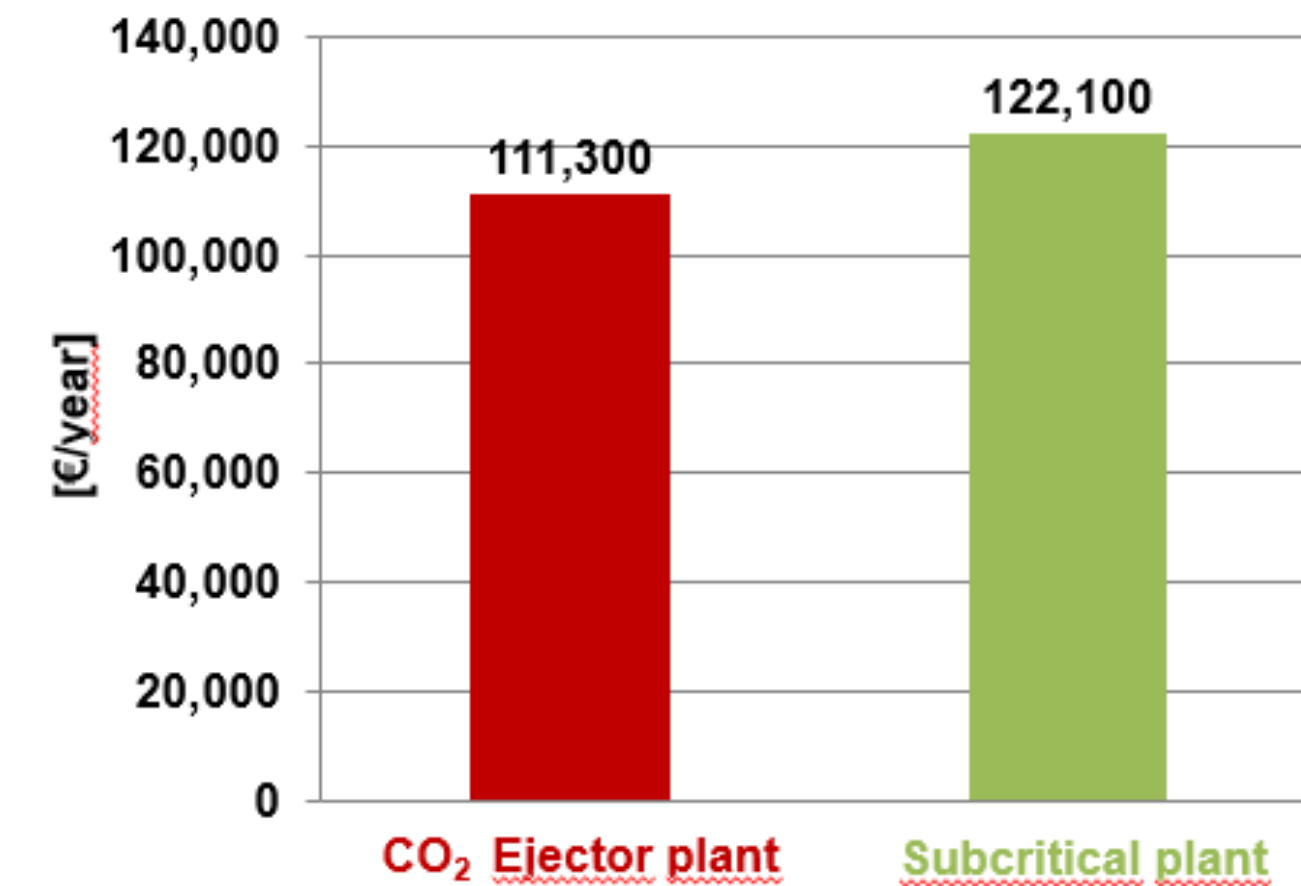
Summer

CO₂ ejector energy consumption similar to subcritical

Winter

Good performance of CO₂ ejector plant

Energy consumption | MEASURED



Saving 9%

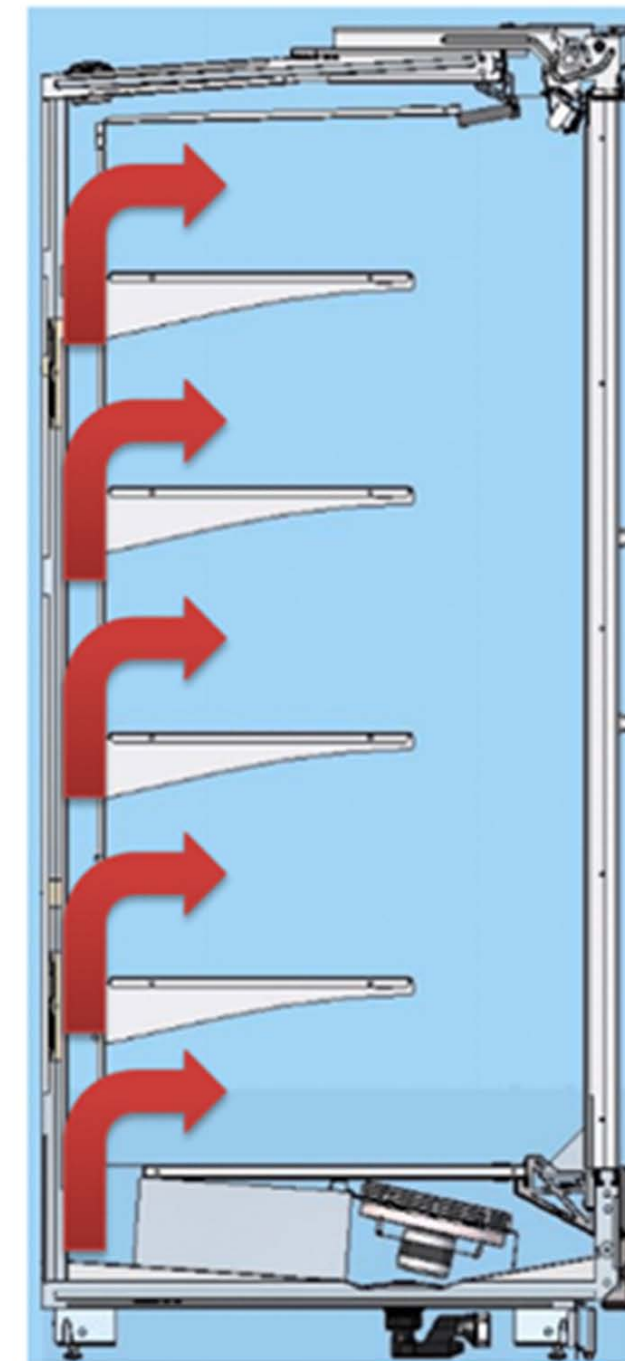
-60,300 kWh/year
-10,800 €/year

COMPLEMENTARY TECHNOLOGY

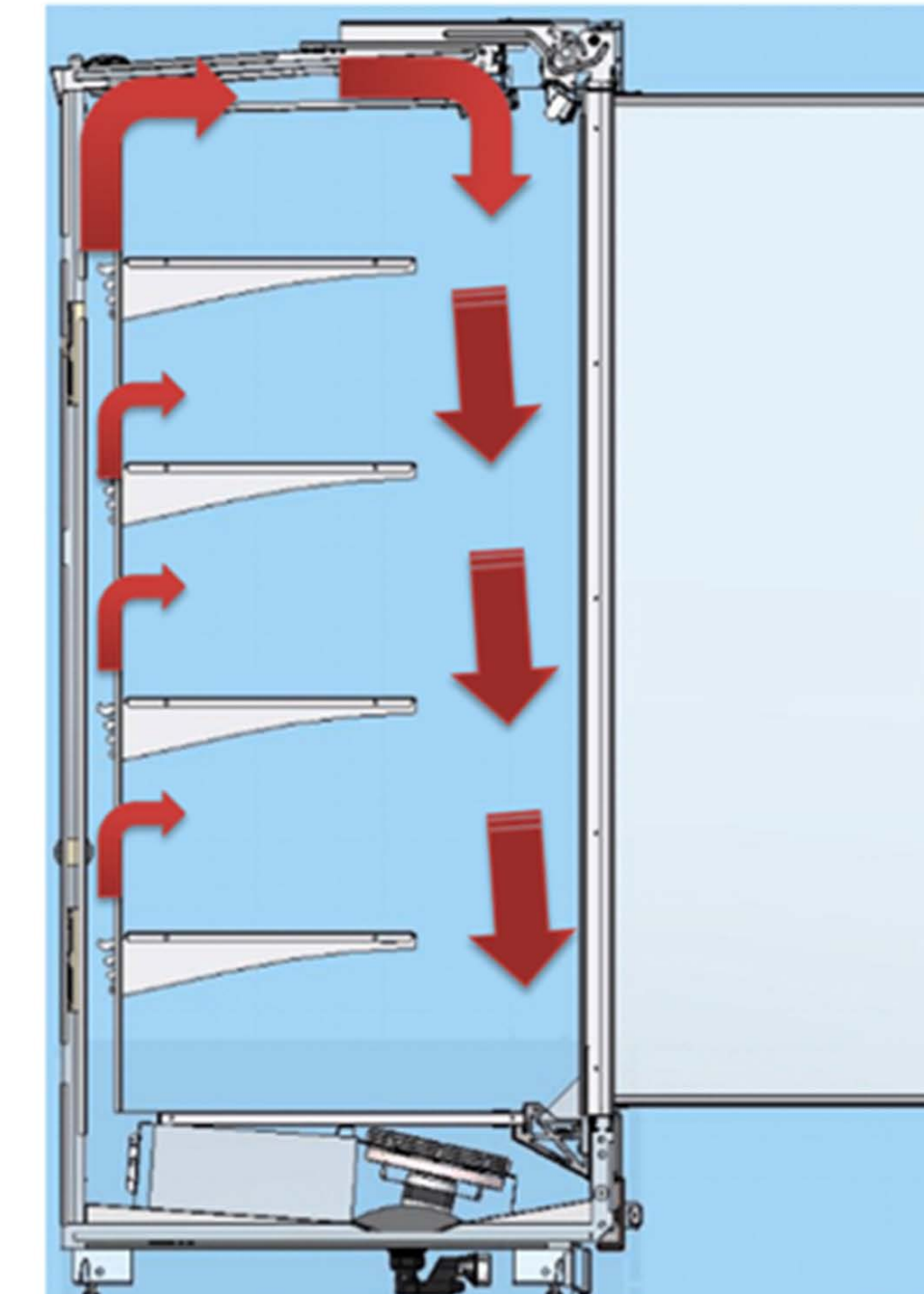
To further **REDUCE ENERGY BY 37%**



TC02 system at RITCHES IGA
Beechworth, VIC



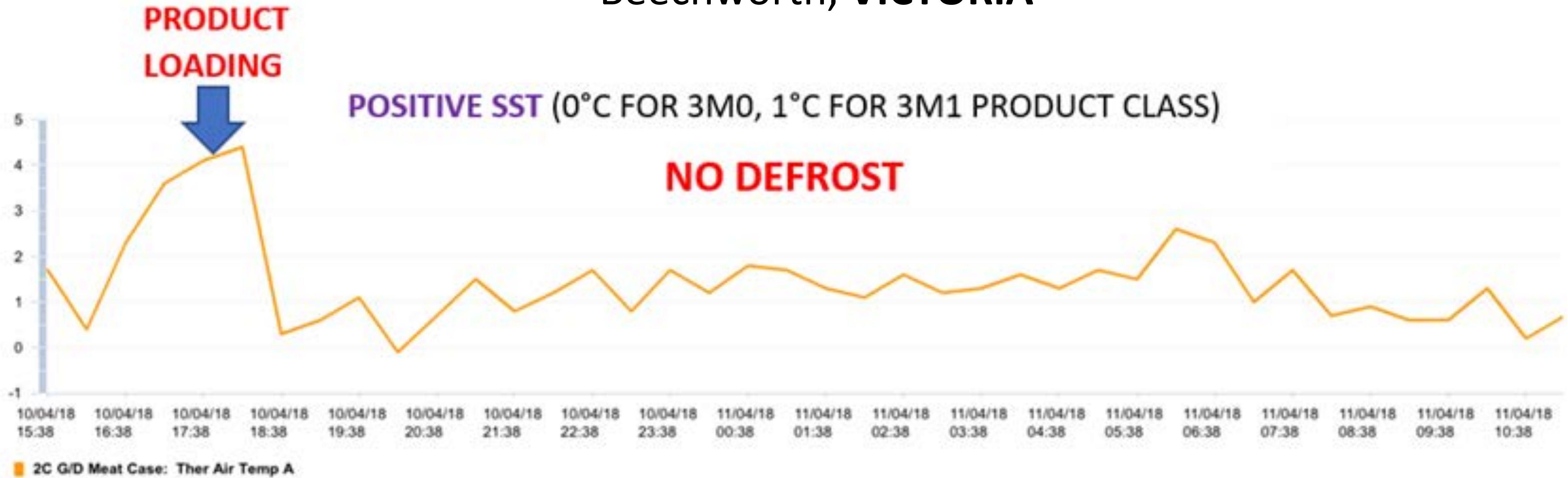
Doors closed



Door opened

Tipo di multideck	Classe temperatura	T. Evap media[°C]	TEC [kWh/24h]	TDA [kWh/24h]	TEC/TDA [kWh/24h/m2]
Air System	3M0	+0	13.05 - 37%	3.29	3.97
Standard	3M0	-7	20.60	3.29	6.26
Air System	3M1	+1	12.25	3.29	3.72
Standard	3M1	-6	18.5	3.29	5.62

