

Using Natural Refrigerants

October, 2009

Technology naturally thought

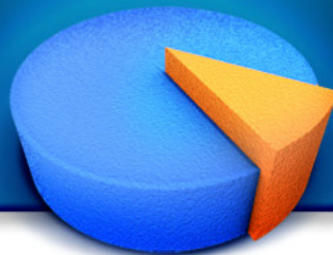
Marek Zgliczynski

Highlights

*Global
Leadership
in market and
tecnology*



*World market
leader*



*Capacity for
30 million
compressors
per year*



*+ **380** million
manufactured
products*



*R&D in **3**
continents*



***400** people
dedicated to research
and development*



***862**
patents globally*



*Global network of
selling and
distribution*



Triple Bottom Line related to business - balance of economic, environmental and social aspects



Besides all product benefits and outstanding performance, Embraco specially focuses on its balance with Social and Environmental dimensions.

ECONOMIC DEVELOPMENT

- **Technology awards to VCC due to its benefits recognition**
- **Lean Concept** - improved productive processes with less waste of time and raw material
- **Code of Ethics**
- **Global technological partnerships with research centers and universities**

SOCIAL DEVELOPMENT

- **Values and Diversity principles**
- **Volunteer working programs**
- **Support to local communities**

ENVIRONMENTAL DEVELOPMENT

- **Management systems:** ISO 9001 (all sites); ISO 14001 (EECON, Brazil and China), OHSAS 18001 (Italy, Brazil, EECON), QC 080,000 (Brazil, Italy and Slovakia).
- **Embraco Ecology Award** - to encourage the practice of environmental education in learning institutions
- **Development of natural refrigerant compressors:** R744, R290, R600a

