



Global overview of natural refrigerants: Market Trends

ATMOsphere America

San Diego

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Alvaro de Oña

Group COO, shecco



1. Global HFC phase down is here = **opportunities for natural refrigerants in new markets**
2. Drive for efficiency leading to innovation
3. Traditional boundaries blurred = competition among naturals
4. Know-how in natural refrigerants increasing and in bigger demand

POLICY DRIVERS

01





Changing the HVAC&R Industry globally?





Ratification: By 1 January 2019 latest.

Top priorities: Standards (initiated by China), access to finance, exemptions

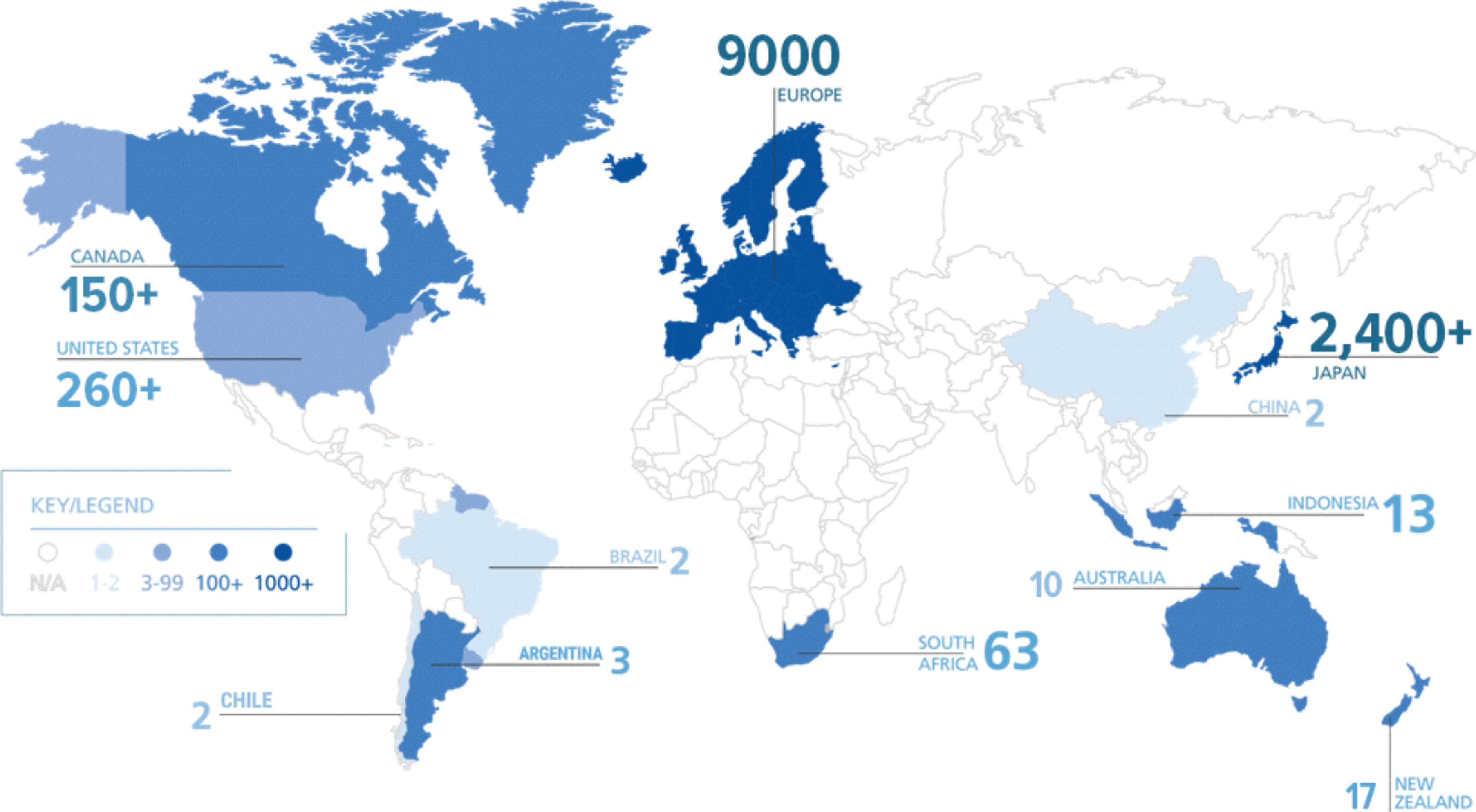
Next Key Meetings

- 11-14 July 2017: Workshop on standards for low GWP alternatives to HFCs (Bangkok, Thailand)
- 20-24 November: 29th Meeting of the Parties of the Montreal Protocol (Montreal, Canada)

