MAKING MODERN LIVING POSSIBLE

Safe and Responsible Usage of Natural Refrigerants

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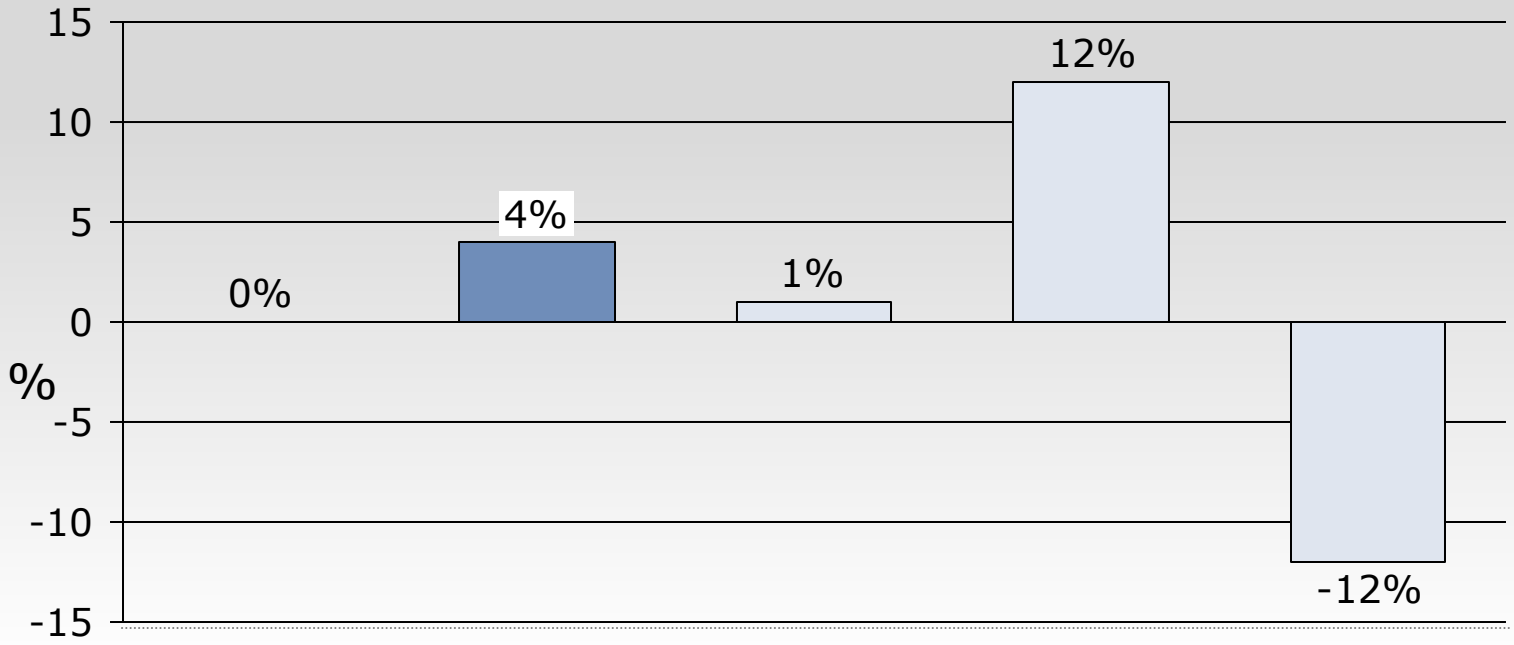
Verdemar – a Brazilian Case Study
A CO2 Refrigeration System with Danfoss

Verdemar – the combination of R134a and CO2 = the key to success

- A sustainable choice which encompasses **efficiency**, **safety** and **cost**
- By building safety into the components and by taking measures **to ensure the safe and responsible use**, Danfoss now allows these components to be sold globally
- Guidance in terms of choosing the right solutions per application **to provide the greatest customer benefit**

Operating Cost Savings with Natural Refrigerants

Energy savings compared to state of the art HFC solutions (Brazilia)