Technological Innovation

Pioneer and leader in the replacement solutions of CFC refrigerants since 1993

R&D Investments: Up to 3% of total income, independent from economy instability

**Isobutane (R 600a)
Compressors**

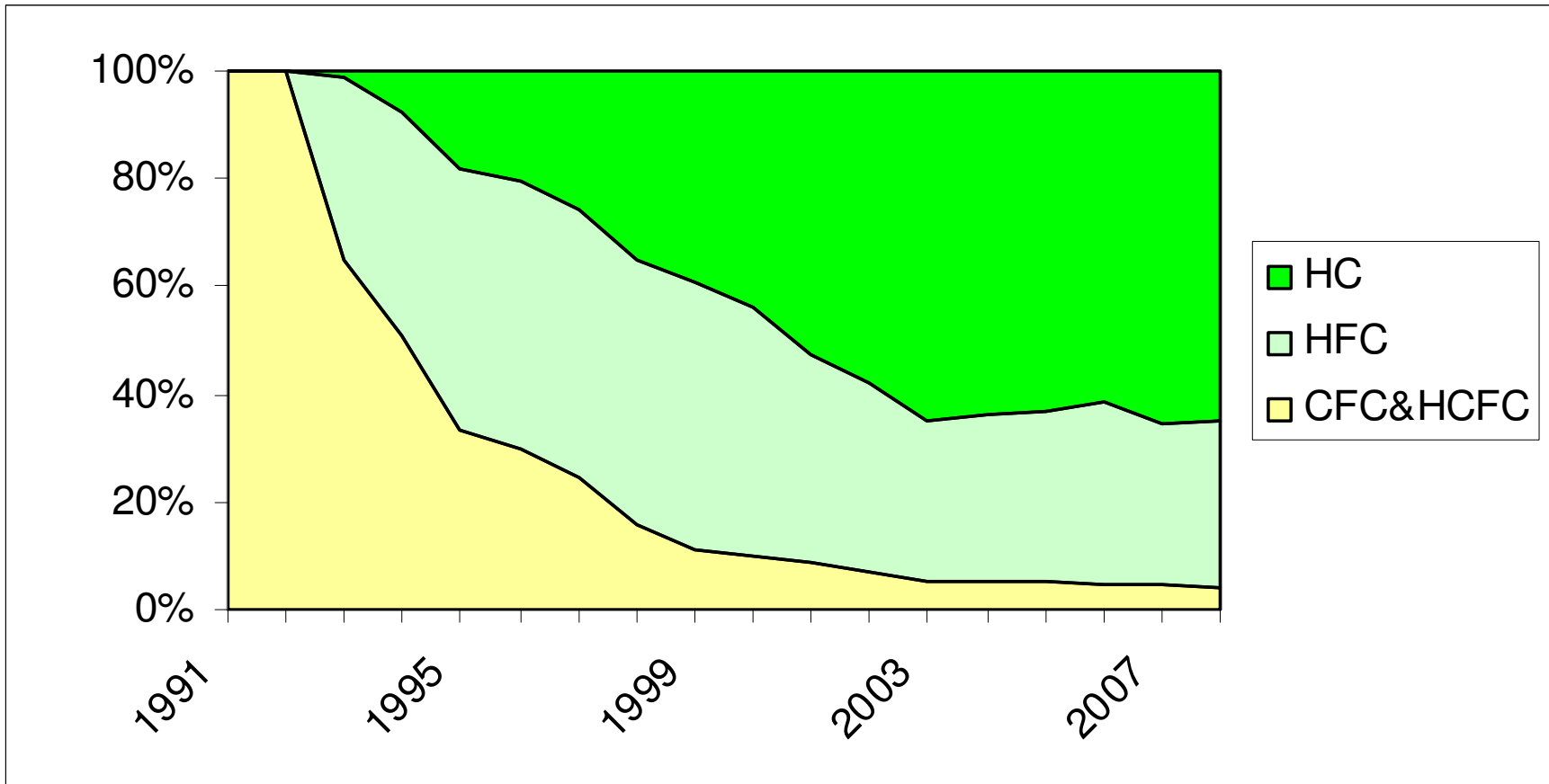
**Propane (R 290)
Compressors**

CO₂ (R744) compressors



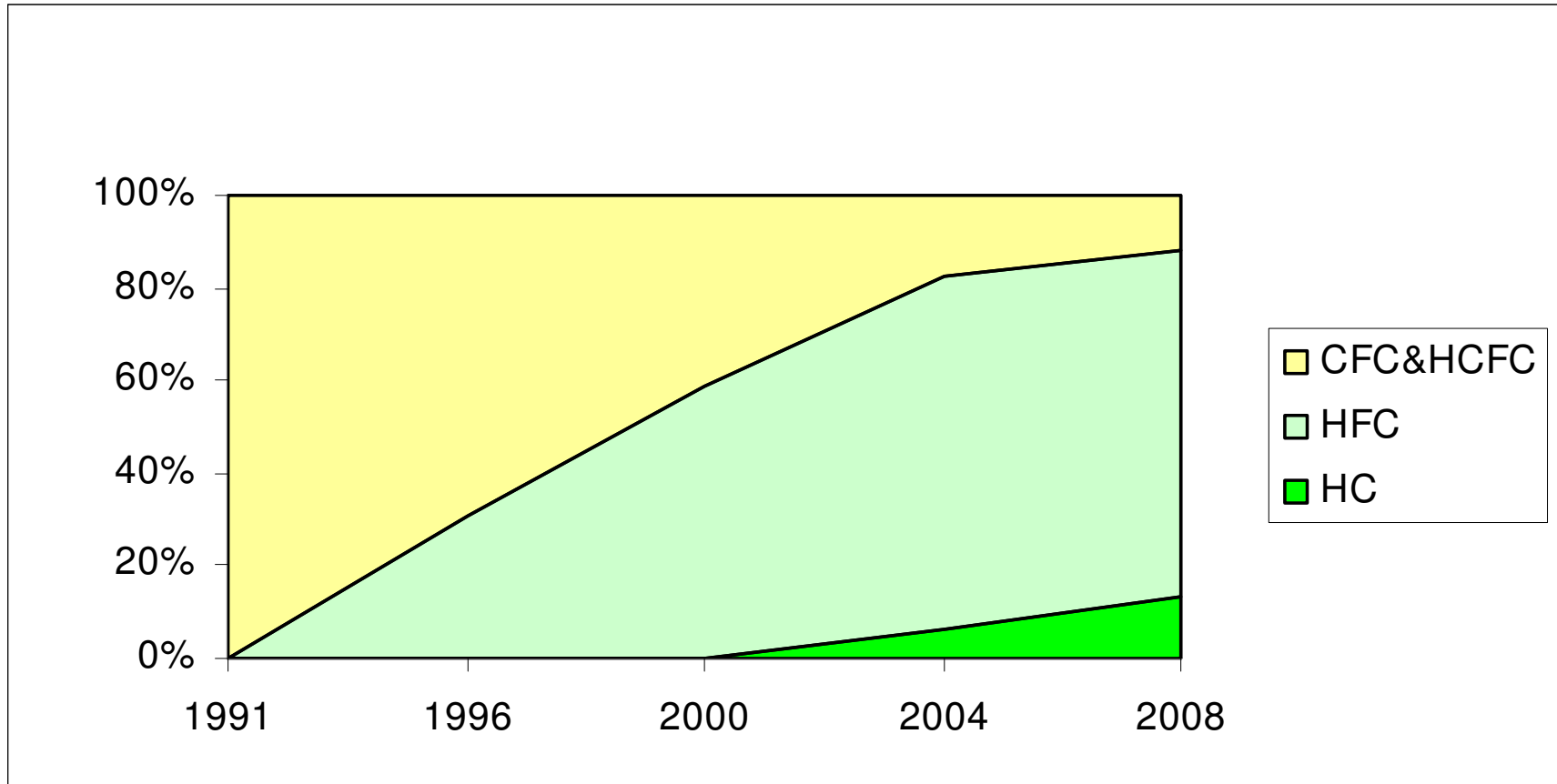
Innovation

Embraco Europe Sales by Refrigerant



Source: Embraco Europe Sales records