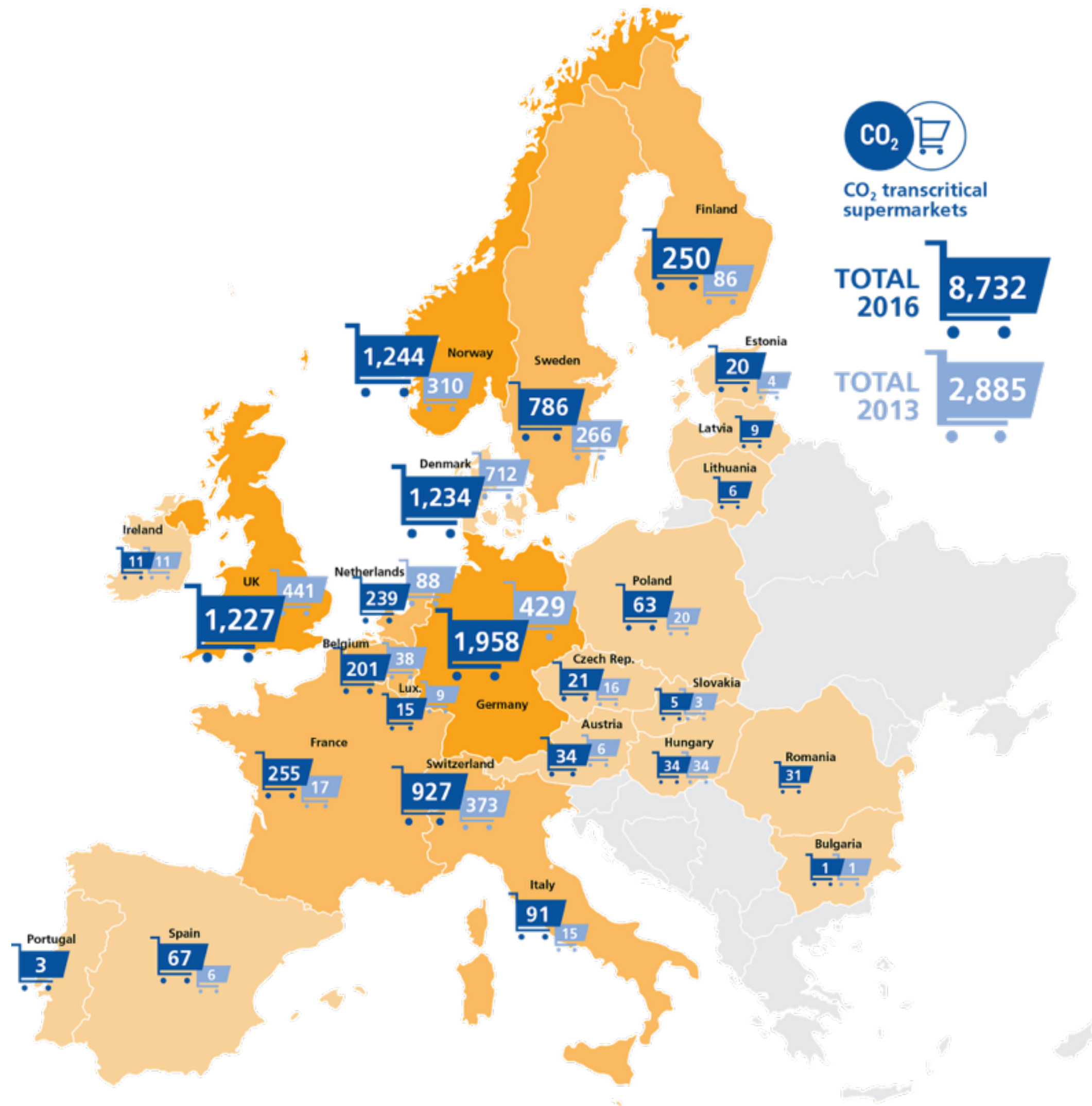
COMMERCIAL & LIGHT- COMMERCIAL REFRIGERATION



CO2 TC STORES GROWING GLOBALLY (FEB 2017)