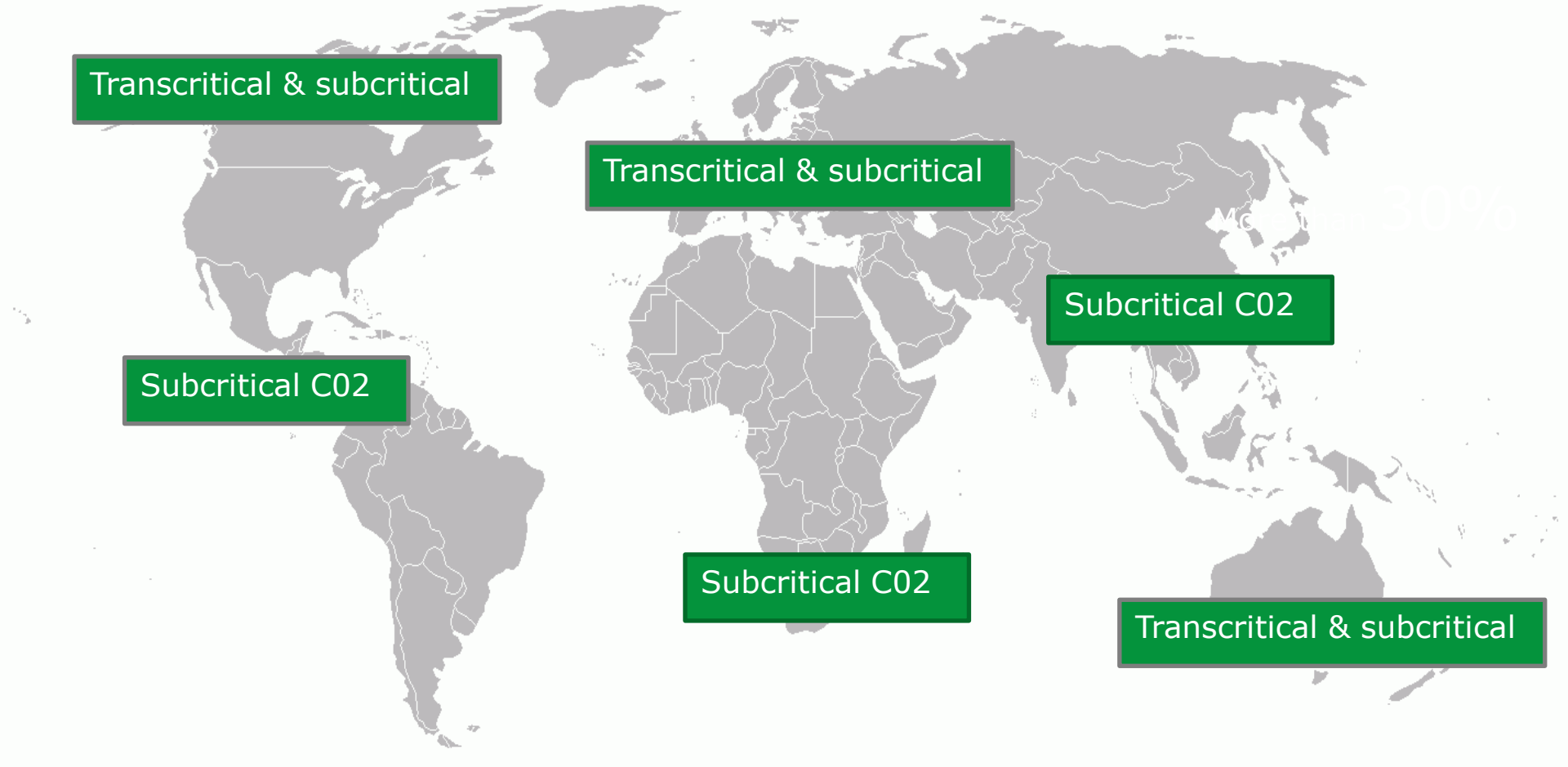


System type	R404A state of the art	R134a/CO_2 cascade	R404A /CO_2 cascade	Ammonia chiller	Transcitical CO_2 booster
Medium Temp:	R404A DX	R134A DX	R404A DX	Pumped CO_2	CO_2 DX
Low Temp:	R404A DX	CO_2 DX	CO_2 DX	CO_2 DX	CO_2 DX

More information including the Pack Calculation II software can be found at http://co2facts.danfoss.com

