

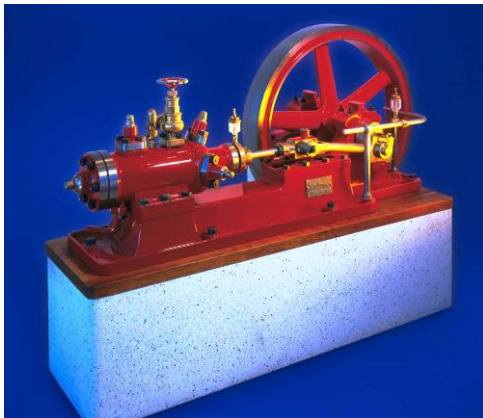
Alexander Cohr Pachai

Global Experience with R717 and R744 Systems



Sabroe history with CO₂

Sabroe 1897



Sabroe CO₂ compressor Type "A"
Serial No. 2
Year of production: 1897
Capacity: 13,000 kcal/h (15 kW) at -10/+25°C
RPM: 90
Installed in a Danish dairy from 1897 to 1940

Sabroe 2009

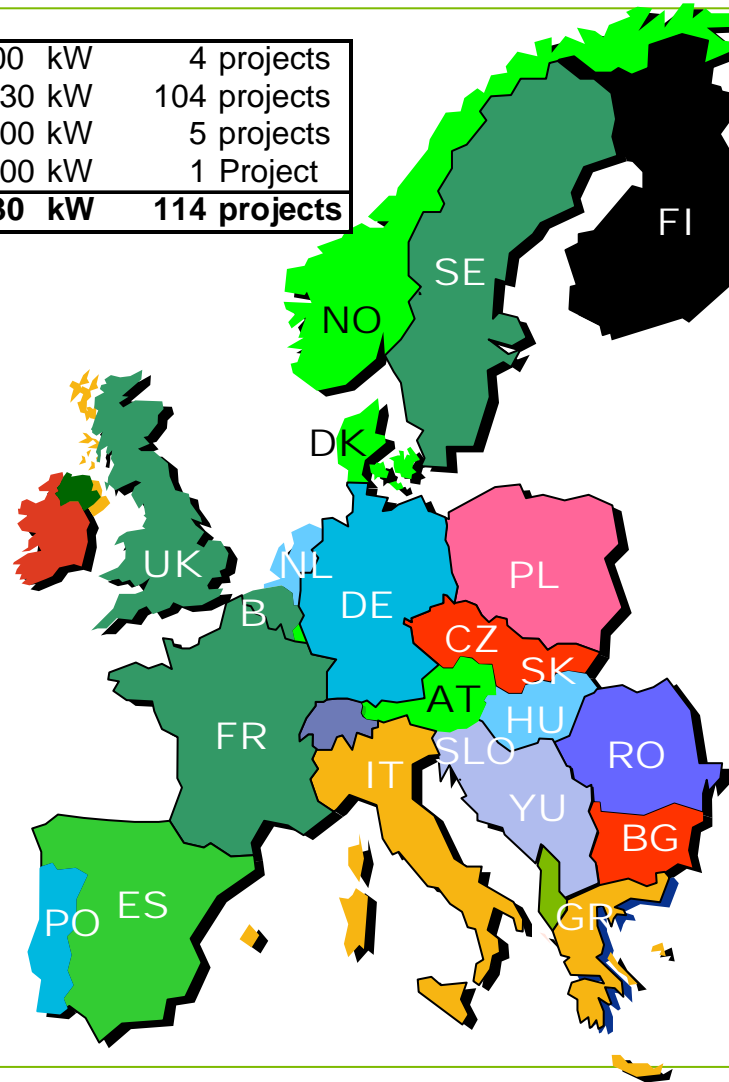


Sabroe CAF600 Twin
Application: Bakery
Year of production: 2009
Capacity: 585kW at -40°C
Installed in Czech Republic

Installed CO₂ refrigeration plants

Installations from 1996 to summer 2009

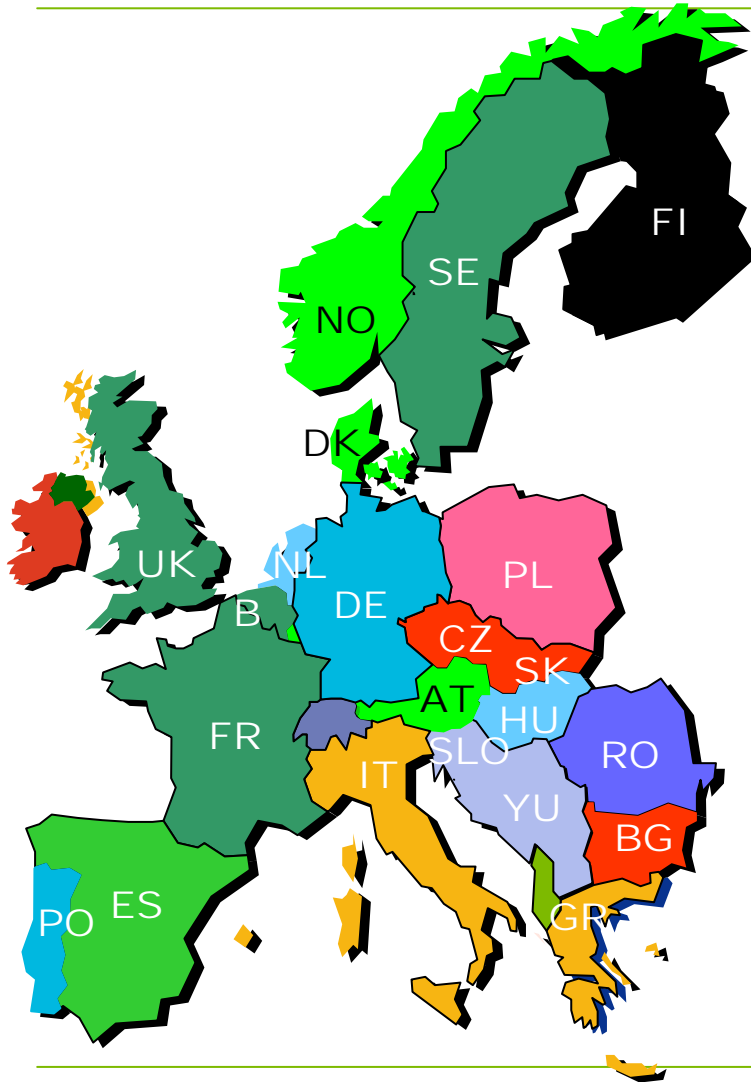
Ships	5.900 kW	4 projects
Supermarkets	13.130 kW	104 projects
Others	5.800 kW	5 projects
Veg. Fresh store	2000 kW	1 Project
In total	26.830 kW	114 projects



