High
Efficiency
Solutions.

CAREL

Use of CO_2 in Emerging Countries: South Africa & LAM

UNIDO

ATMOsphere
technology summit
natural solutions

Pick n Pay Supermarkets

Johannesburg South Africa

Brazil CO_2 Facility

Sao Paulo Brazil

High
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Agenda

1. Background
2. End User Vision
3. CO_2 System Designs
4. Training & Education
5. Upcoming Developments

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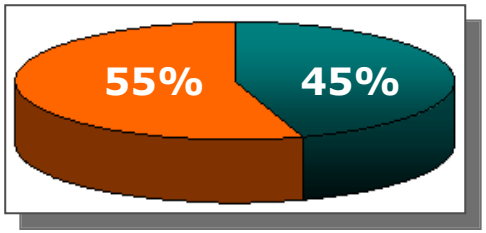
Background

- **The Direct effect of the gas in the Atmosphere**
  The lack of refrigerant is due to the leakages of the installation and to the fact that the gas is not recovered in old and disuse plants

- **Indirect effect**
  Quantify the CO_2 due to the production of the energy necessary for the operation of the plant in its life

Direct greenhouse effect **Indirect greenhouse effect**



Background

System Design Objectives – Pick n Pay

Careful consideration of the 1st CO_2 technology was realised with the development of a Subcritical cascade Dx system for the Low temperature fixtures whilst the Medium temperature fixtures moved to a lower GWP refrigerant R134A as a first step.

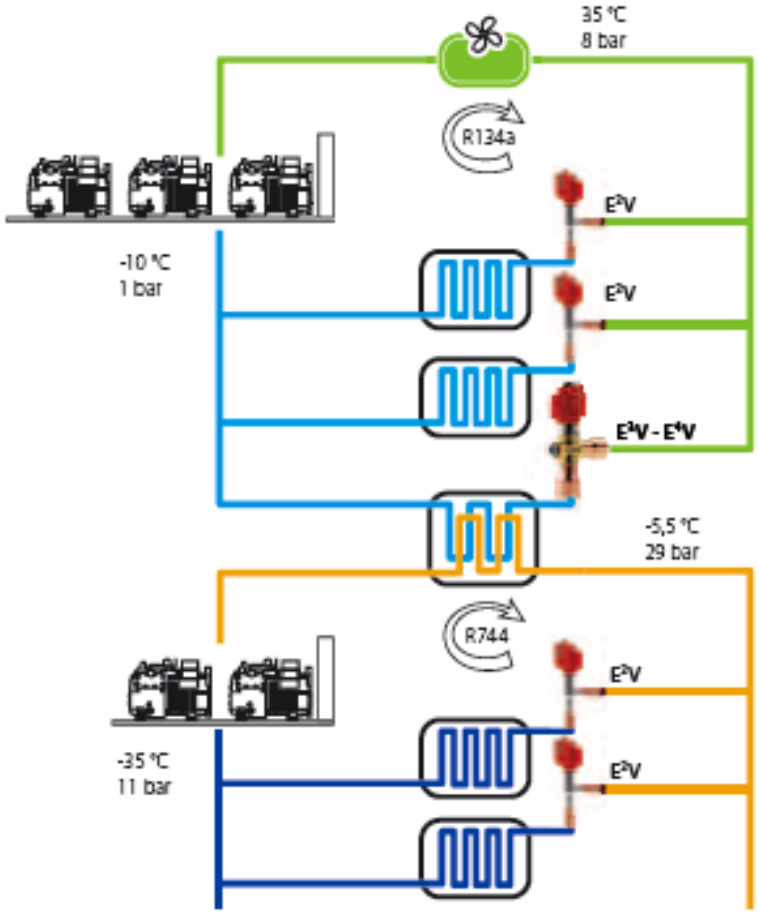
System Design Objectives – Bitzer Brazil

In order to prove the benefits CO_2 technology within LAM, Bitzer set out to invest into a new purpose built facility to carry out an analysis between R22 – R404A which is widely used vs R744 (CO_2). The new facility would also serve as a beacon within LAM as a training centre to educate the industry and further enhance system designs.