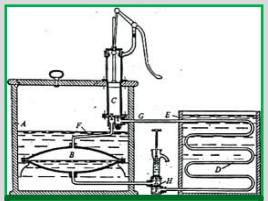
Global > Local

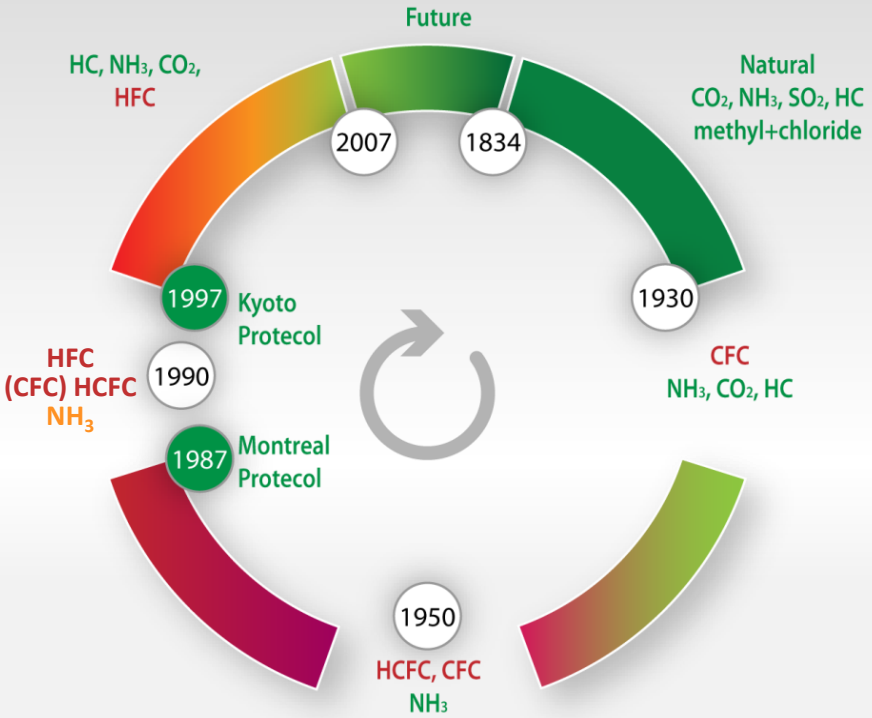
Worldwide presence of CO2 solutions



CO2 an increasingly important refrigerant
– cuts energy consumption by up to 20% globally

The History of Refrigerants


Patent from 1834
by Jacob Perkins

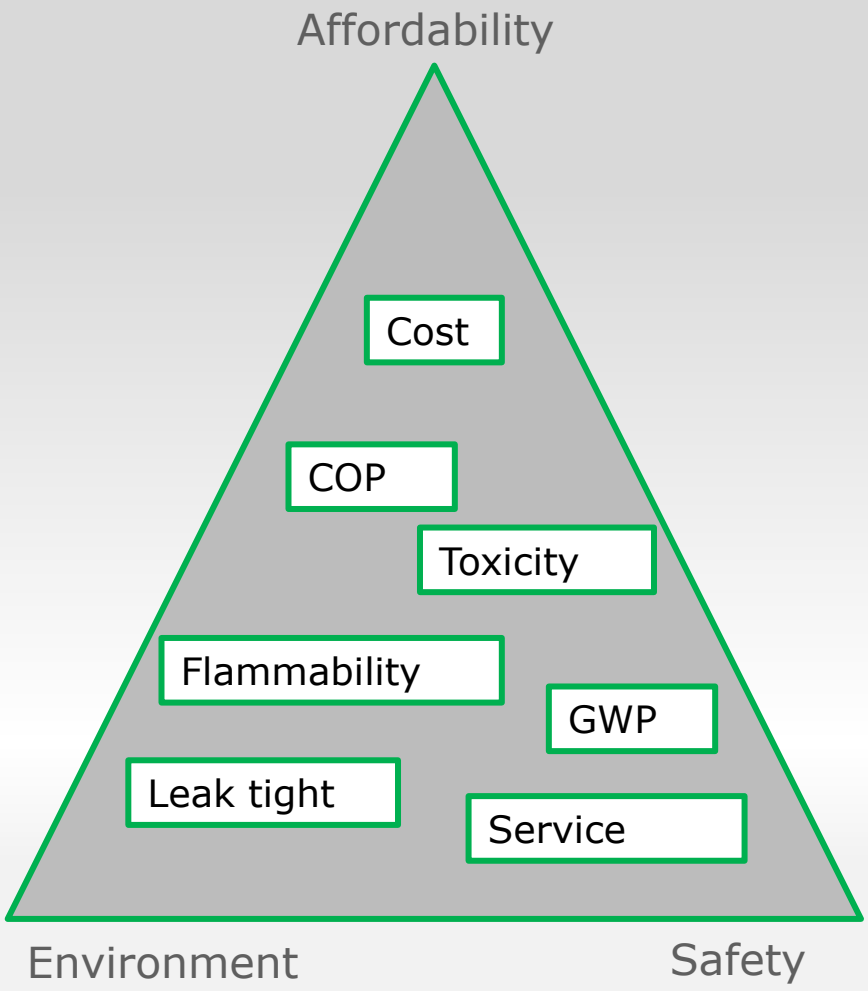


- The Danfoss process to ensure low risk
- Building safety into our offering:

  - IECex approvals on all hydrocarbon products to ensure safety

  - 90 bar standstill security on CO2 systems

The sustainable balance



Real sustainable solutions are only made ensuring all three parameters

- **Safety** during installation and usage
- Minimised **environmental** impact
- **Affordable** design and application

Controls for Natural Refrigerants are now becoming global available

All products sold by Danfoss for use with Hydrocarbon refrigerants (flammable) are IECex Zone II approved

Refrigerant	Availability
CO2	Global
NH3	Global
Hydrocarbons	Global**

** In North America only below 150 g of charge

For some countries special agreements have to signed with customers to ensure safe use

45 bar	52 bar	90 bar	140 bar
Commercial range for subcritical CO_2	Components for industrial systems allowing hot gas defrosting	Standstill capable range for CO_2 systems	Supercritical components

90bar

Maximum working pressure

Components enable standstill capable, intrinsically safe CO_2 systems


ICF


ICS


ICM

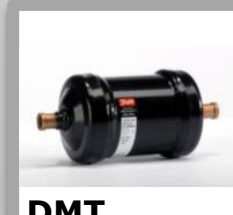

AKVH


CCM


EVUL


ICMTS

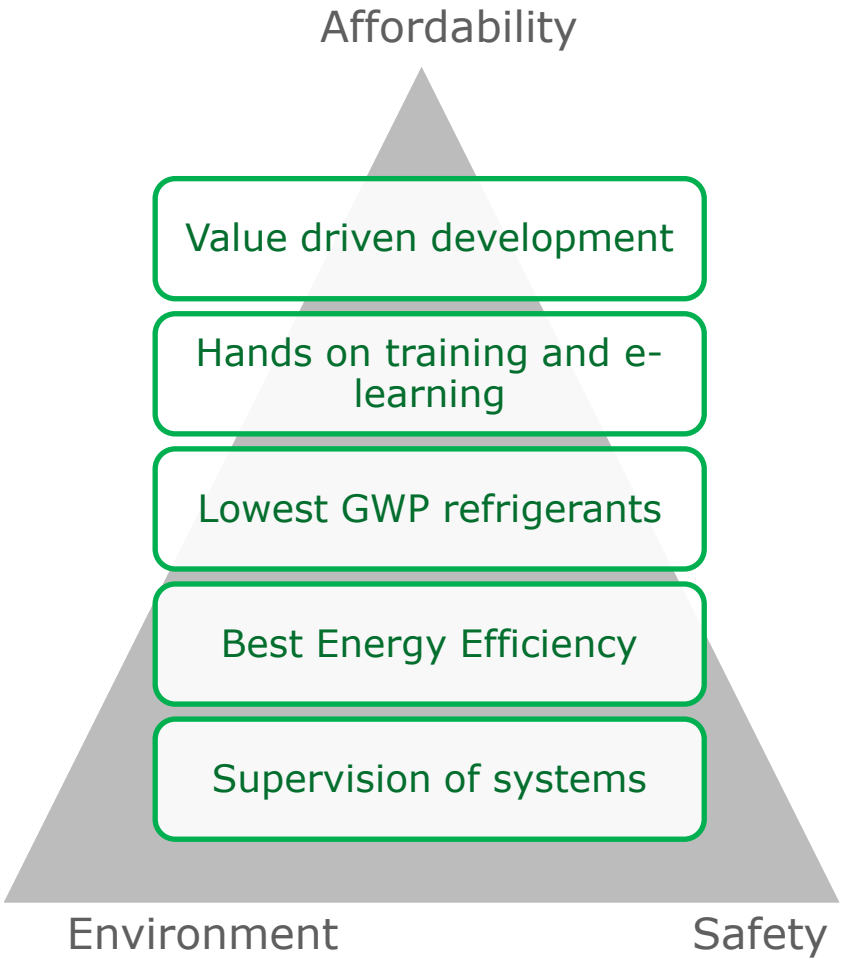

CCMT


DMT

Raising awareness of safety practices - through Danfoss Learning platform

Classroom and Laboratory Training in Brazil

Adressing sustainability



- **Product development** must address main market needs
- **Educational back up** is the main driver for new technology implementation
- **Improved Energy efficiency** is proved using the new combined R134a/CO2 system
- **Running cost** of the investment is in line with projections

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