

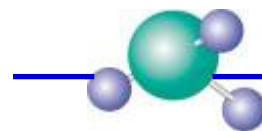
euramm^on
refrigerants delivered by mother nature



Applications with Natural Refrigerants

Brazilian Situation and Experiences

by L. Tomaz Cleto – Yawatz Engenharia Ltda



Yawatz Engenharia

Ammonia Partnership® Associated Company

RAC in Brasil – Influences

- Industrial Refrigeration: EU → R-717
- Industrial Air Conditioning:
 - Mainly USA → HFCs Chillers
 - EU → R-717 Chillers
- Commercial Air Conditioning:
 - Mainly USA → HFC Chillers
 - Invasion of Asian VRF systems - **AGAINST THE TIDE !!!**
 - 3-4 times more refrigerant charge
 - 10-15% Refrigerant Leak Rates

RAC in Brasil – Influences

- Supermarkets:
 - Mainly USA → R-22 Direct/ HFCs Direct
 - Leak Rates of 100%/year (Avg)
 - Some R-22 or R-134a Chiller Systems (MT and AC)
 - Some R-717 PHE Chiller Systems (1997-2000)
- Commercial Refrigeration:
 - Mainly USA → HFC Direct
- Appliances/ Domestic Refrigeration:
 - R-134a
 - 2004 - 2005 - First Series with R-600a

Natural Refrigerants in Brasil (2010)

Ammonia

- More than 80% of the Food Industry using R-717.
- Brasilfoods Experience - huge plants with low ammonia charge.
 - Rio Verde – GO
 - Freezing Tunnels: 13000 kW (-38/-10°C)
 - Cold Stores – LT: 5500 kW (-30/-10°C)
 - Cold Stores – MT/ IT: 30000 kW (-10/+35°C)
 - Chilled Water/ AC: 15000 kW (0/+35°)
 - 1/5 of a Standard Refrigerant Charge

Natural Refrigerants in Brasil (2010)

Ammonia



Natural Refrigerants in Brasil (2010)

Ammonia

- Hundreds of R-717 PHE Chillers:
 - Mainly for Process and Food Industry (including AC).
 - Very few in air conditioning for office buildings.
 - 9 systems for Supermarkets using PHE chillers and secondary fluids:
 - LT (Tyfoxit)/ MT (Prop. Glycol)/ AC (Water).

Natural Refrigerants in Brasil (2010)

Hydrocarbons

- ~10 Chemical Plants using R-1270 Chillers.
- Some Chiller Conversions → R-22 to HC 22A (R-290)
- 1 R-290 Chiller system for Orange Juice Cooling.
- 1 R-290 Chiller system for Distribution Center (LT).
- 2 New projects for Supermarkets with R-290 Chillers and secondary fluids:
 - LT (Tyfoxit)/ MT (Prop. Glycol)/ AC (Water).

Natural Refrigerants in Brasil (2010)

Hydrocarbons

- New series of fridges and freezers using R-600a and C-Pentane (foam).



Natural Refrigerants in Brasil (2010)

Carbon Dioxide

- 2 R-744/R-717 cascade systems for Food Industry.
- 1 R-744/R-134a cascade system for Supermarket.
- 3 new projects using R-744 cascade system for Distribution Centers.
- 2 new projects using R-744/R-134a cascade system for Supermarkets.
- 2 new projects using R-744/R-717 cascade system for Food Industry.

Natural Refrigerants in Brasil (2010)

Verdemar Supermarket – Nova Lima First CO₂ Cascade System in Latin America



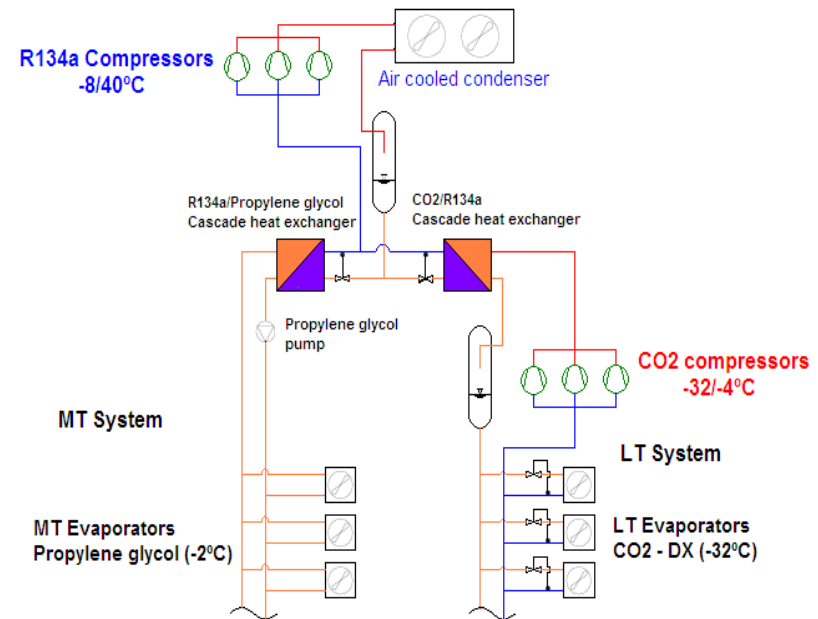
The frozen products section of the new store: Low temperature islands with CO₂

