

Carrier

A United Technologies Company

COOLtec

The Ultimate CO₂ Refrigeration System for every
food retail store format

Market developments for CO₂ in Commercial Refrigeration

ATMOsphere Europe 2011 Conference, Brussels

Speakers: Christoph Brouwers / Lothar Serwas

MARKET DEVELOPMENTS FOR CO₂ IN COMMERCIAL REFRIGERATION

The last two decades

Significant GWP of HFC refrigerants demanded efforts to reduce the greenhouse gas effect resulting from these substances

- refrigerant charges reduced
- system tightness improved

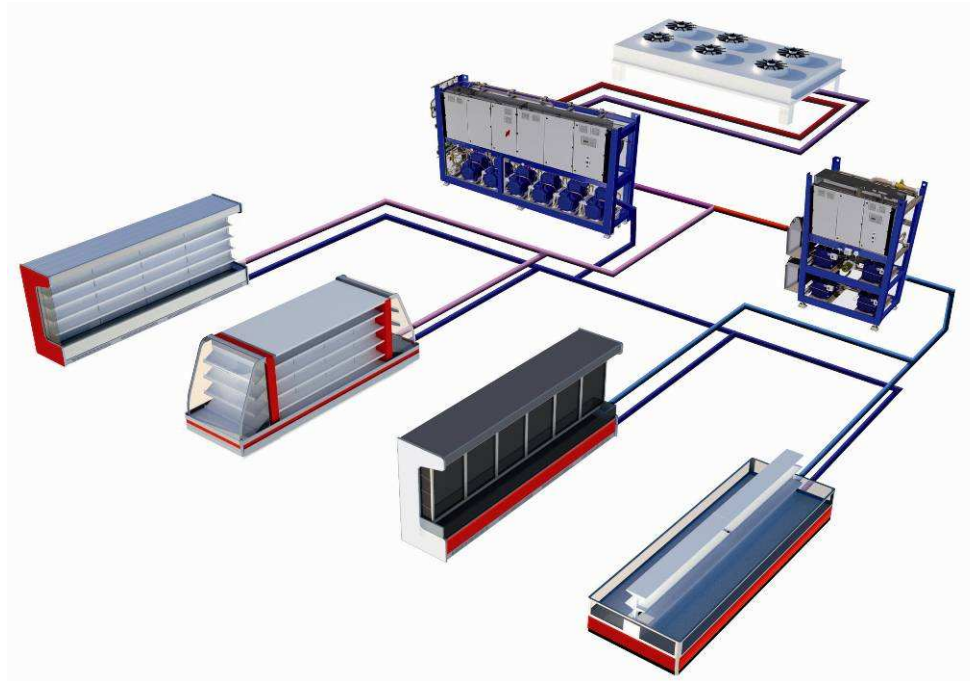
Situation better but no real long term way forward

- numerous supermarket refrigeration systems with different natural refrigerants, some with secondary refrigerant- / waste heat circuit, realised



MARKET DEVELOPMENTS FOR CO₂ IN COMMERCIAL REFRIGERATION

Based on collected experiences CO₂ DX emerged as state of the art solution in food retail stores today



MARKET DEVELOPMENTS FOR CO₂ IN COMMERCIAL REFRIGERATION

Market drivers

- climate protection
- economic aspects
- energy efficiency
- products, technical innovation, services



MARKET DRIVERS AND DEVELOPMENTS

Climate Protection

- European Union

 - F-Gas Regulation – actual review of effectiveness

- National regulations

 - CO₂ is standard in several countries today because governments have shown strong leadership towards sustainable solutions

- End users

 - many food retail chains take a safe line and invest into CO₂ refrigeration equipment, some opt for CO₂ as their standard
 - Sustainability is a business objective of leading retail chains



MARKET DRIVERS AND DEVELOPMENTS

Economic aspects

- price of HFC refrigerants rising rapidly
 - refrigerant disposal costs at the end of the life cycle
 - cost for energy is rising continuously
 - compliance with F-Gas Regulation adds to cost of ownership
 - life-cycle cost comparisons starting to show more attractive ROI for CO₂ systems at large store formats
[supporting policy and volume growth is key!]
 - risk of potential refrigerant conversion and additional costs due to possibly tightened requirements of a revised F-Gas Regulation
- retailers are more and more prepared to review their investment strategy towards natural refrigerants



MARKET DRIVERS AND DEVELOPMENTS

Energy efficiency

- reducing energy consumption makes perfect sense
 - saves operating costs
 - enhances corporate image
 - supports the fight against climate change
- CO₂ systems in commercial refrigeration have proved their attractive energy savings by 10% in mild to cold climates
- industry is working on next generation of CO₂ systems for warmer climates