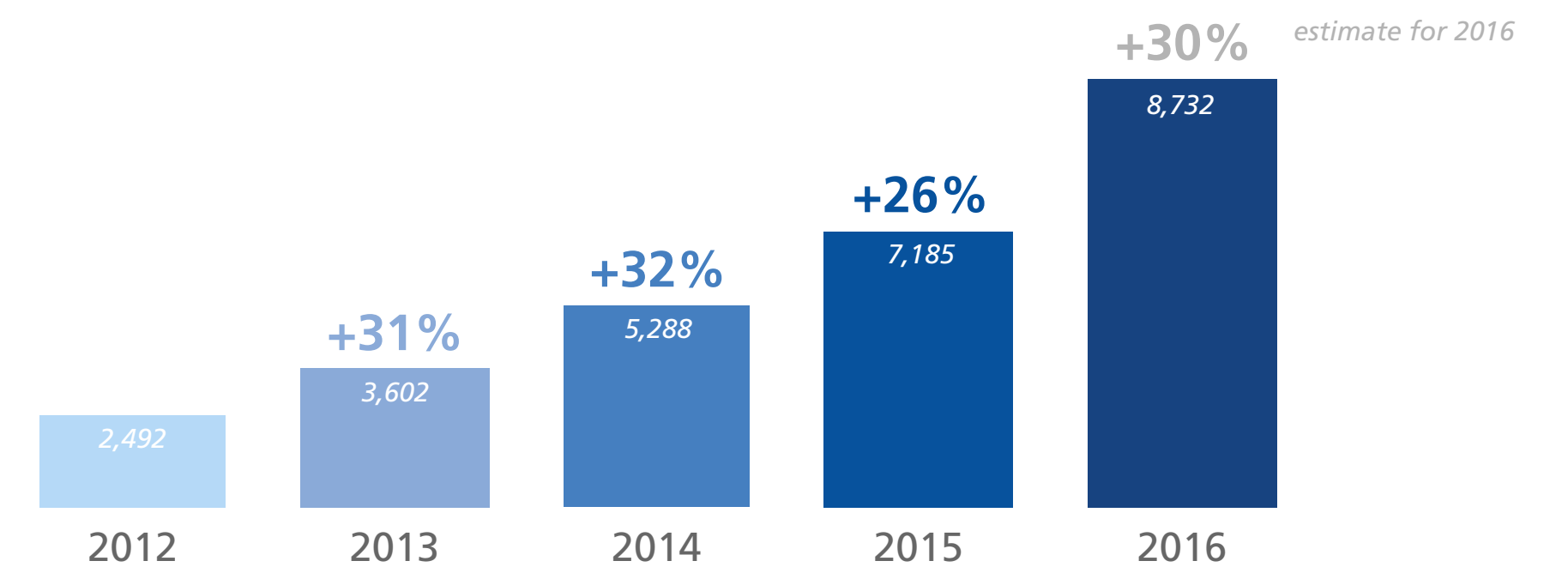
CO2 TC STORES IN EUROPE (MID 2016)



Number of CO₂ stores in the EU, Norway, Switzerland has **tripled** in the last 3 years = **8% of the overall market share** in the food retail market

Despite earlier claims that there are no viable solutions for warmer climates, the **number of new installations is growing steeply in Southern Europe**