Total installed industrial LT systems		
AT	2.880 kW	9 projects
Brazil	1.332 kW	1 projects
CZ	2.450 kW	4 projects
DE	3.852 kW	9 projects
DK	681 kW	2 projects
Dubai	1.830 kW	2 projects
ES	28.472 kW	34 projects
FI	250 kW	1 projects
FR	13.034 kW	25 projects
IT	1.263 kW	1 projects
Jordan	650 kW	1 projects
Kazakhstan	802 kW	1 projects
Lebanon	634 kW	1 projects
Liechtenstein	400 kW	1 projects
LT	853 kW	1 projects
NL	4.450 kW	4 projects
NO	3.087 kW	9 projects
PL	400 kW	1 projects
PO	749 kW	1 projects
RUS	6.471 kW	5 projects
Saudi Arabia	1.200 kW	2 projects
SE	4.375 kW	20 projects
SLO	420 kW	1 projects
Thailand	960 kW	3 projects
UK	2.030 kW	3 projects
Ukraine	532 kW	1 projects
USA	15.565 kW	15 projects
Vietnam	150 kW	1 projects
Mexico	300 kW	1 projects
In total	100.073 kW	160 projects

Total	126.903 kW	274 projects
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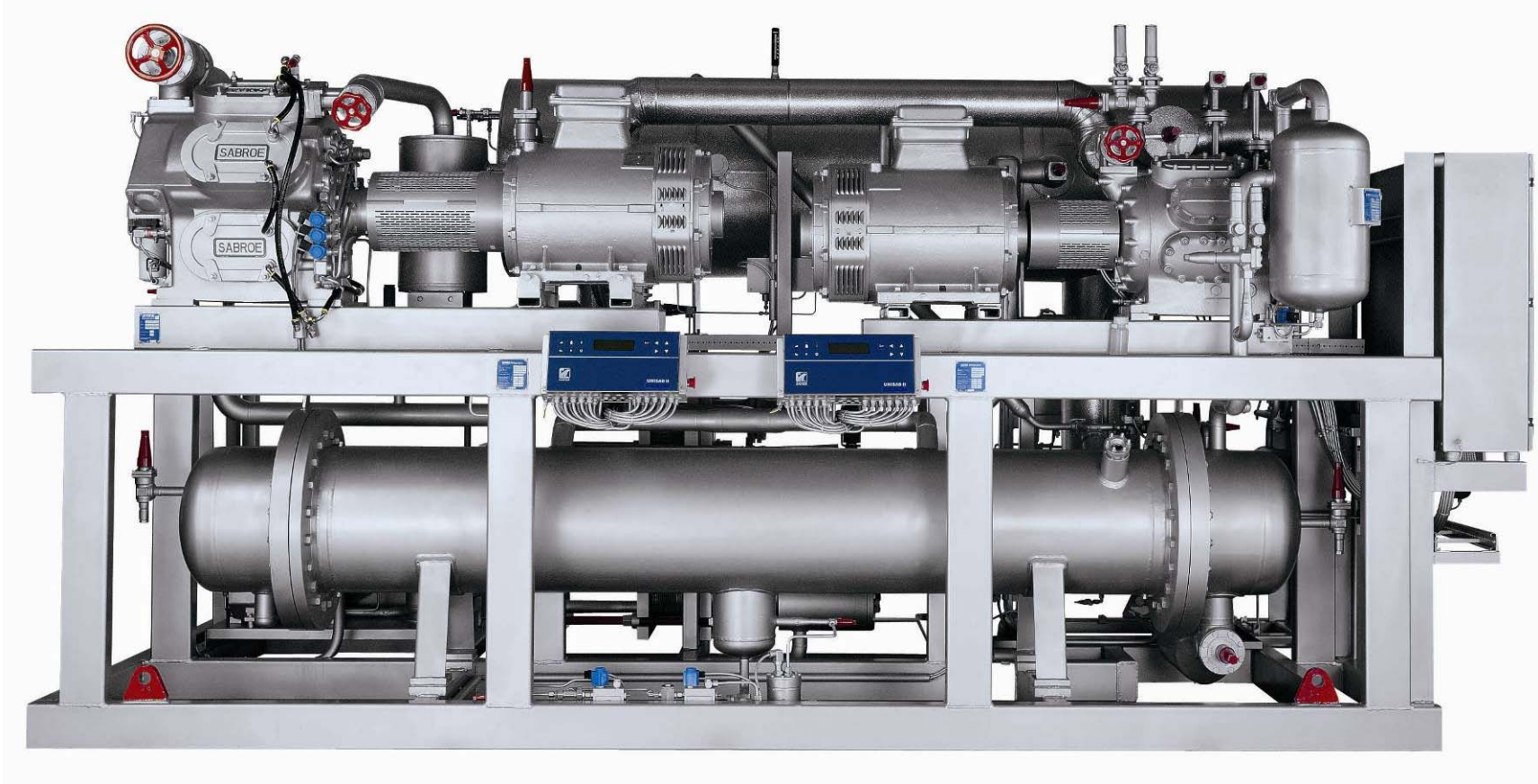
Applications



- Fish freezing (NO, NL) @-48°C
- Pie freezing (LT) @-48°C
- Bread (DK, CZ, ES, RUS) @-48°C
- Chicken (Vietnam, UK) @-48°C
- Ice cream (FR, RUS) @-40°C
- Fresh produce (B) @+4°C
- Fruit and vegetable (BG) @-48°C
- Coffee drying (ES, DE, Brazil) @-54/-45/-30°C
- Distribution centers (NO, FR, ES, PO, USA)

- Supermarkets in SE, NO, DK, UK, FR and NZ

Single cascade system using NH₃ and CO₂



Twin compressor sets



Delivered to Mexico City



A dual temperature system (-30°C and -50°C)



Commitment from the main companies in the industry

The Nestlé Position on Industrial Refrigeration

1 October 2001
Nestec S.A.
Avenue Nestlé 55
1800 Vevey
Switzerland

Search here... **GO**

Supported by **UNEP** and **GREENPEACE**

Refrigerants, Naturally!