Common Objectives

Lower GWP (Global Warming Potential)
Efficient plant performance
Easy for service personnel to understand

Background – End User



Subcritical Cascade

R134a MT/CO_2 Dx LT

CO_2 System Design – CO_2/R134a

System Design Medium Temperature

R134a Dx with Sub cooling
-10c SST/43c SCT

The system consists of 2 x Multiplex racks with a combined capacity of 648.77kw

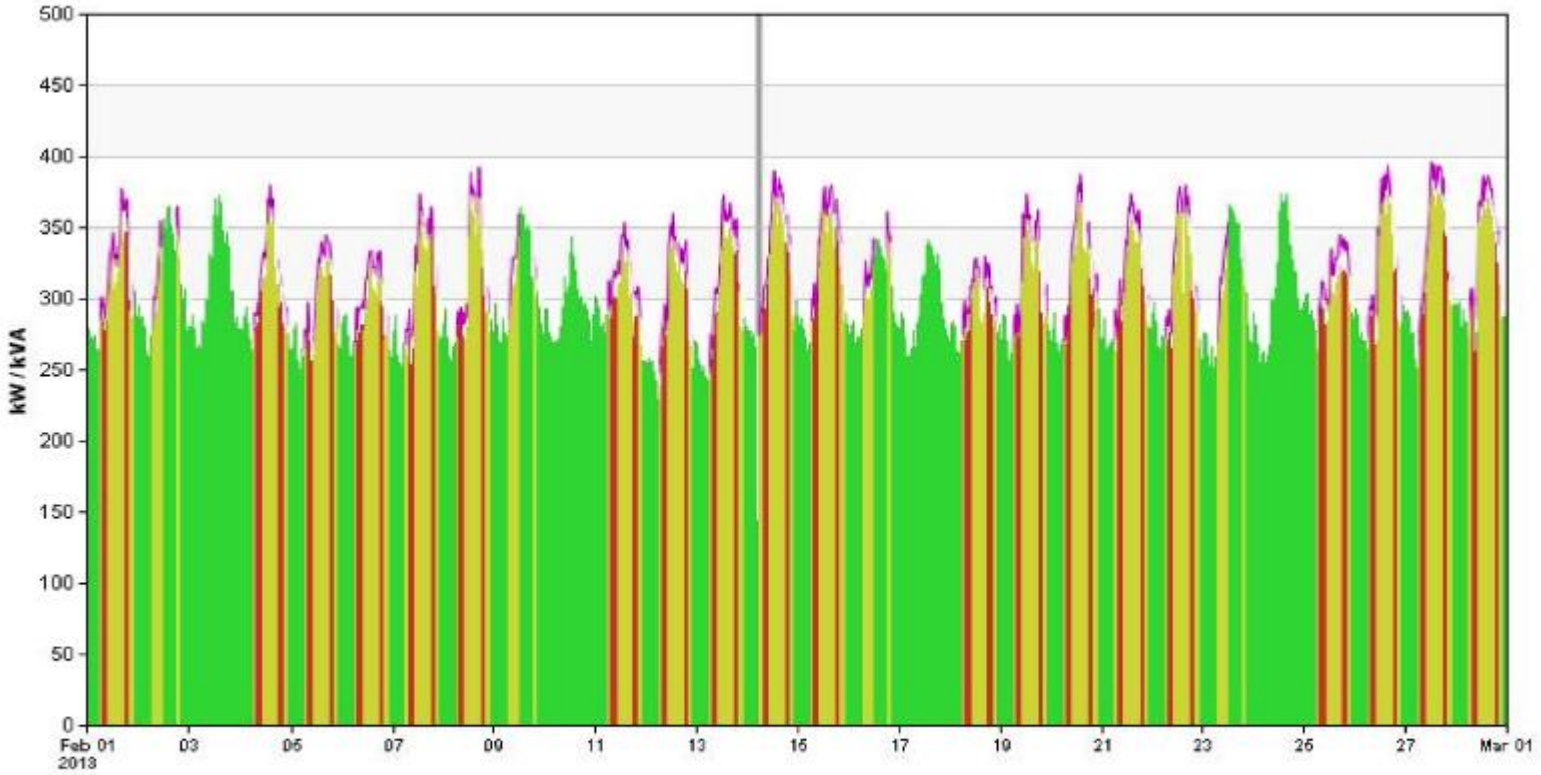
System Design Low Temperature

R744 (CO2) Dx
-32c SST/-5c SCT

The system consists of 1 x rack with a combined capacity of 70.9kw

CO_2 System Design – CO_2/R134a

System Performance – R404a /Feb 2013



From ***Feb 01, 2013*** *to* ***Mar 01, 2013*** *(Duration* ***28*** *days)*

Total Energy:	199,699.22 kWh	Capacity:	705.74 kWr
Average kW demand:	297.393 kW		

CO_2 System Design – CO_2/R404A/R22

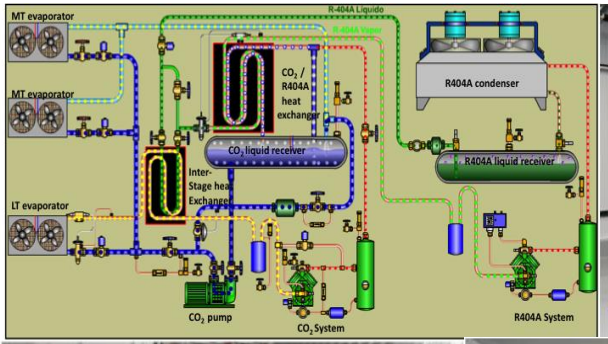
Bitzer Brazil

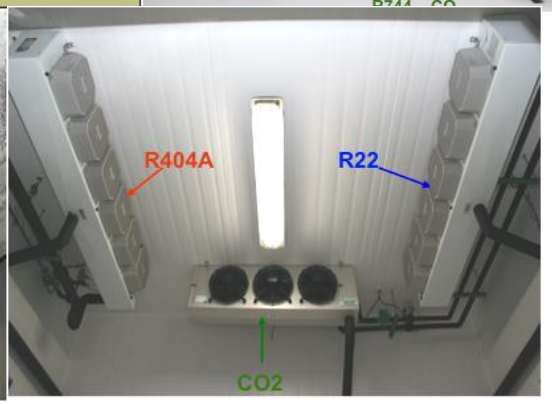