Growth of CO₂-based stores

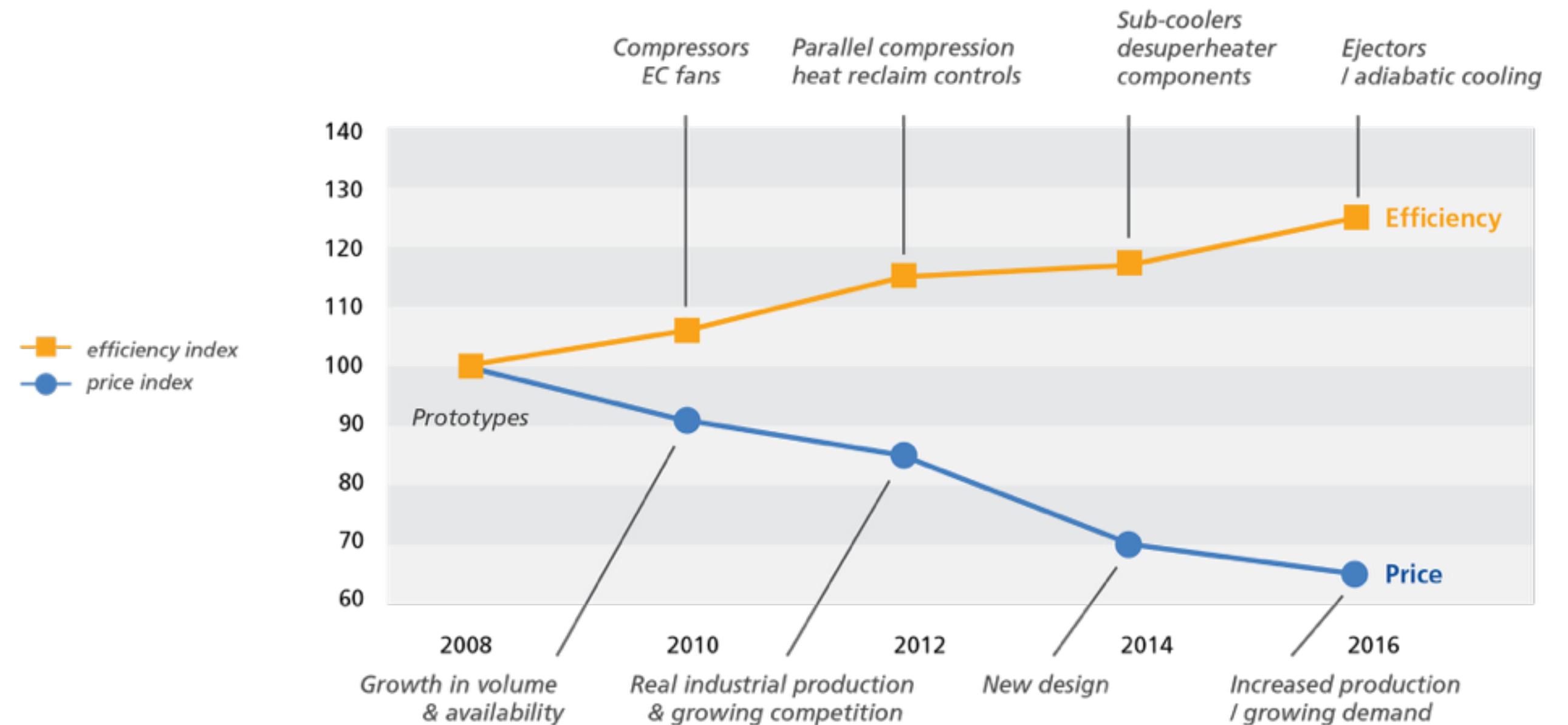


KEY TREND: CO2 COST OF EQUIPMENT DECREASING



Cost of equipment becoming comparable to systems using HFCs

Prices are falling as technology reaches mass production (in commercial refrigeration same as HFC technology or 5-10%)