In line with our environmental commitment to nature, Nestlé will continue its phase out of our few remaining refrigeration systems, replacing them with natural refrigerants ahead of goal.

Wherever possible, Nestlé will use natural refrigerants in new industrial refrigeration systems. We emphasize our preference for natural refrigerants due to their characteristics of ammonia in suitable applications.

Refrigerants in industrial food production Mode of distribution would be improved.

Partnerships for Sustainable Development

Welcome

Refrigerants, Naturally! is a global initiative of companies committed to combat climate change and ozone layer depletion by substituting harmful fluorinated gases ("F-gases", such as CFCs, HCFCs and HFCs) with natural refrigerants.

Please browse the following pages to learn more about the initiative.

Refrigerants, Naturally! is taking an important step in addressing environmental issues with coherence. The future of sustainable refrigeration lies in this type of forward looking technology innovation.

Mr. Rajendra Shendra, Head of OzonAction Branch, UNEP DTIE

About us

- Who we are
- What we do
- Members
- Official Supporters
- History and Achievements
- Contact

Natural Refrigerants

- About Natural Refrigerants
- Why move to Natural Refrigerants

Media Centre

- News

Johnson Controls



The CO₂ freezer story

Innovation in Industrial Refrigeration

Refrigeration: An Essential Technology in the Food Industry

In line with our environmental policy, Nestlé is committed to minimising the impact of its industrial operations on the environment. This includes the technologies the Company uses in its 500 factories worldwide and, among these, refrigeration. Without refrigeration in manufacturing, storage and distribution, modern food production would not be possible.