MARKET DRIVERS AND DEVELOPMENTS

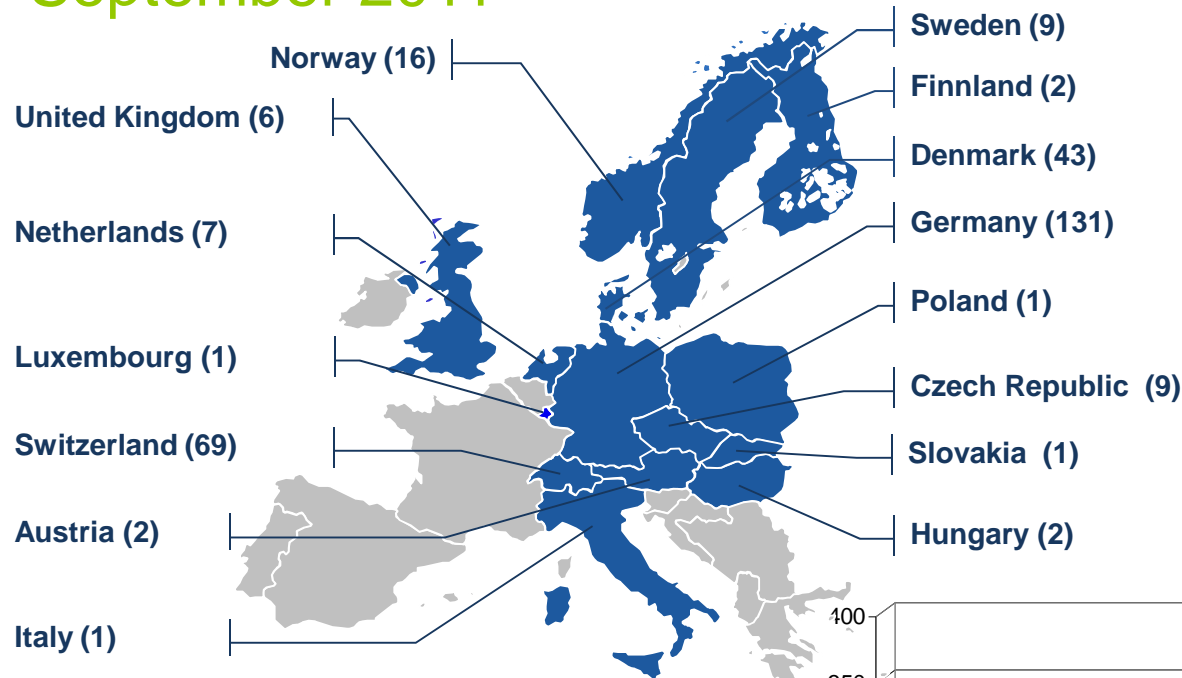
Products, technical innovation, services

- plug-and play heating system solution as an add-on to the range of CO₂ refrigeration systems
- integrated solutions for refrigeration, space heating and cooling
- CO₂ based refrigeration systems under development and testing for warmer countries
 - parallel compression / economizer
 - expansion compression unit / ejector instead of HP valve
 - combination with sub cooling unit
- energy analysis services