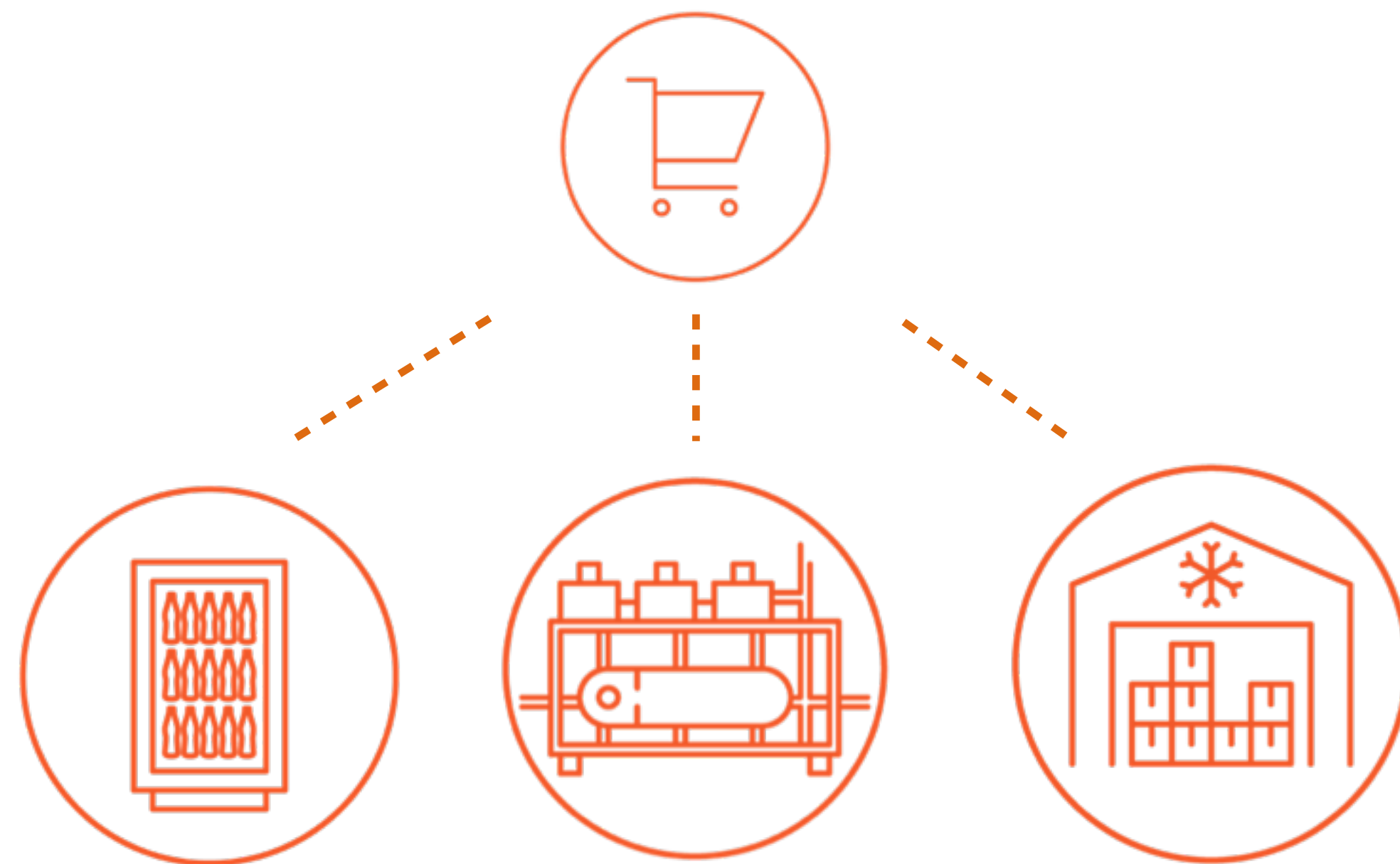
source: Advansor, ATMOSphere Europe 2016



- Currently **32 subcritical CO₂ supermarkets** in China (HFC/CO₂ cascades) - south east region
- Majority operated by Metro China, first ever installed by Tesco
- 5 contractors able to handle CO₂ installations
- Market opening up to natural refrigerants. Potential identified in:
 - CO₂ in commercial and industrial; HPs
 - low charge NH₃ in industrial refrigeration
 - but also...R290 in RAC



KEY TREND: DISSIPATING BOUNDARIES



Limits between “light-commercial” and “commercial” refrigeration become vague: HC pushing into larger store formats, and CO₂-based systems into smaller formats

= internal competition between different NR systems has increased

KEY TREND: HYDROCARBONS GROWTH



Plug-in units in supermarkets with R290: A reality today

Market estimate by early 2017:

1,500,000+ units worldwide

Figures reported by AHT (market leader) by 2017:

- over 300,000+ units manufactured per year

Source: Atmosphere Europe 2016



KEY TREND: HYDROCARBONS GROWTH



- On-the-spot **survey to 33 companies**, including key players
- Ejectors, parallel compression and waterloop systems as major technology trends
- **15-20% increase in production** of natural refrigerant systems expected for 2017-2018
- **R290 dominating plug-ins**, showing the greatest potential
- Even higher growth expected by 2020 and beyond, with a few companies expecting to have their **entire production moving to only natural refrigerants**
- **Regulation** and mainly **customer demand** are the reasons for the expectations, especially for Europe



INDUSTRIAL REFRIGERATION

03



COMPETITION BETWEEN DIFFERENT NR SYSTEMS HAS INCREASED



Low-charge Ammonia systems becoming a strong trend for industrial refrigeration

Key drivers:

- increased safety - lower risk
- higher efficiency
- easier servicing (compact units)
- return on investment for the end user

CO₂ TC becoming competitive for higher cooling capacity needs.