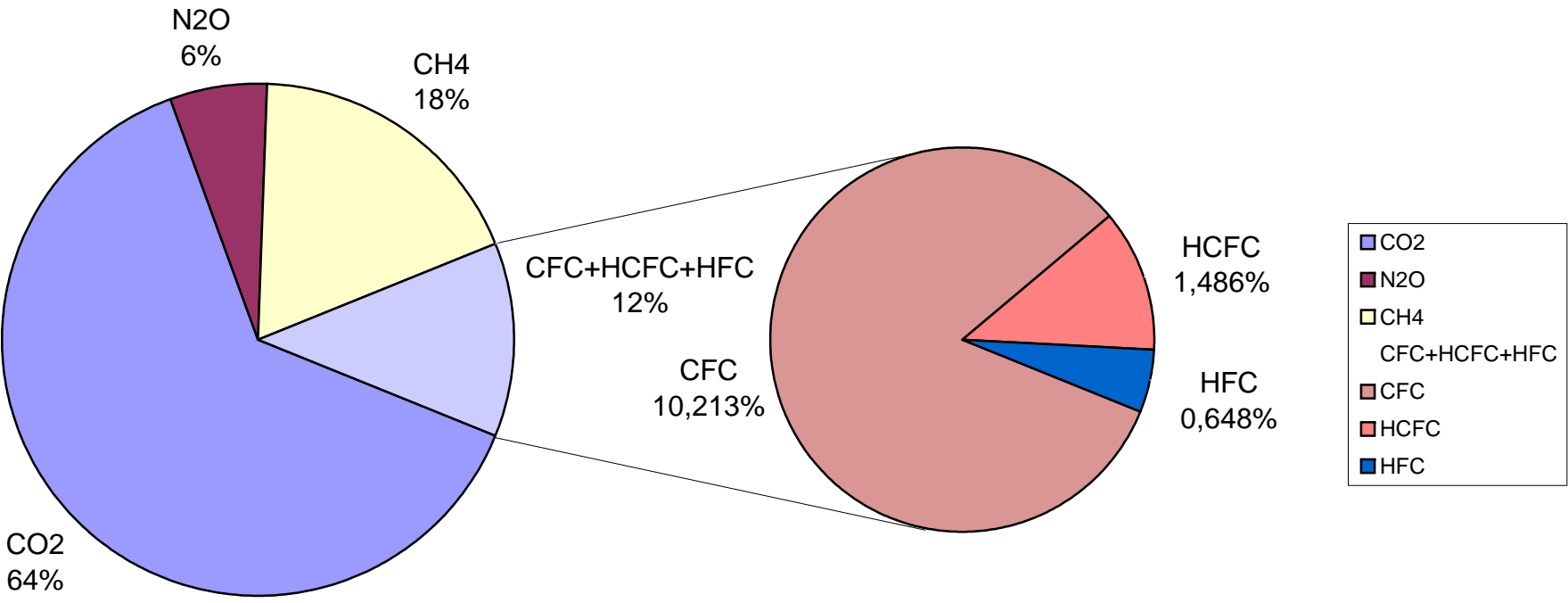


The other end of the scale

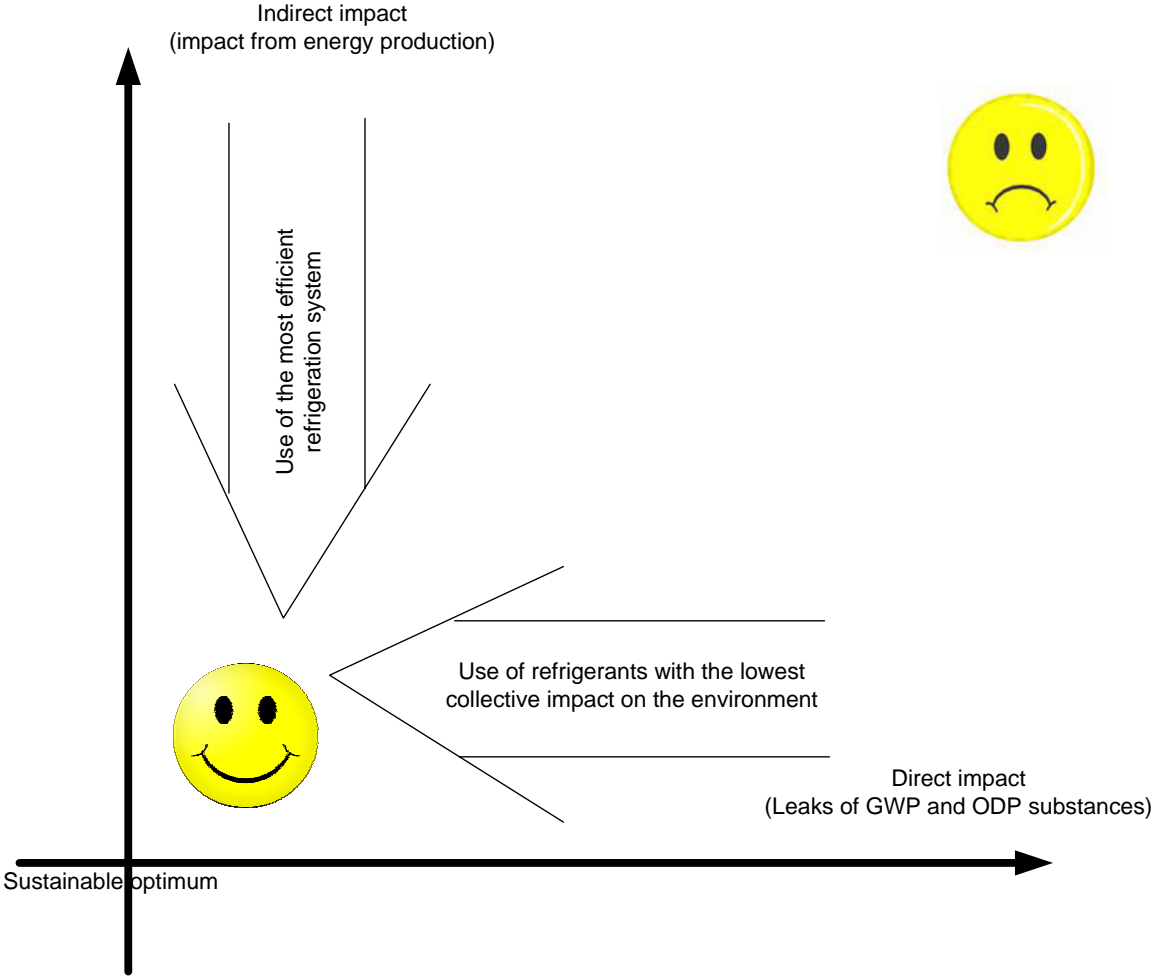


Commissioned October 24th 2008

The gases contributing to the global warming



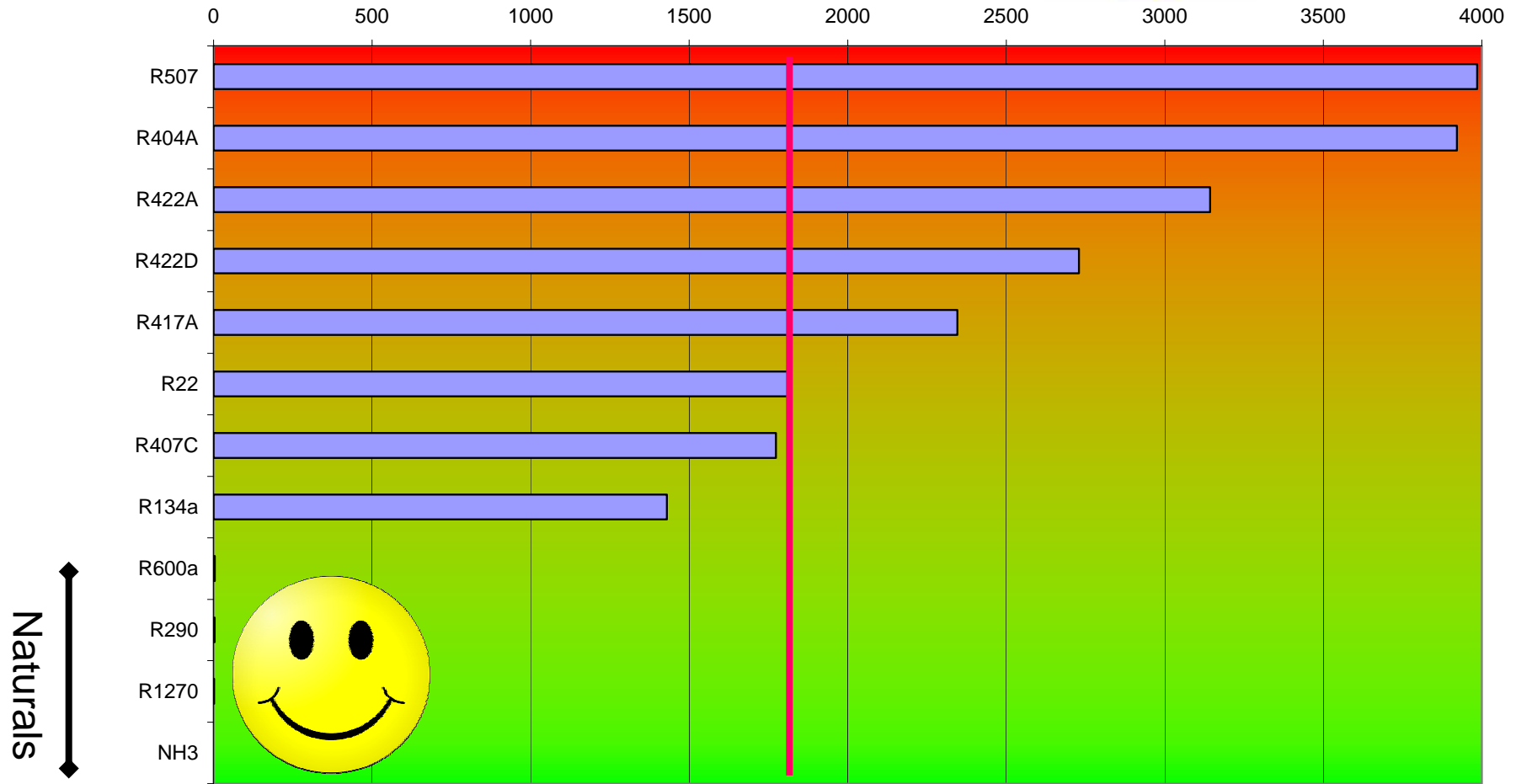
Use refrigeration systems with a minimum impact on the environment, both direct and indirect