Light Commercial Sales by Refrigerant

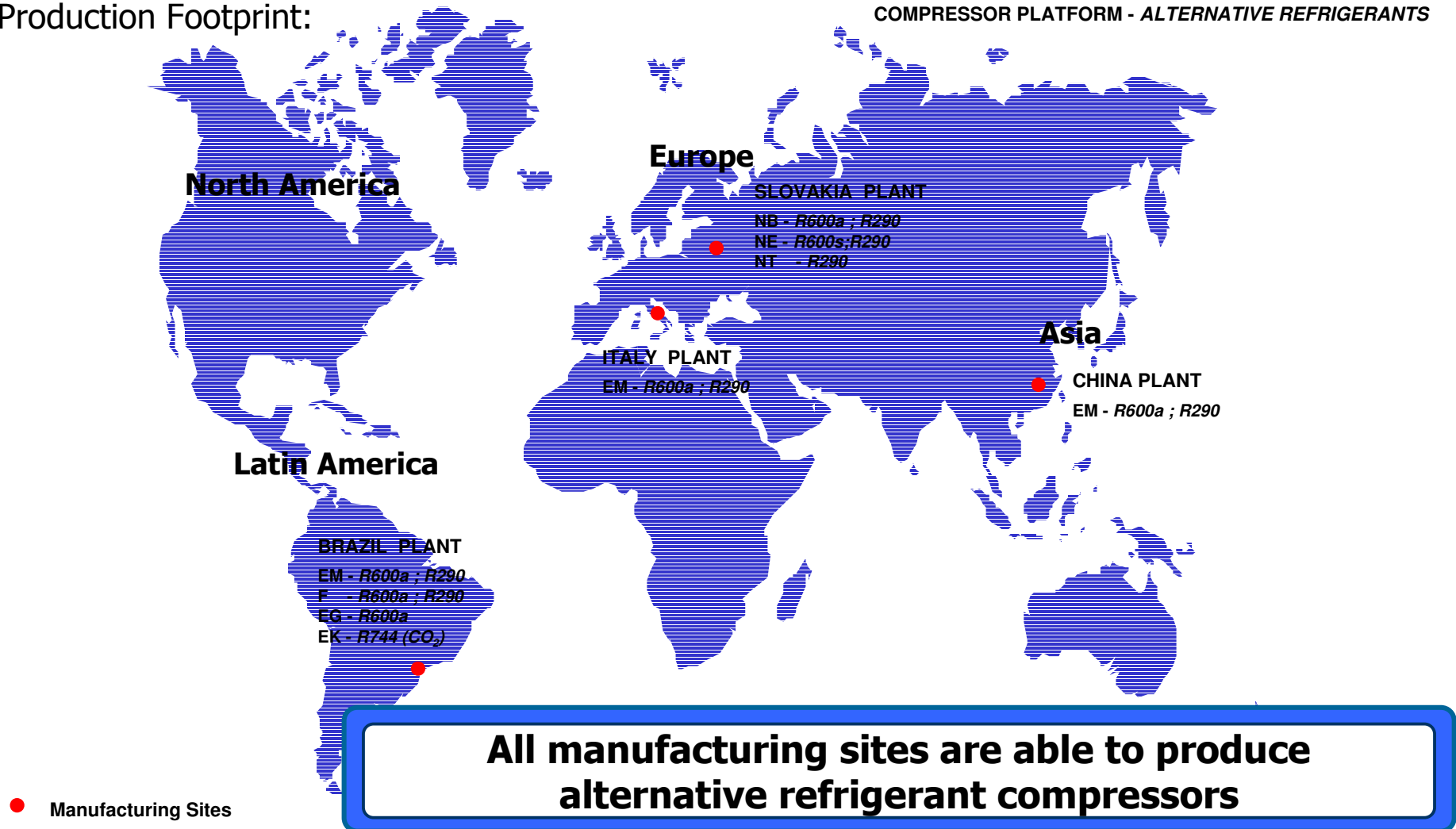


Source: Embraco Europe Sales records

Alternative Refrigerant Compressors

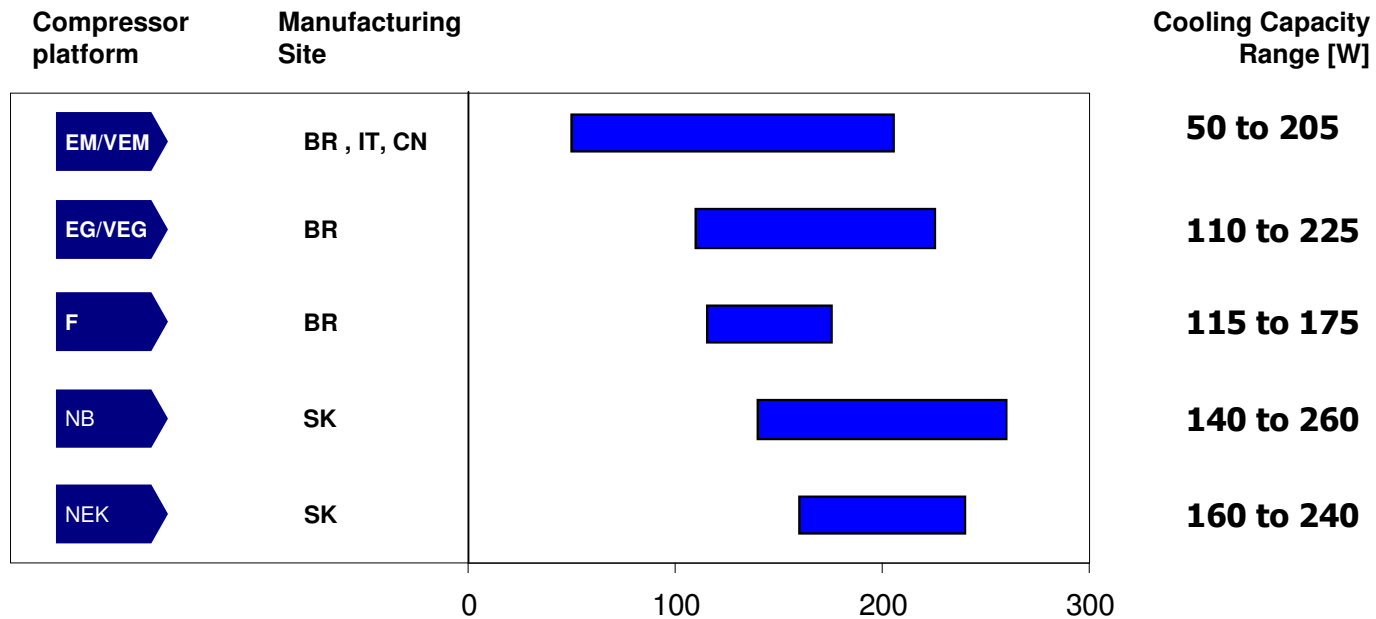
Production Footprint:

COMPRESSOR PLATFORM - ALTERNATIVE REFRIGERANTS



Embraco products and manufacturing

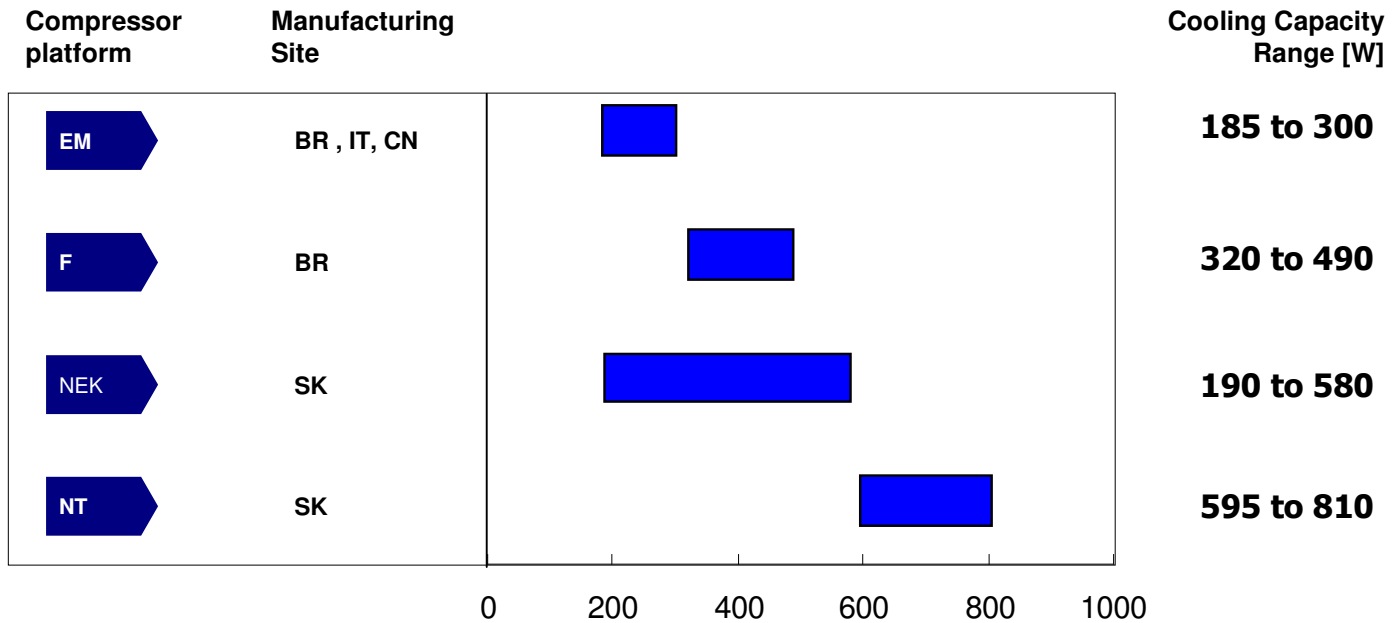
Household appliances, light ice cream freezers and GDMs
R600a Refrigerant Fluid



Check Point Condition: ASHRAE LBP 32 / 50Hz

Embraco products and manufacturing

GDMs, walk in rooms, horizontal and vertical freezers
R290 Refrigerant Fluid



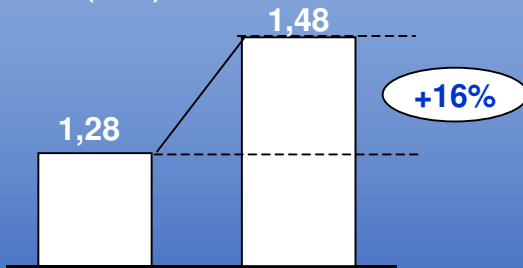
Check Point Condition: ASHRAE LBP 32 / 50Hz

Propane (R290)



EM Family

COP (W/W)

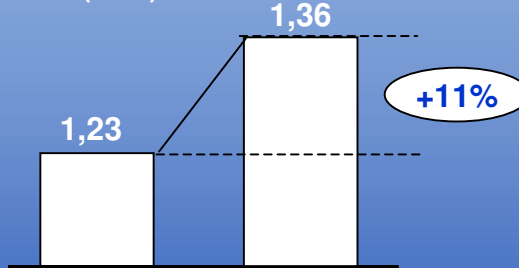


NE1121Z
(R134a)

EMT2125U
(R290)

NE Family

COP (W/W)

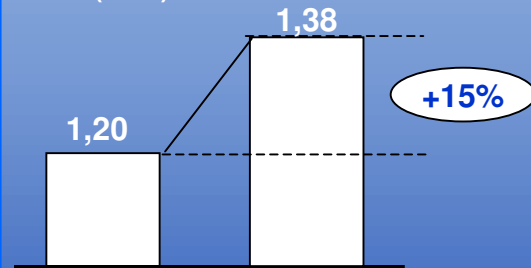


NE2134Z
(R134a)

NEK2134U
(R290)

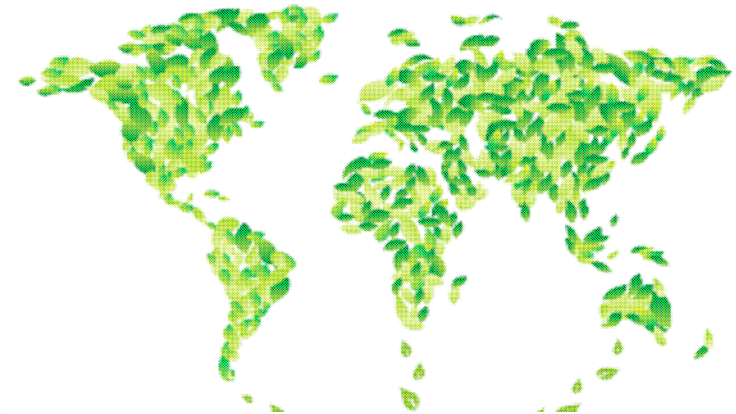
NT Family

COP (W/W)