Rack Configurations

- R404a/CO_2
- (Pumped CO_2 MT, DX CO_2 for LT)
- R404a
- R22

Each Rack Capacity

- 10 Kw of freezing at –30ºCsst
- 20 Kw of cooling at –10ºCsct



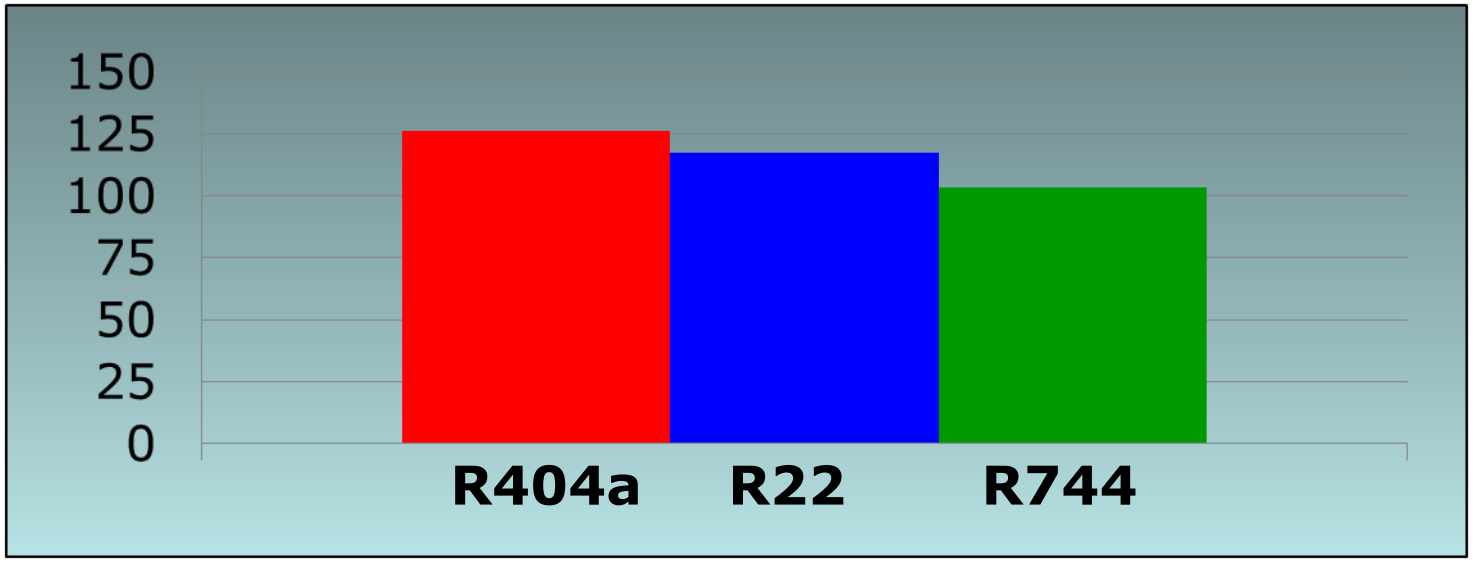


Three Cold Rooms

2 x MT and 1x LT with EEV Stepper (Electronic Expansion Valve

CO_2 System Design – CO_2/R404A/R22

System Performance



power consumption per year – R744-system	103234 [kWh]
power consumption per year - R404A-system	126295 [kWh]
power consumption per year - R22-system	117435 [kWh]

CO_2 System Design – CO_2/R404A/R22

Energy Consumption [kWh]		
	SJP (CO_2)	Curitiba
Rack MT+pump+cases	61909	83890
Rack LT+cases	26609	29893
TOTAL	88518	113783

For LT Rack/cabinets we have a 11,25% of Energy Saving

Total Energy Saving 22,26%

South Africa & LAM

- Reduction in the consumption of electric energy
- Reduction of CO_2 piping diameter sizes
