



ATMO
sphere

solutions for europe
natural refrigerants

19 & 20 April, 2016 – Barcelona





SANDEN

Delivering Excellence



solutions for europe
natural refrigerants

19 & 20 April, 2016 – Barcelona

100% CO₂ solutions for small and medium store formats

Sylvain GILLAUX – Sales & Marketing Manager



Model	CDU1		CDU2	CDU3	CDU4	CDU5	CDU6
Image							
Installation	Remote	Remote	Remote	Plug in Top/ Bottom	Plug in Top/ Bottom	Plug in Top/ Bottom	Plug in Top/ Bottom
Compressor	DC variable speed Scroll compressor x3	DC variable speed Scroll compressor x3	DC variable speed Scroll compressor x1	DC variable speed Scroll compressor + DC Variable speed Reciprocating Compressor	DC Variable speed Reciprocating compressor X2 or AC single speed x2	DC variable speed Scroll compressor	DC Variable speed Reciprocating compressor or AC single speed



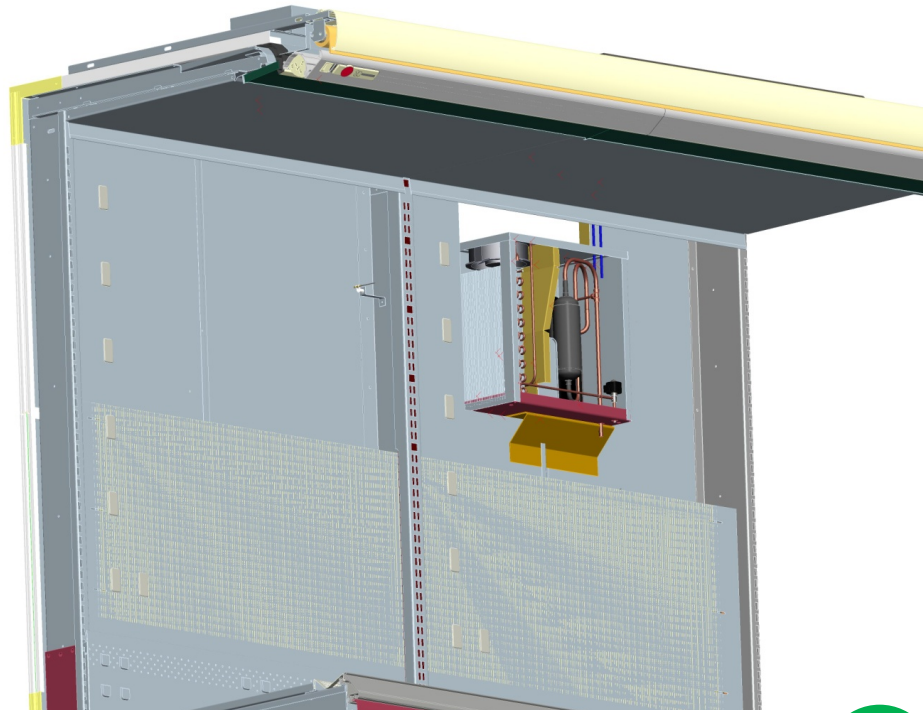
2015 Target
→ Expand globally

More than 200 stores installed in Japan!

Based on an existing “SANDEN CO₂ Technology” range of products and platforms:

- Confirm interest of European customers and end-users
- Deploy to the market, considering necessary adaptations
- Gather experience and feedback from all involved parties on the value chain.

1st achievements in Europe



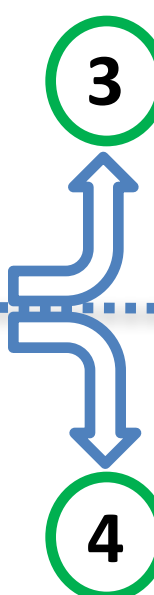
Water loop (semi-plug-in)
Air plug-in



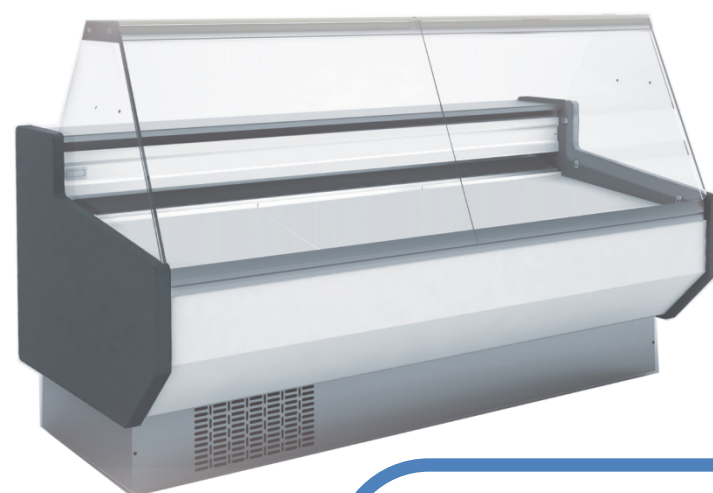
Plug-in CDU



Remote CDU



Remote cabinets
Cold rooms / lab.