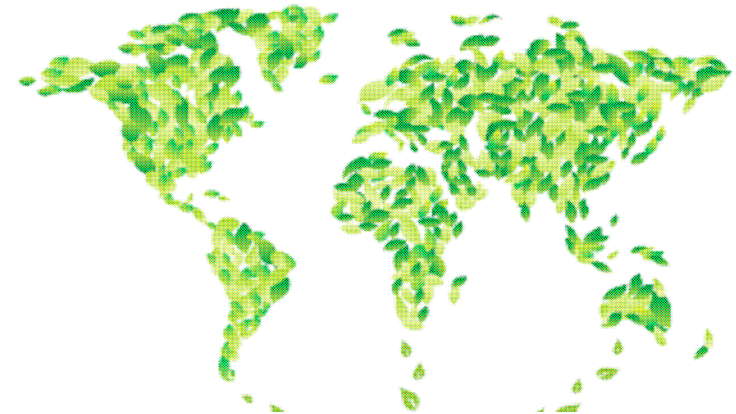
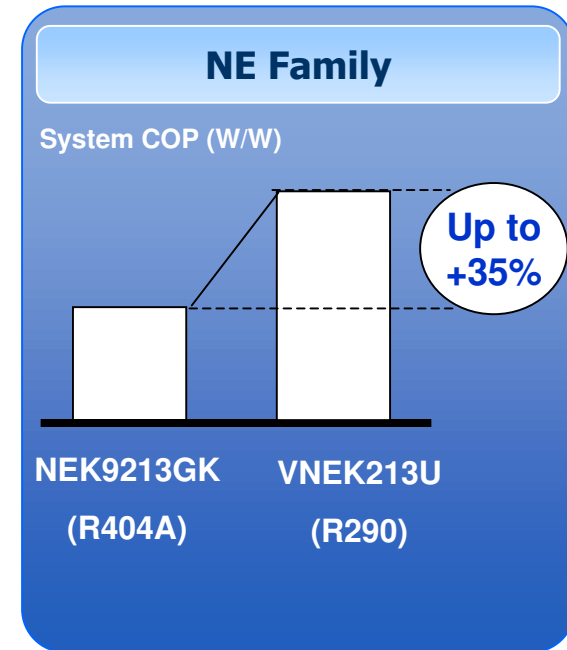
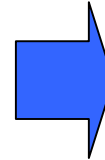
T2178GK-
(R404A)

NT2170U
(R290)



Test Condition: Check Point Ashrae LBP 32°C

Propane (R290) Variable Speed Technology



Propane (R290)



Characteristics of the refrigerant:

- Common availability;
- Lower applied cost;
- Compatibility with mineral and alkylbenzene oils and all the material used in compressors and refrigeration system;
- Great ecological appeal:

Refrigerant	ODP*	GWP**	Useful Life
R 12	1.00	7100	120 years
R 134a	0	3200	16 years
PROPANE (R 290)	0	< 5	Months

Source: 3rd report from the German Parliament Enquiry Commission "Protection of the Atmosphere", 1990.