Arneg Santiago Air System & TC02 system at RITCHES IGA
Beechworth, **VICTORIA**



SANTIAGO AIR SYSTEM IS **37% MORE ENERGY EFFICIENT** THAN
SIMILAR CATEGORY CONVENTIONAL REMOTE CABINET

Data courtesy of Ritchies Supermarkets & Refrigeration Innovations

*“We are running the **ARNEG SANTIAGO AIR SYSTEM** in a **Ritches IGA** in Victoria, a **trans-critical Co2 store with the Danfoss ejector system** (first in Australia)-**positive SST, no defrosts**, at the desired temperature. To date we have observed a clear coil and no reduction in airflow” (running over 8 weeks) – the store reports **good meat condition** over the period of running. I believe the case could also be used for dairy and other medium temperature applications. **Having no defrosts is a good energy outcome.***

Dave Redden

**F.A.I.R.A.H. Principal,
Refrigeration Innovations P/L**

*“Part of **Woolworths CRS 2020** targets, **Woolworths Marrickville** is the first store where we have implemented natural solutions for self-contained refrigerated showcases.*

Arneg Plug-in SENDAI 2 **TCO2** has been selected as preferred option for the trial”

Michael Englebright –
WOOLWORTHS

*National Engineering Manager
Format Development*

*“The partnership between **Drakes & Arneg** on **natural refrigerants** goes back many years. Arneg continuous technology improvements make Arneg our preferred refrigeration case company”.*

Bob Soang
General Manager
DRAKES. Supermarkets



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Thank you very much!