**Our SANDEN CO₂ Technology
 has been successfully integrated
 in identified key applications (MT & LT)**

① Air plug-in solutions

Key feature
 Challenges

1st installation in Europe
 Initial cost
 Energy efficiency
 ROI
 N°1 end user's comment

1st CO₂ inverter-type plug-in in Europe
 Horizontal mounting of scroll compressor
 Allow intelligent communication between cabinet control and CDU control
 Adapt CO₂ loop layout
 October 2015 (France / Paris)
 ~+15% vs HFC (cabinet + CDU)
 -21% (to be confirmed by field data over 12 months)
 Depending on cabinet quality / pricing
 Extremely silent



② Semi plug-in solutions

Key feature

Challenges

1st installation in Europe

Initial cost (total store)

Energy efficiency

ROI

N^o1 end user's comment

1st CO₂ inverter-type semi plug-in in Europe

Allow intelligent communication between cabinet control and CDU control

Adapt CO₂ loop layout to cabinets

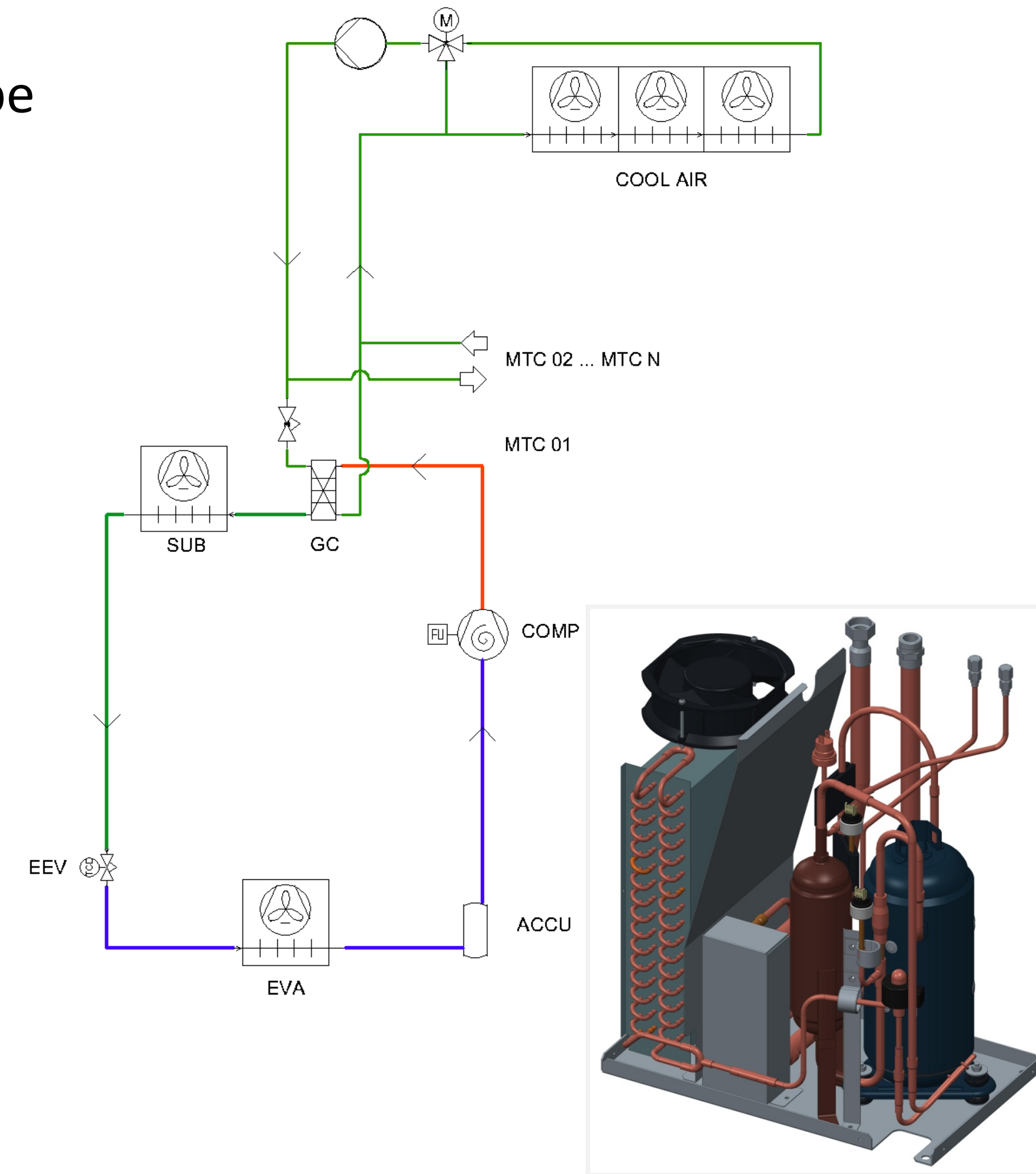
January 2016 (Switzerland)