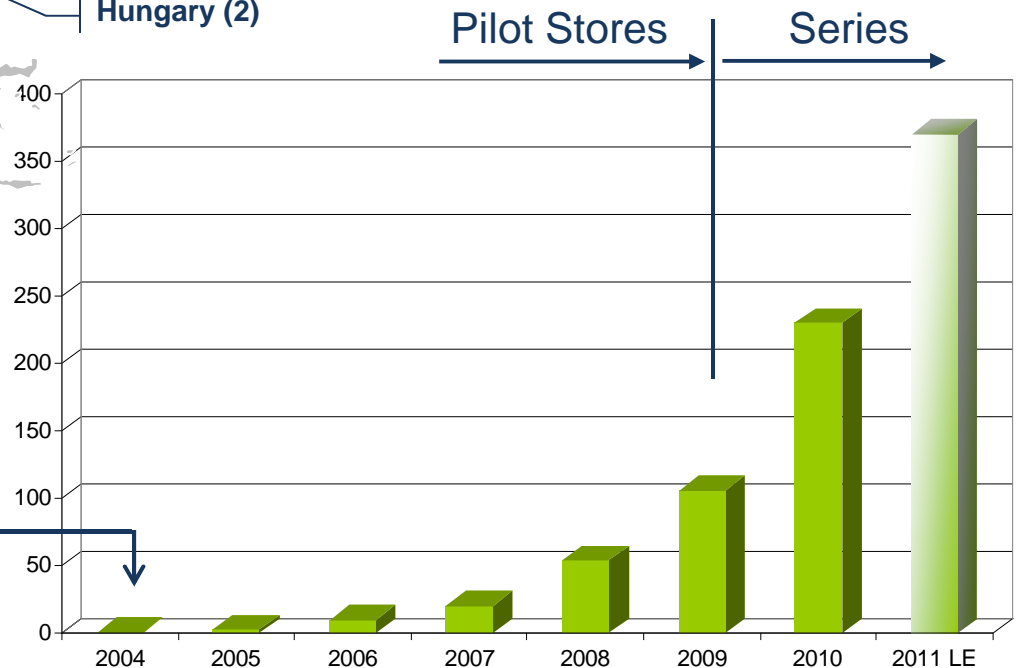
COOLtec STORES IN OPERATION

September 2011



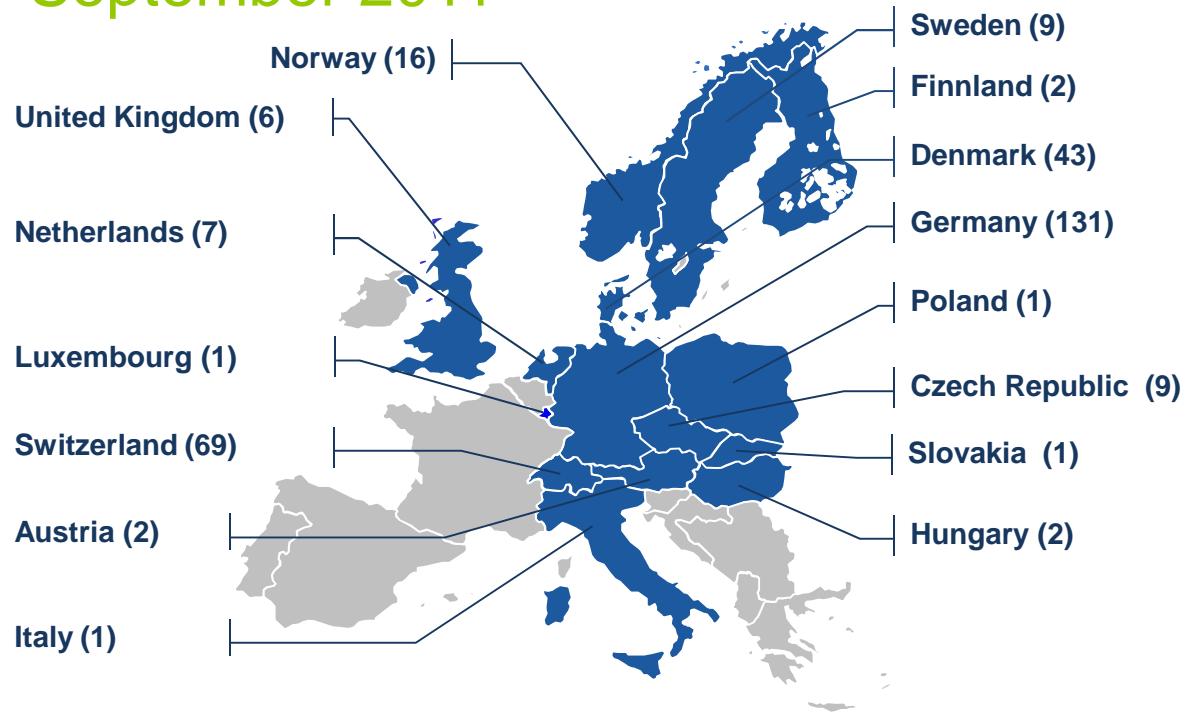
YTD September 2011
 300 Stores in operation (151 YTD PY)
 33 MW MT capacity (18,5 MW PY)
 4,3 million operating hours (483 Years)

First CO₂OLtec Installation in Switzerland in 2004



COOL₂tec STORES IN OPERATION

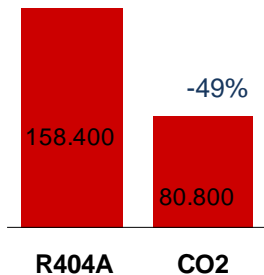
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Environmental Impact

CO2 equivalent(tons)