- Reduction of CO_2 refrigerant charge
- CO_2 refrigerant charge less costly
- Low GWP (CO_2)
- Smaller refrigeration rack and smaller compressor numbers
- Smaller and more efficient evaporator coils

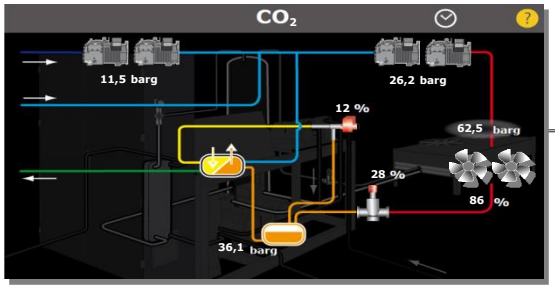
CO_2 Training & Education

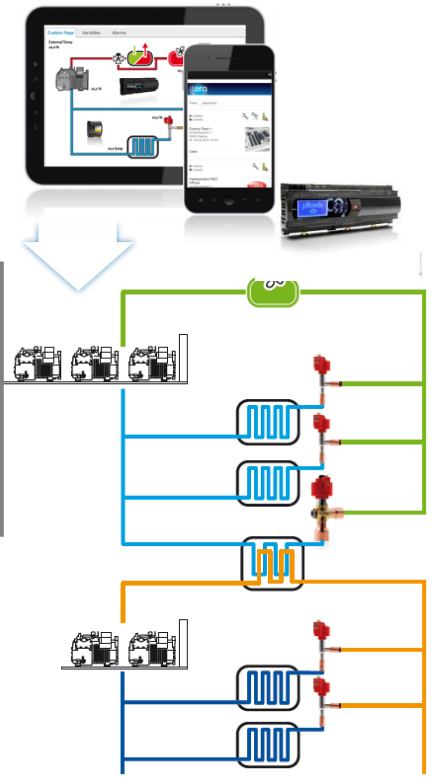
Consideration for easier Tools

- Easy access to all relevant information
- Easy understanding of working conditions
- Guided and flexible procedures
- Built in safety's
- Predictive alarms
- System integration
- System Efficiency Kpi's

Conceal complexity behind

- General overview, detailed information
- Added value , Kpi system performance, COP
- Improve service levels through faster remote troubleshooting
- Reduced hardware costs





CO_2 Training & Education

Pick n Pay South Africa

All training was conducted onsite to in both Practical and theoretical aspects when using R744 (CO_2) refrigerant.

