



ATMO
sphere

Business Case for
Natural Refrigerants

25-27/09/17 - Berlin

Frigo-Consulting



Cost effective solution for small to medium sized markets

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First job site equipped with eCO2cube



- Migros Kreuzplatz, Zurich Switzerland
- System in operation since July 2017
- Sales area: 400 m²
- Walk-in-cooler & -freezer: 35 m²
- Low & medium temperature cabinets: 40 m
- Building:
 - Low energy building “Minergie”
 - Temporary installation
- System capacities
 - Heating 60 kW
 - Air conditioning 15 kW
 - Medium temperature 40 kW
 - Low temperature 10 kW
- Roof-Top-Unit down town Zurich



Impressions of roof top unit

38dB(A) in 5m



Impressions of cold rooms



Impressions of sales area



proved for 120 bar

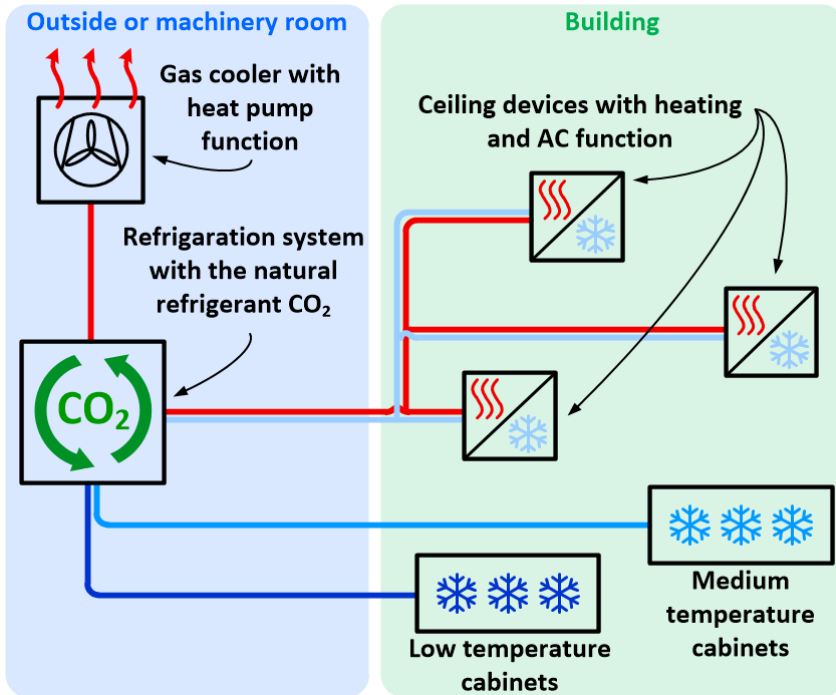
Involved parties



MIGROS
Genossenschaft Migros Zürich

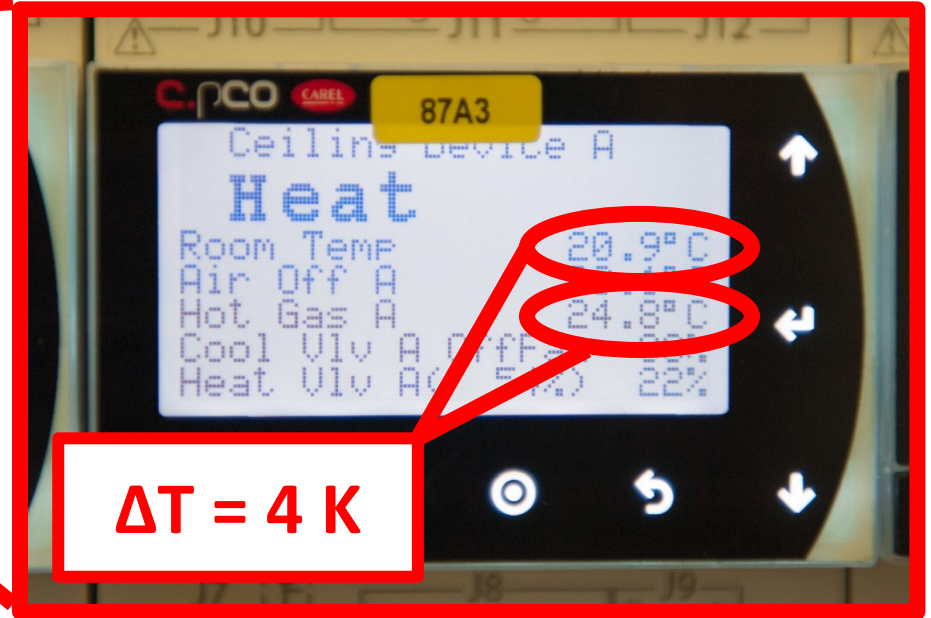
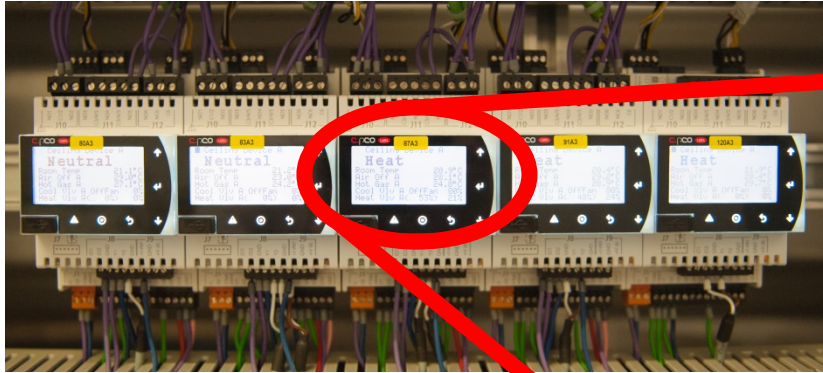