Natural Refrigerants in Brasil (2010)

Verdemar Supermarket – Nova Lima



The new SKYRACK BREEZE from Plotter & Racks; environmental-friendly and extremely-efficient



Simplified refrigeration circuit of the SKYRACK BREEZE with CO₂ which is installed in Verdemar

Natural Refrigerants in Brasil (2010)

Learning Lab at Bitzer – São Paulo
More than 250 participants



Natural Refrigerants in Brasil (2010)

Learning Lab at Bitzer – São Paulo Test Comparison of 3 Systems



Market Trend

Industrial Refrigeration in Brasil

- Food Industry
 - R-717, Ammonia and NH_3
 - PHE Chillers – Reduced Refrigerant Charge
 - Secondary Fluids (-15.0°C a 0.0°C)
 - R-744 - ??? – Great Future!
 - Legislation/ Safety → ABNT NBR 16069:2010

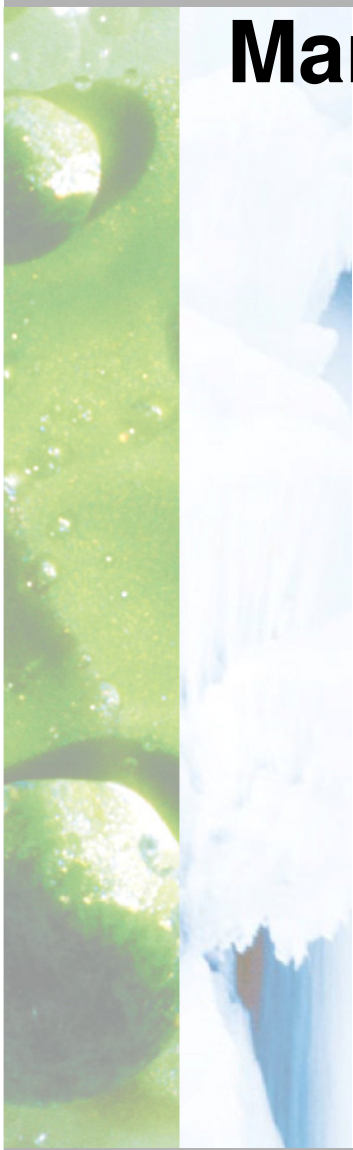
Market Trend

Industrial Refrigeration in Brasil

- Process Industry/ Industrial Air Conditioning
 - R-22 – “Naturally” almost Phased-Out
 - HFCs – Chilled Water Systems
 - R-717 – PHE Chillers – Reduced Charge
 - HCs – (R-1270) – for EEx Plants

Natural Refrigerants in Brasil

Market Trend



**Who is going to
catch the bouquet?**

Natural Refrigerants in Brasil

Market Trend

- “Excellent choice, but only in Europe!”
- “In Brasil? Only in 10-15 years!”
- HCFC Phase-out Government Plan to start in 2011
 - Ministry of Environment will not support the HFC phase down now (maybe after 2020).
 - Maybe too late for Natural Refrigerants.
- We cannot wait for legislation.

Natural Refrigerants in Brasil

Market Trend

- (Just a few) **People** (not the companies) are doing the Job!

- Look the example of “good exit”:

The VRF “Massive Attack” → Thousand of systems with R-410A installed in less than 3 years. Several buildings with more than 2000 kW capacity.

Natural Refrigerants in Brasil

Market Trend

- Seminar “**Use of Natural Refrigerants for Refrigeration and Ar Conditioning Systems**”
 - Ministry of Environment/ UNDP/ ANPRAC.
 - São Paulo / Recife / Porto Alegre/ Manaus/ Brasília.
 - Industrial Refrigeration/ Air Conditioning/ Commercial Refrigeration/ Supermarkets/ MAC/ Secondary Fluids/ Low Refrigerant Charge/ Safety Issues.
 - Carbon Dioxide/ Ammonia/ Hydrocarbons.

Natural Refrigerants in Brasil

Market Trend

Rio 20!6 Natural!



rio20!6



**Natural
Refrigerants**

A Project for the Future !

Natural Refrigerants in Brasil

Market Trend



**Natural
Refrigerants**

RIO 20!6 NATURAL:

- Chillers for Air Conditioning
- Supermarkets and Retail Stores
- Cold Stores
- Appliances