* ODP = Ozone Destruction Potential

** GWP = Global Warming Potential (compared to CO2)

Characteristics of the propane products

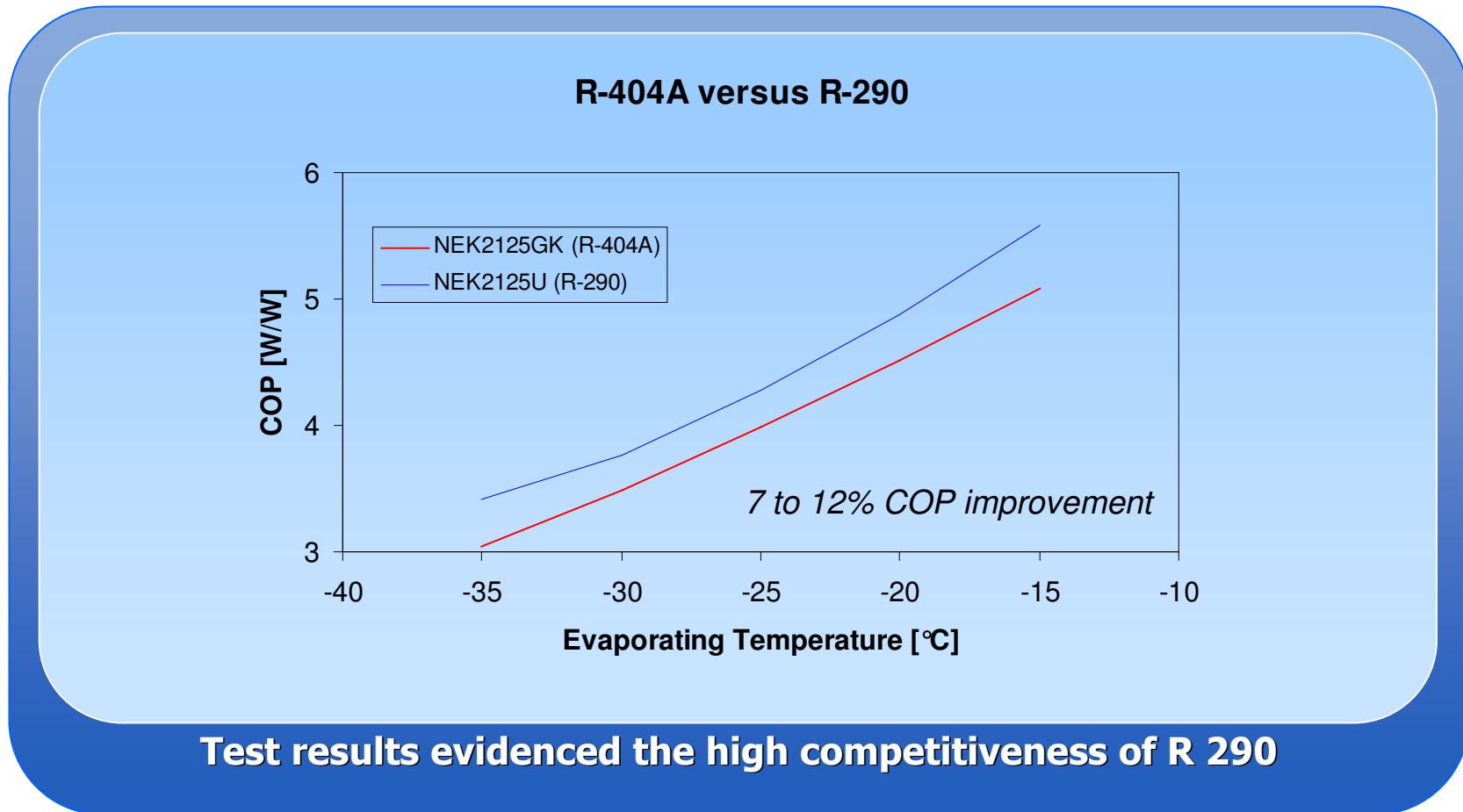
- Don't require particular adaptation of the refrigeration systems;
- Higher efficiency and capacity performance;
- Low noise;
- Embraco is offering full range of high efficiency compressors for light commercial application;
- Production in South America, Europe and Asia (China);



Propane (R290)



Test results:



Testing condition: Condensing temperature = 55 °C; Liquid and vapor temperatures = 32.2 °C; 50Hz



CO₂ (R744)



Characteristics of the refrigerant:

- Natural fluid;
- Not flammable;
- Lowest GWP refrigerant fluid.