GWP for R22 and the alternatives

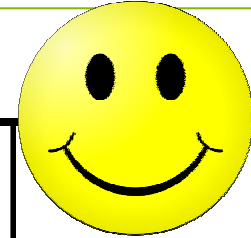


GWP for popular refrigerants



Ref: IPCC 2007

Another driver

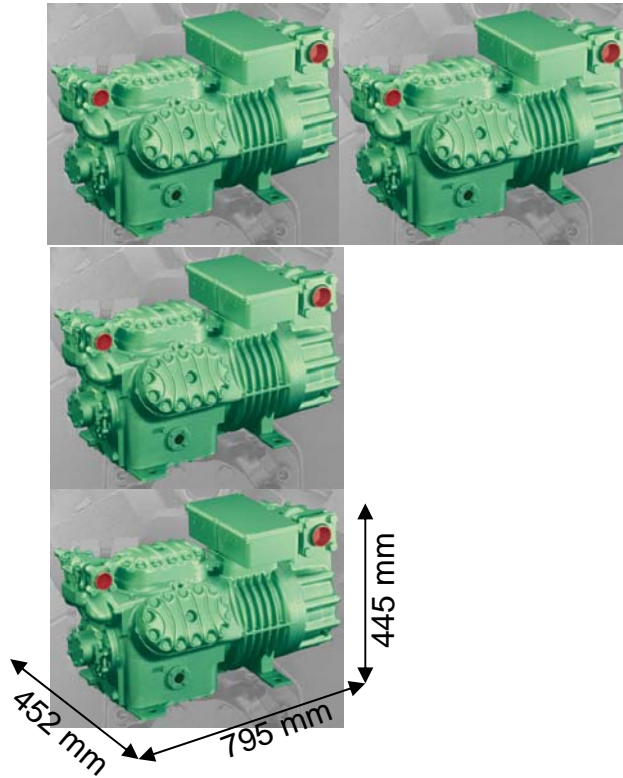


CO2/Propane		Cooling capacity [kW]	Heating capacity [kW]	Power input [kW]	COP [-]
-35/-5°C	2MHC-05K2	2,86	3,49	0,78	3,67
-10/+40°C	2CC-3.2P	7,54	10,35	2,72	2,77
	Total power			3,5	1,97
	Improvement				28%

R134a/R404A

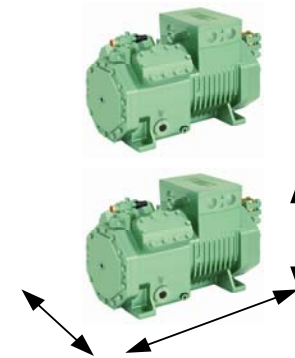
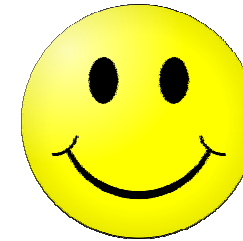
-10/+40°C	2EC-2.2Y	3,32	4,65	1,31	2,53
-35/+40°C	4DC-5.2Y	3,69	6,87	3,22	1,15
	Total power			4,53	1,55