Cumulated reduction of CO2 emissions

77.600 tons or* (40.900 tons YTD PY)

23.200 X
(12.900 YTD PY)



* Average car using 0,12Kg CO2/km; run time 15.000 km per year

CO₂ DX-REFRIGERATING SYSTEMS

Geography



CO₂ DX systems today

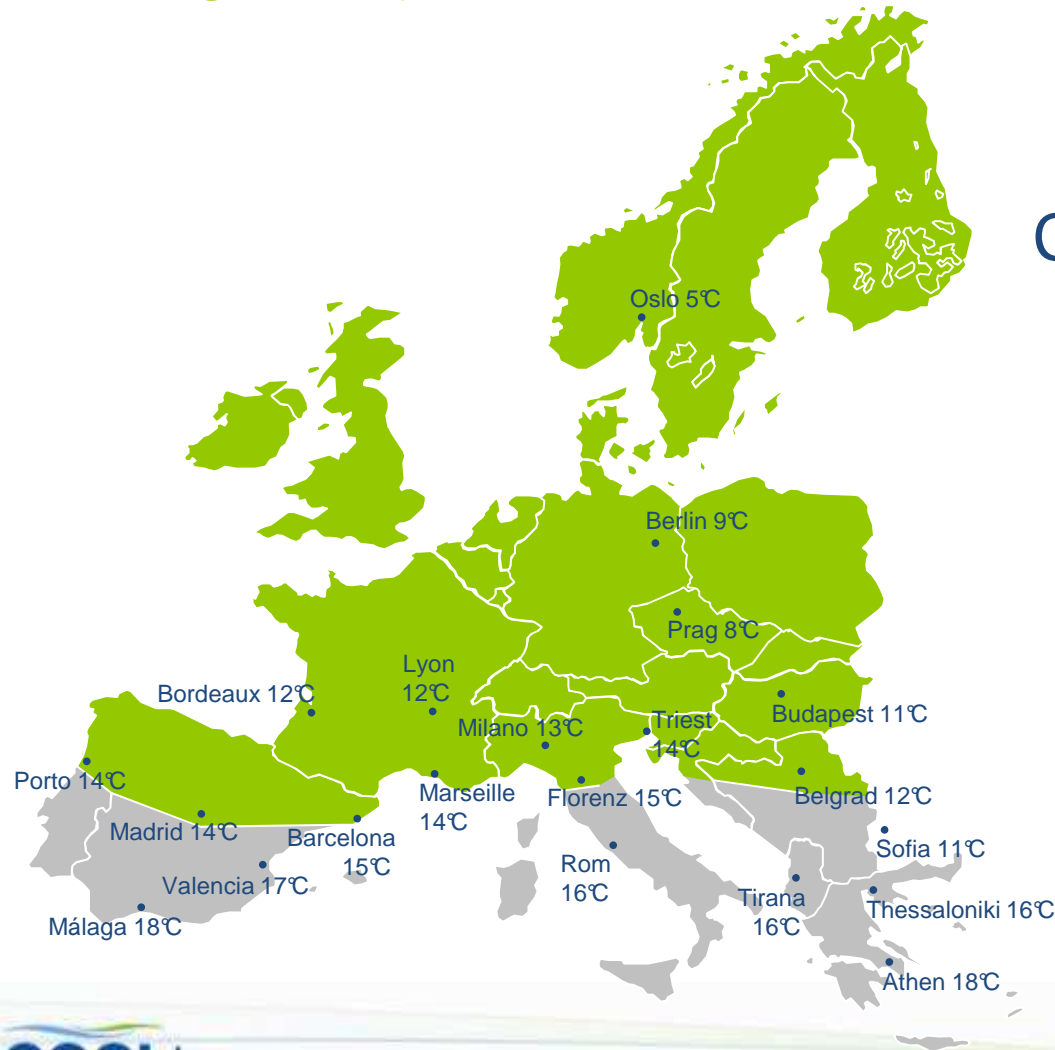
Attractive energy performance
at average annual temperatures
up to +15 °C in line with EPEE
statement and energy data
recording

COOLtec



CO₂ DX-REFRIGERATING SYSTEMS

Geography



CO₂ DX systems today

Attractive energy performance
at average annual temperatures
up to +15 °C in line with EPEE
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COOLtec



CO₂ DX-REFRIGERATING SYSTEMS

Geography



CO₂ DX systems next generation

Attractive energy performance across Europe

COOLtec





Thank you for your attention!

Innovative solutions,
naturally...



Carrier has the right refrigerant for every application, but every application will not have the same refrigerant solution.