Key drivers:

- increased reliability and performance of CO₂ systems
- growing competition in the segment pushing prices down
- excellent safety record
- return on investment for the end user

Distinction between “commercial” and “industrial” is less clear, since NH₃/CO₂ systems push into the food retail sector, and CO₂ into industrial

KEY TREND: INDUSTRIAL APPLICATIONS WITH CO2 & NH3



CASE STUDIES

04





Strong investment of large food retail groups = CO₂
Transcritical systems becoming the norm in Europe, N.
America, Japan.

Efficiency and reliability are increasing, and prices are
going down.

Case Study: Aldi Süd reaches 1000th installation:

- Strategic decision in 2010: Exclusive focus
on natural refrigerants
- Now: Over 54% of all Aldi Süd's stores
globally are running on CO₂



Source: [r744.com/articles/7423/aldi_sud_proud_to_install_1_000th_co2_system](https://www.r744.com/articles/7423/aldi_sud_proud_to_install_1_000th_co2_system)

KEY TREND: US JOINS THE RACE



As HFCs are being phased down globally, the competition among natural refrigerant solutions is increasing...but they can also coexist successfully.

Case Study:

NH₃/ CO₂ Supermarket retailer in the US saving 30% on energy bills

http://r744.com/articles/7329/nh3_co2_system_continues_to_save_energy_at_piggly_wiggly_store_nbsp





Belgian retailer **Colruyt** targeting 100% **hydrocarbons for refrigeration**. Exclusive use of hydrocarbons as of 2017

Based on:

- Medium capacity chiller (**55lbs** of R290 charge) + secondary glycol loop
- Standalone chest freezers (R600a)

Reported:

- High energy savings
- Reduced leakage rate to approx 5%

Source: Accelerate Europe

(https://issuu.com/shecco/docs/ae1609/34?utm_source=shecco+natural+refrigerants&utm_campaign=5dfd40d6b5-AE1606&utm_medium=email&utm_term=0_9db972ca57-5dfd40d6b5-)





- Hydrocarbon-cooled pick-up stations for food purchased online
- Rethinking the way consumers buy and collect refrigerated goods
- Viessmann
 - Click4Food: 10 installations already in Sweden & Finland
 - R290 and R600a
- Hauser
 - 1 installation in Vienna, Austria
 - R600a



The "Click4Food" system from Viessmann



World's biggest CO₂ industrial plant (vegetable processing plant in the Netherlands by Advansor for Staay Food group):

- 3,36 Megawatt (955 ton of refrigeration) total cooling capacity
- 7 transcritical CO₂ racks
- 45 compressors (28 medium temp., 14 parallel, 3 frost)
- heat recovery, providing “free” heating for the office facilities
- Installation in 2016, in operation since early 2017
- Lower capital, installation & maintenance costs.





- R290 implemented in cold storage facility
- Test phase: energy consumption over 9 days with the compressors operating 75% of the time delivered average energy consumption of 3,000 kWh
- currently, Colombia's flower sector has 31.1 million kW of cooling capacity, **99% of which is R22** and the remaining 1% is R134a



Source: The Natural Voice Magazine, edition 2, October 2016 (shecco)

FIRST NH₃/CO₂ SYSTEM IN ARGENTINA



System installed at a **Carrefour** distribution centre in Buenos Aires.

First of its kind in Argentina, and second in Latin America

- Ammonia - CO₂ - brine system
- Installation began in 2016, running since 19 Jan 2017
- Biggest in the region: 150000 ft (14,000 m²)
- High cooling and freezing efficiency; low pressure system with a high coefficient of heat transfer
- Lower cost of installation





- **Godrej Appliances**
 - Replaced CFC, HFC and HCFC as early as 2002
 - Efficient and green ACs using R290; first in the world
 - **India's first ACs with 7-star performance**
 - **300,000+ units sold since launch**
 - Earliest brand to opt for voluntary energy labelling of its refrigerators



SHECCO USEFUL LINKS



Industry Platforms:

www.hydrocarbons21.com

www.R744.com

www.ammonia21.com

shecco Publications, incl. GUIDEs

<http://publications.shecco.com>

Accelerate Magazines:

www.accelerateEU.com/

www.accelerateNA.com/

www.accelerateAUNZ.com/

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