Comparing 100 kW@-40/-5°C



R22 vs R404A

550 m³/h 446 m³/h
239 kg x 4 = 956 kg

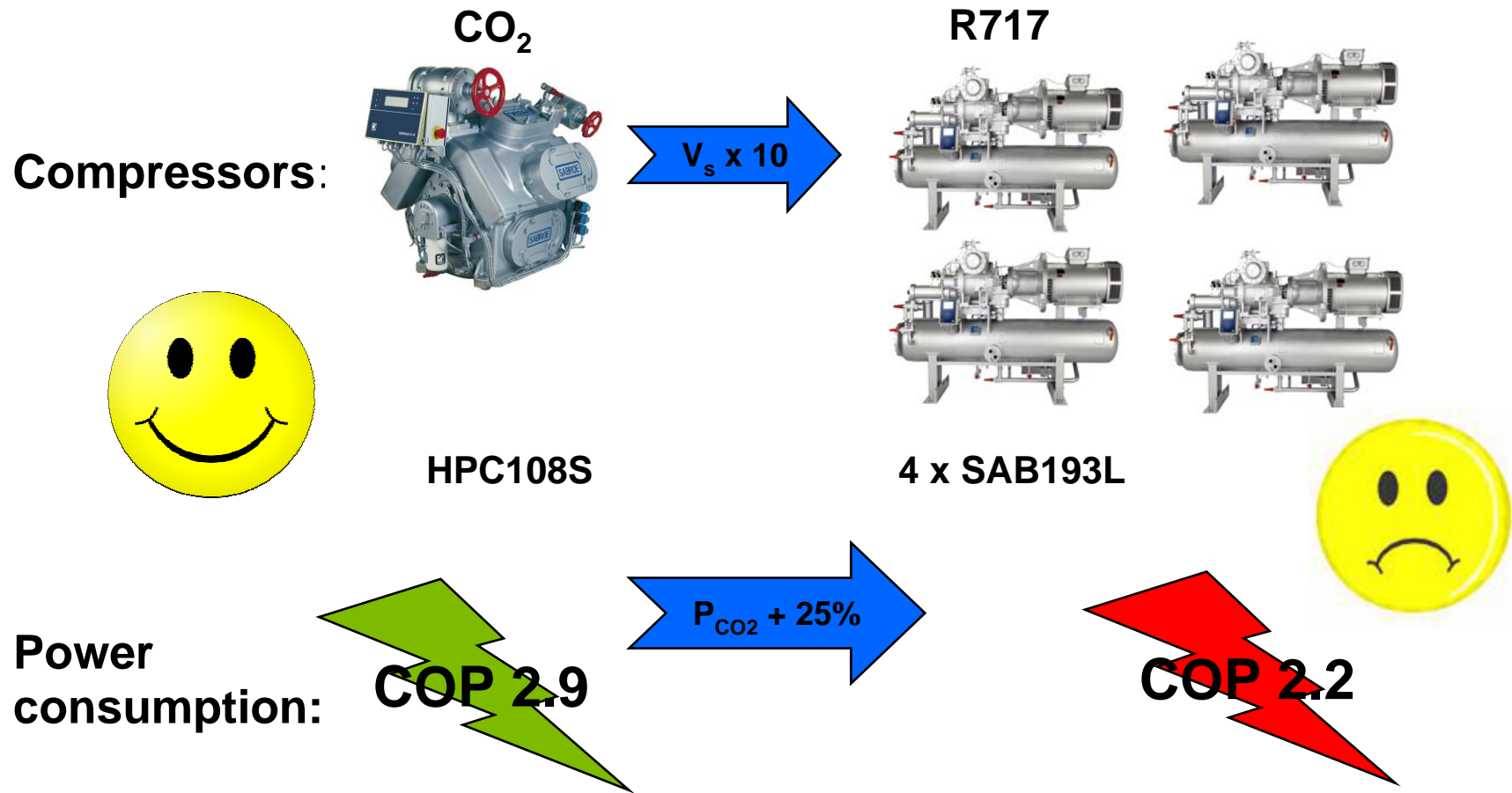


R744 63 m³/h

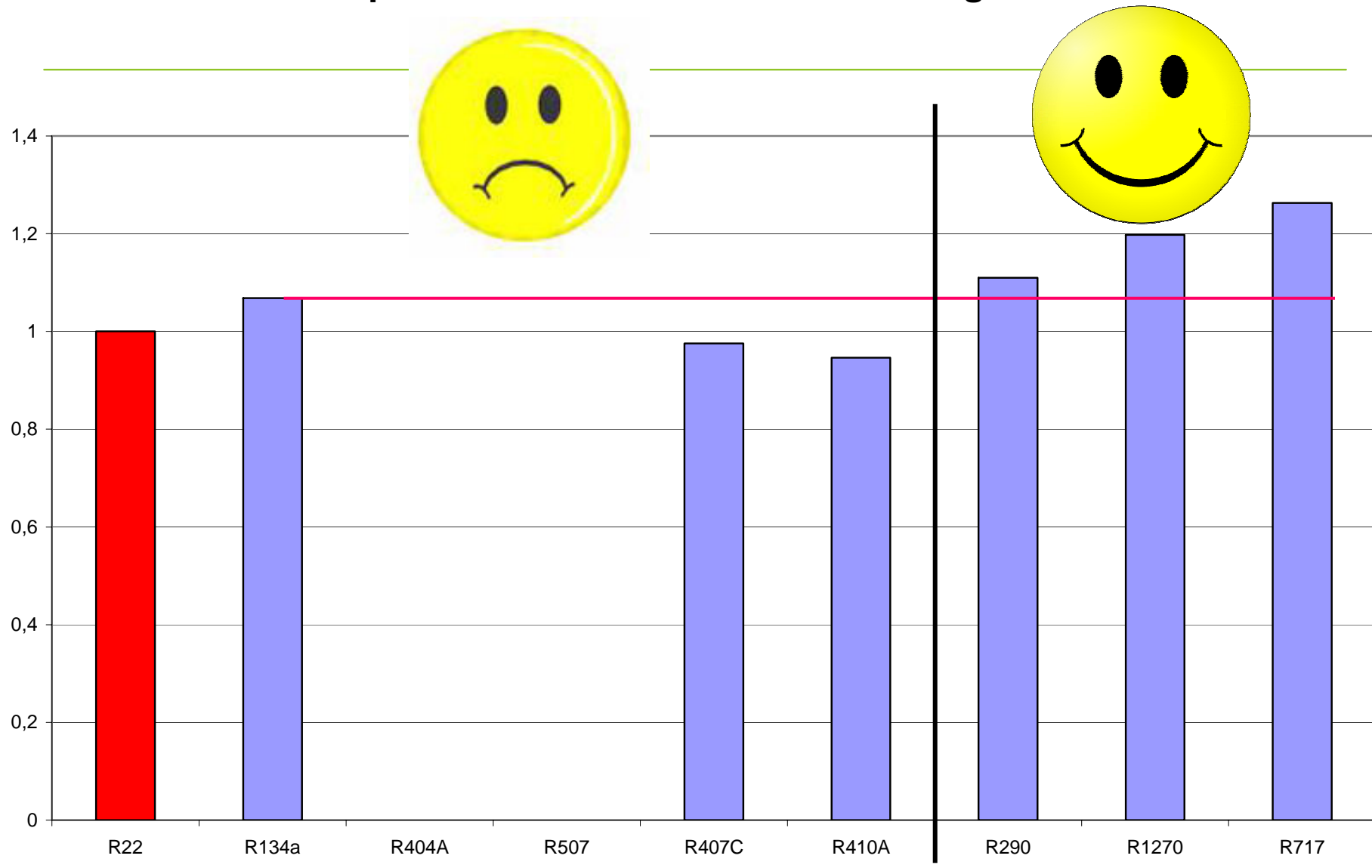
144 kg x 2 = 288 kg

Another comparison

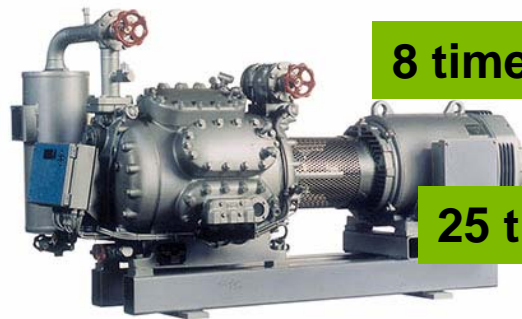
Differences CO₂ versus R717 on the low temperature side at -50°C / -5°C:



Eurovent Certified products and COP vs. Natural refrigerants



Volumetric cooling capacity



8 times less swept volume with R744

25 times less oil volume with R744

HPO28

Refrigerant: 744
Capacity 280kW @ -40/-4°C
Swept volume: 194m³/h
Oil volume: 14 litres



SAB233S

Refrigerant: R717
Capacity 280kW @ -40/-4°C
Swept volume: 1475m³/h
Oil volume: 360 litres



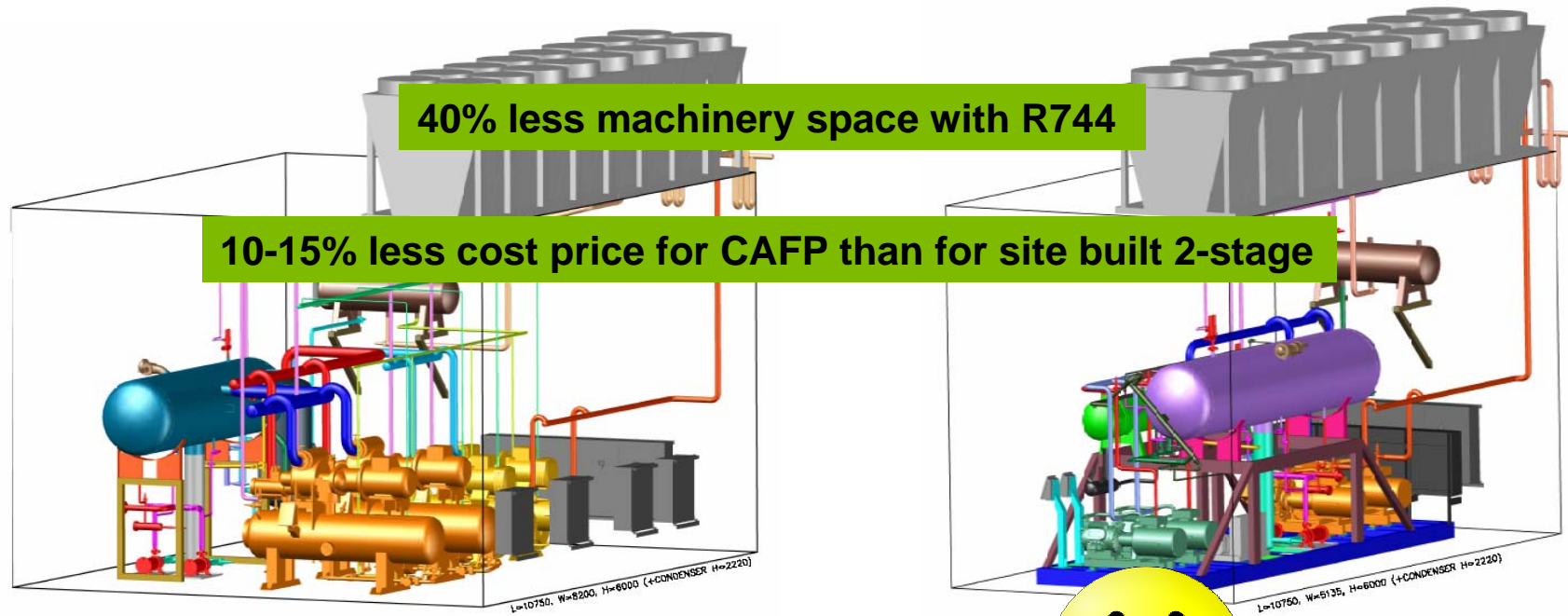
Machine-room

2-stage R717

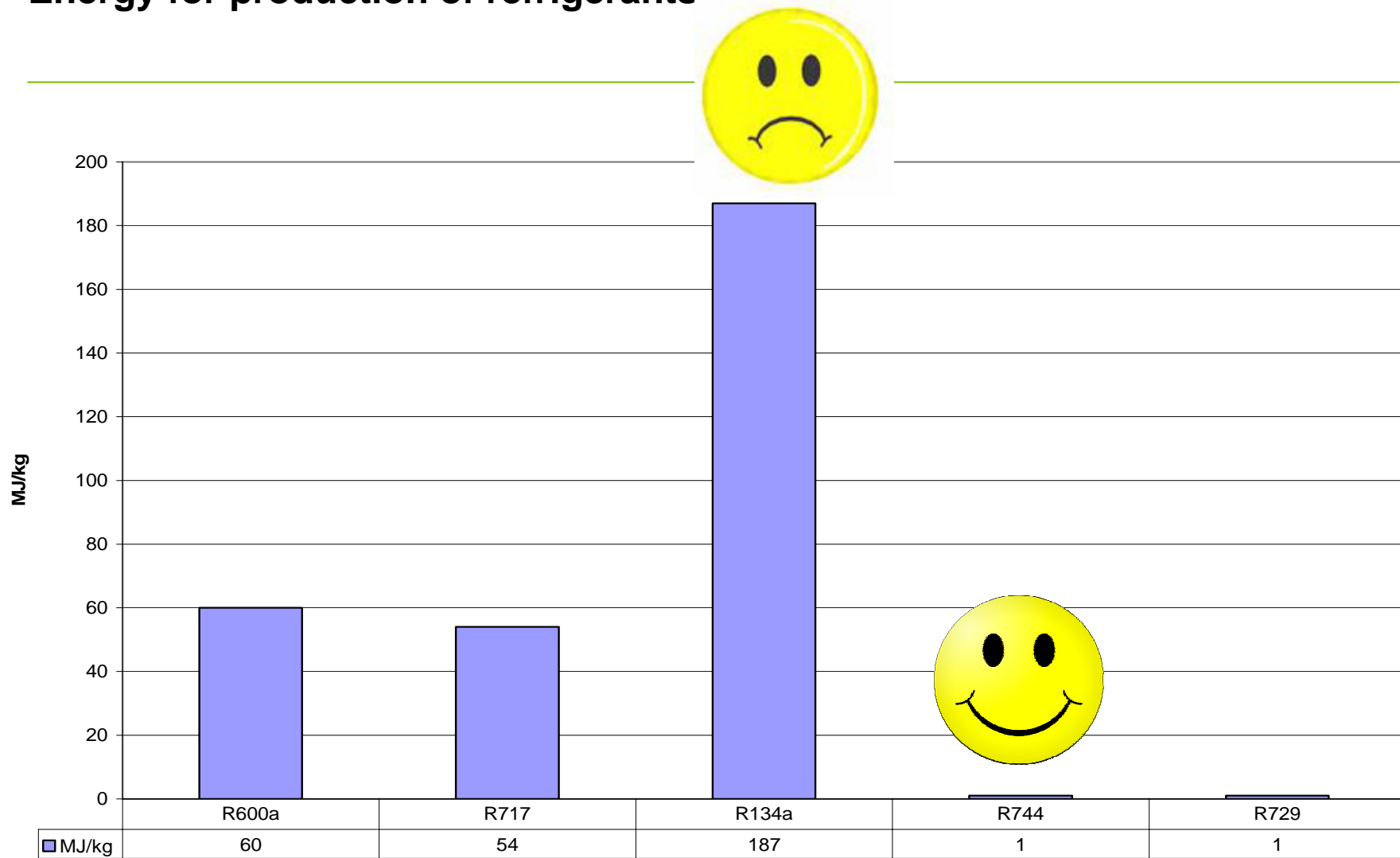
- Capacity: 580kW (Te: -40°C / Tc: 33°C)
- LS compressors: 2 x SAB233S
- HS compressors: 2 x SAB151M
- Open intermediate cooler (Tm: -11,6°C)
- LxWxH: 10750x8200x6000mm