Characteristics of the CO₂ products

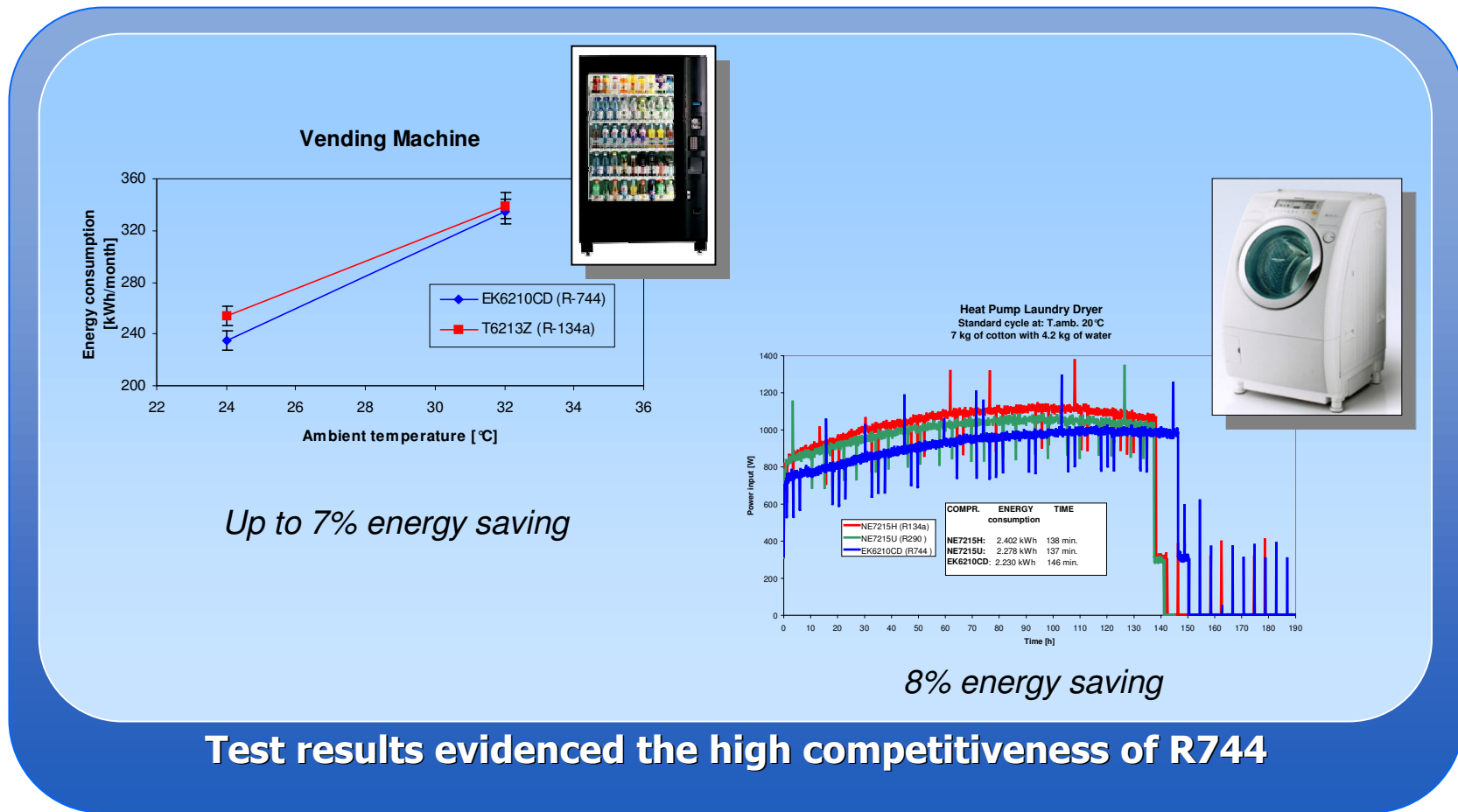
- New platform concept;
- Safe, silent and reliable product;
- Competitive performance;
- Suitable to variable capacity (VCC) for premium applications;
- Environmental friendly technology;
- Application in refrigeration and heat pump.



CO₂ (R744)



Test results:



CO₂ (R744)



Lineup:

Product Data - R744 (M/HBP)

Compressor	Voltage / Frequency	Displacement		Cooling Capacity W	Start of Production	Board Approval
		cc	cu in			
EK6160CD	100V 50-60Hz 1 ~	1.00	0.06	380*	Already	
EK6175CD	100V 50-60Hz 1 ~	1.30	0.08	500*	Nov'09	
EK6210CD	115V 60Hz 1 ~	1.75	0.11	805	Already	UL
EK6210CD	220V 60Hz 1 ~	1.75	0.11	805	Already	
EK6210CD	220-240V 50Hz 1 ~	1.75	0.11	700	Already	CCC, VDE
EK6214CD	220-240V 50Hz 1 ~	2.45	0.15	905	Dec'09	

* at 50Hz

Testing Condition

	Evaporating Temperature °C (°F)	Discharge Pressure bar	Return Gas Temperature °C (°F)	Ambient Temperature °C (°F)	Approach Temperature °C (°F)
MBP	-10 (14)	85	32 (89.6)	32 (89.6)	32 (89.6)

CO₂ (R744)



Assembly line production capacity of 60k compressors per year



**Responsible technology
for a better quality of life**

Thank you !

Marek Zgliczynski

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