Lower vs CO₂ rack // equivalent to HC

Equivalent to best-in-class water-loop
 (to be confirmed by field data over 12 months)

Depending on cabinet quality / pricing

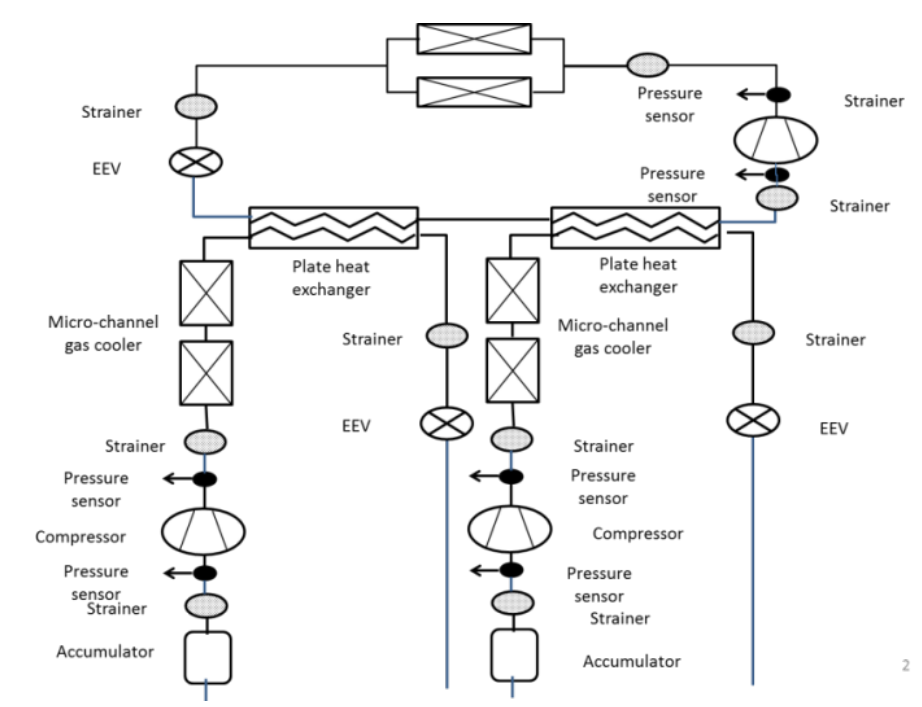
Extremely silent



Key feature
 Challenges

1st installation in Europe
 Initial cost
 Energy efficiency
 ROI
 N°1 end user's comment

1st CO₂ inverter-type CDU range 2~10kW
 Communication with store monitoring sys.
 Adapt to European power input
 Adapt CO₂ loop layout
 Get "acceptance" from installers
December 2015 (France)
 ~+8~17% vs HFC (including installation)
 See next slide (to be confirmed by field data over 12 months)
 Depending on cooling capacity installed
 Installation easiness / silent / compact



Focus on energy efficiency

SANDEN has optimized its CDUs for temperature conditions with highest occurrence.

Data were measured on the field in Asia, then extrapolated to European typical climates

Conditions: evaporating temperature = -5°C // Same cooling capacities for R404a and CO₂ systems

Calculation is weighted on:

- > temperature occurrences of each climate area
- > hourly cooling demand function of the outside temperature



CDU-S unit	Annual consumption [kWh]
Strasbourg	3 353
Helsinki	2 990
Athens	4 492



CDU-L unit	Annual consumption [kWh]
Strasbourg	13 556
Helsinki	11 383
Athens	20 151



SANDEN CO ₂ CDU	Annual savings
Strasbourg	37%
Helsinki	39%
Athens	30%

Key findings / observations / feedbacks

#1: Very low charge of natural & non-flammable refrigerant

#2: Optimization vs instantaneous cooling needs

#3: Extremely silent

#4: Easiness of installation vs racks

#1: cooling capacity (MT & LT) matching exactly needs

#2: Easiness of installation

#3: Extremely silent

#4: low charge of refrigerant due to down-sized CDU



#1: Very low charge of natural & non-flammable refrigerant

#2: Optimization vs instantaneous cooling needs

#3: Extremely silent

#1: Cooling capacity (MT & LT) matching exactly needs

#2: Easiness of installation

#3: Extremely silent

#4: Low charge of refrigerant due to down-sized CDU



SANDEN

Delivering Excellence



solutions for europe
natural refrigerants

19 & 20 April, 2016 – Barcelona

THANK YOU! GRACIAS!

Sylvain GILLAUX – Sales & Marketing Manager





solutions for europe
natural refrigerants

19 & 20 April, 2016 – Barcelona

Thank you very much!