CAFP

- Capacity: 580kW (Te: -40°C / Tc: 33°C)
- LS compressors: 2 x HPO28
- HS compressors: 2 x SMC108E
- Shell & tube cascade cooler (Tm: -12°C / -7,9°C)
- LxWxH: 10750x5135x6000mm



Energy for production of refrigerants



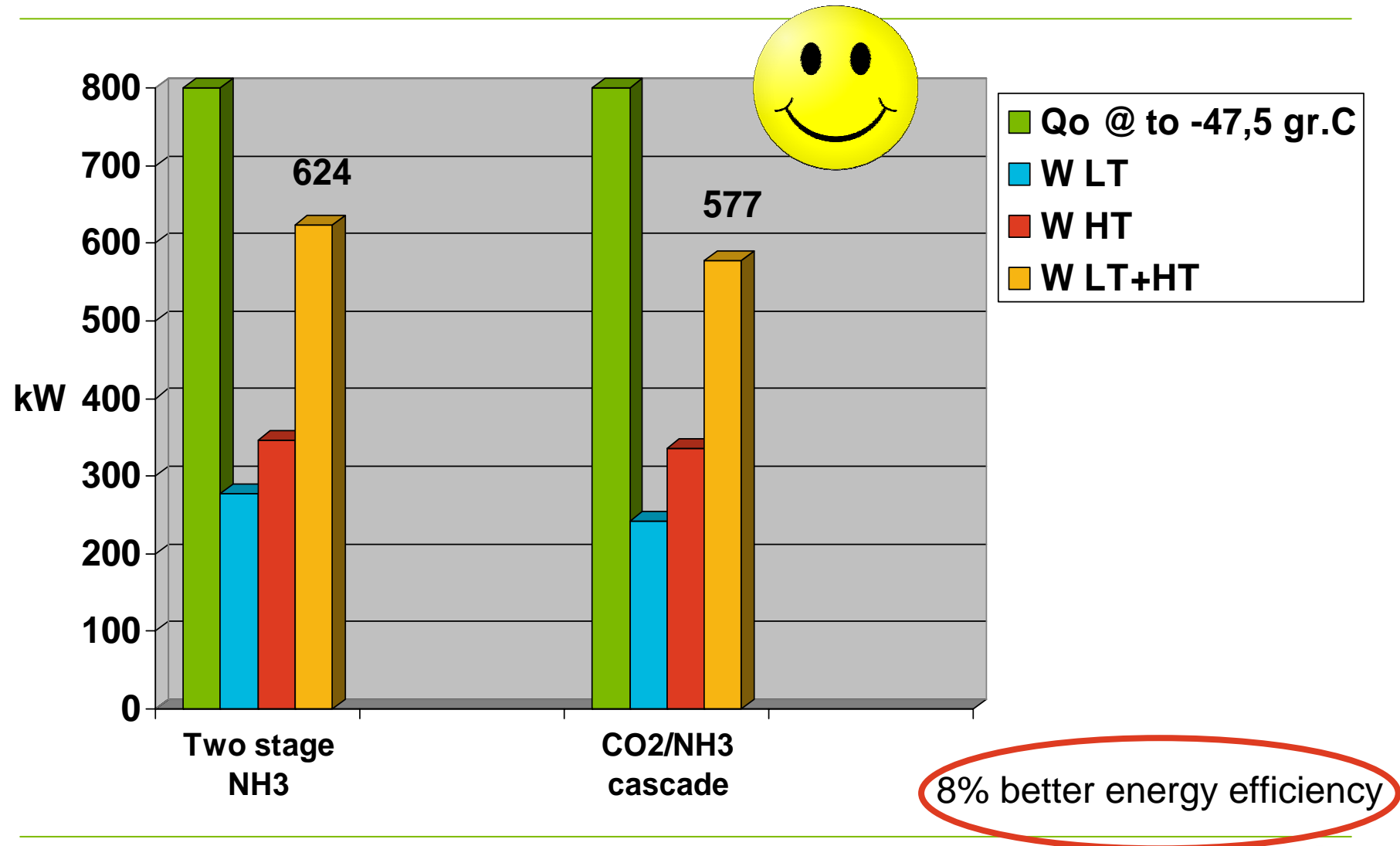
At the iterance of a fish freezer



Later in the process



Comparisson of required shaft power



Natural refrigerants

There are not many applications – if any – that cannot be cooled with natural refrigerants

Natural refrigerants have a long track record that prove them to be efficient, reliable, viable and long lasting systems

The growing interest in getting the most energy efficient and sustainable systems help the systems with the best efficiency – based on natural refrigerants

Questions?

Thank you for your attention