Bitzer Brazil

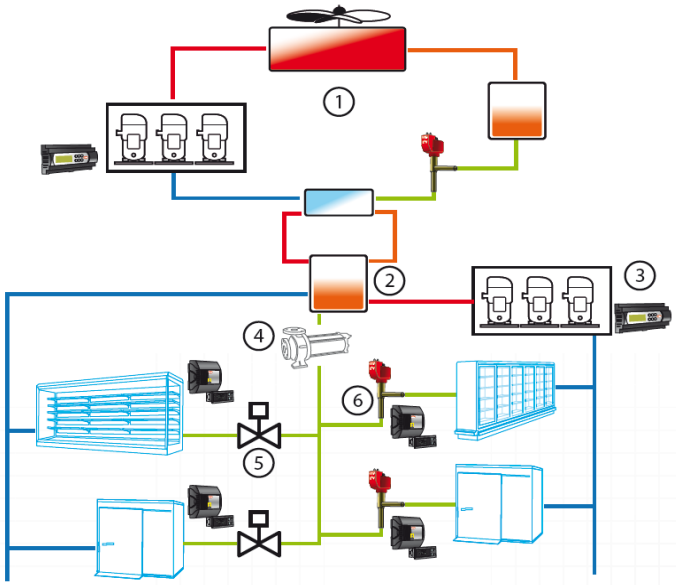
The focus of the CO_2 Technology and training centre Bitzer Brazil, which is the only one of Its kind in the America's is to present new Technologies and to promote the technical Improvement in a simple and objective way the Use of Carbon Dioxide in Commercial and Industrial refrigeration.

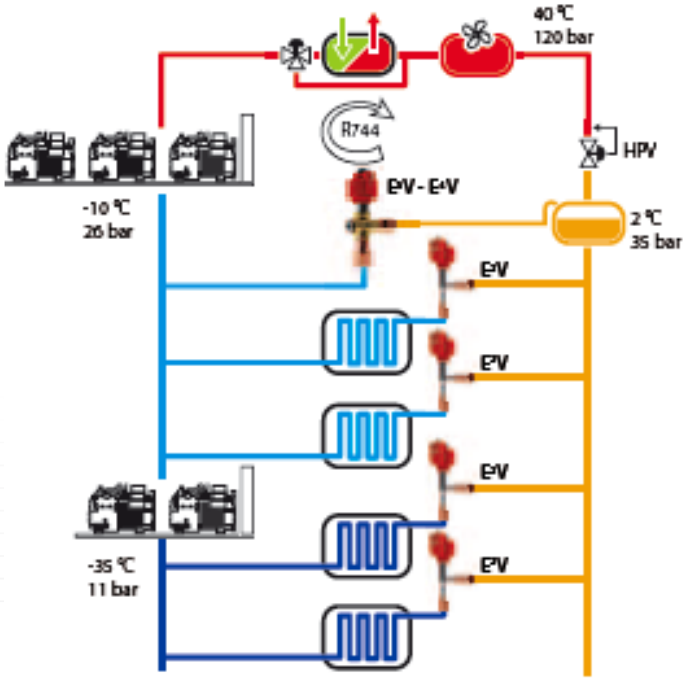
- 1000 Technicians Trained
- 21 Installations in 2012

Upcoming CO_2 Developments

Metador Refrigeration

Total store – CO_2 Liquid Pump MT & Dx LT
- Transcritical Booster System





Upcoming CO_2 Developments

Bitzer Brazil

Total store – Transcritical Booster System

First CO_2 Transcritical System of Latina America made by

BITZER BRAZIL

A special Thank you to

- Pick N Pay Supermarkets – South Africa
- Metador Refrigeration – South Africa
- Bitzer Brazil - LAM

thank you for your attention,

any questions?