Operation Modes



- HEATING, REFRIGERATION & AIR CONDITIONING
- Cost and energy efficient
- Low noise level in sales area
- Simple heat/cold distribution
- Quick installation & easy maintenance
- Natural and environmentally friendly
- Developed for small to medium markets
- Customized capacity, low space requirements, high efficiency
- All in one

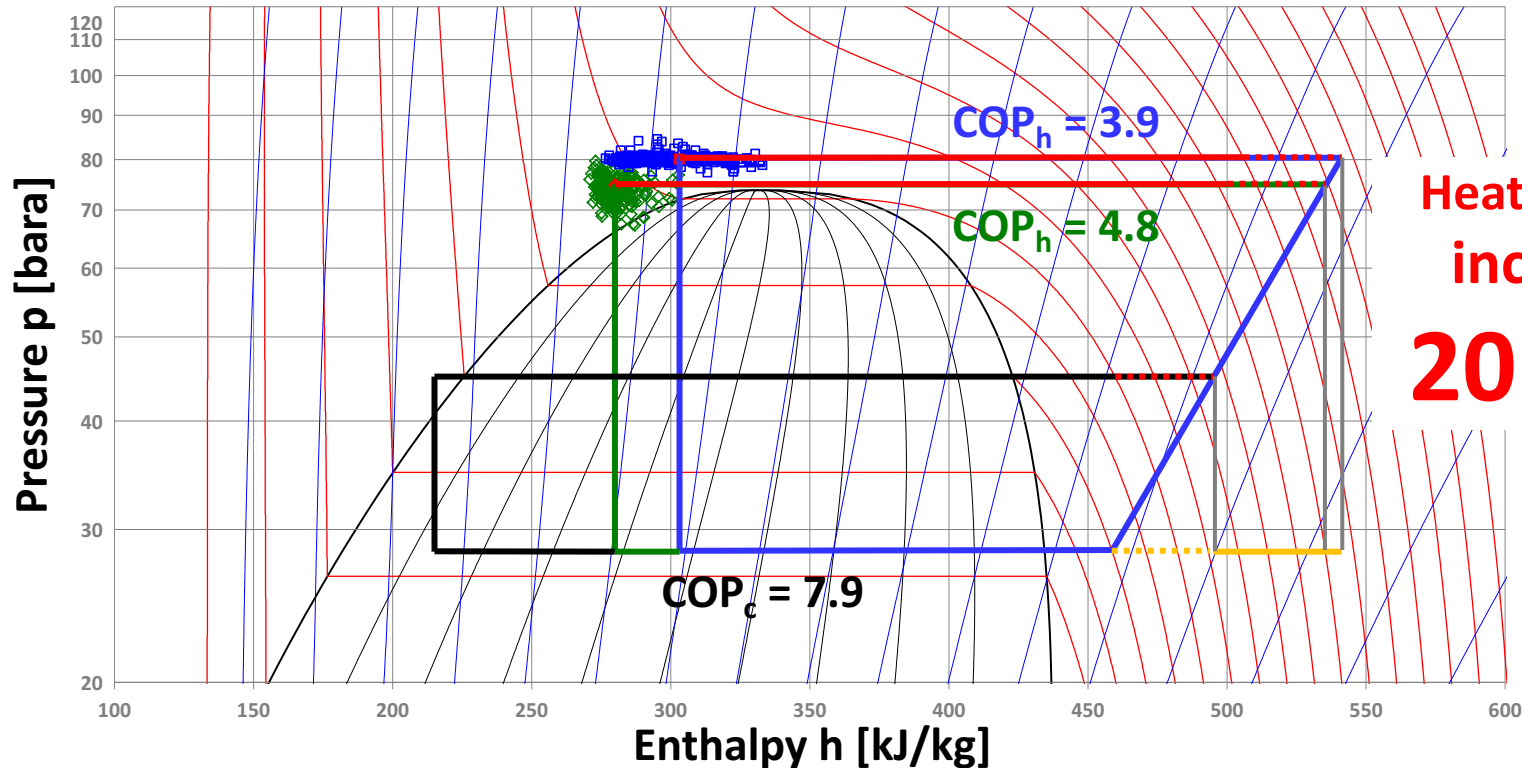
Impressions technical equipment



controls designed for heating and cooling

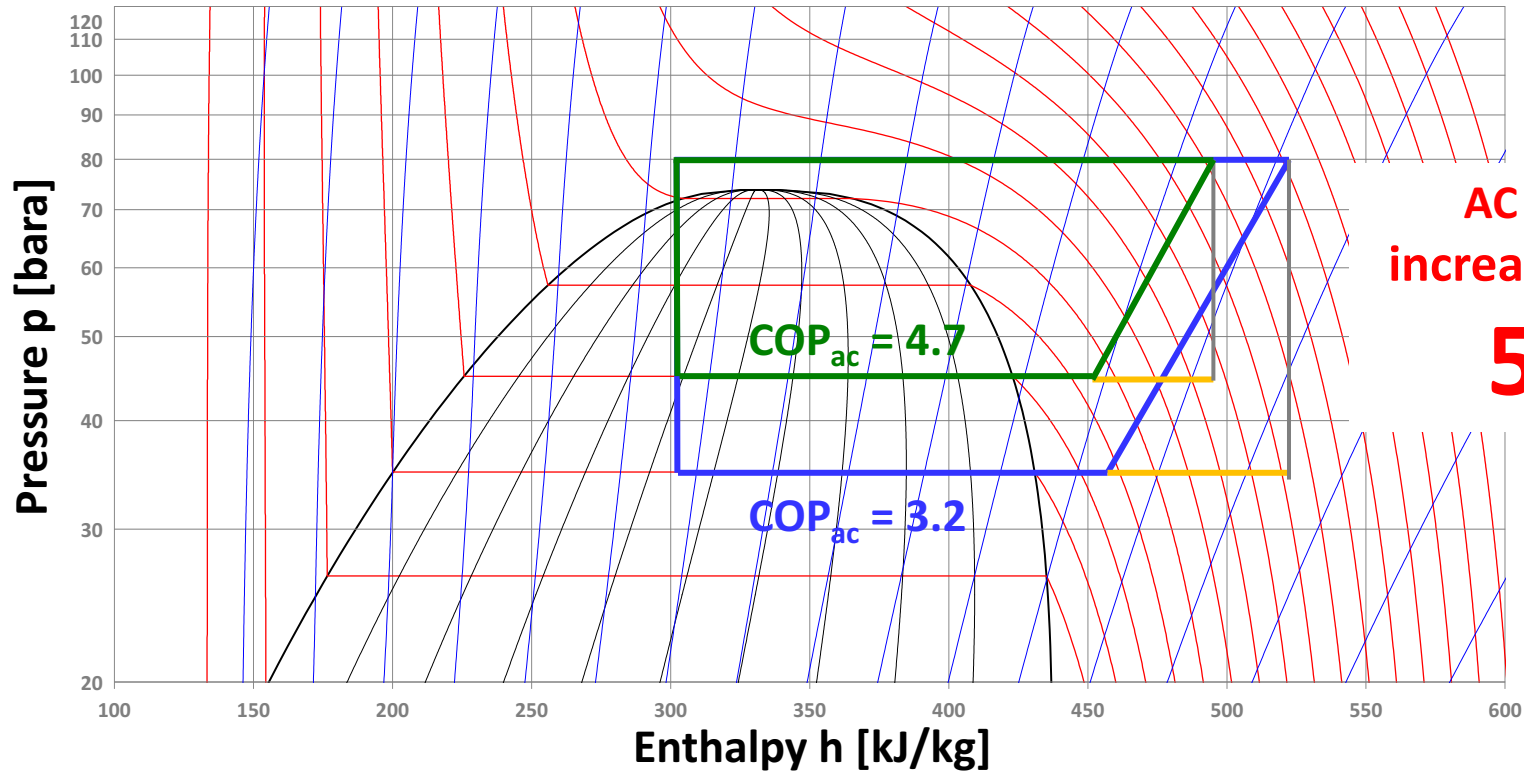
$$\Delta T = 4 \text{ K}$$

Comparison of heating modes



Heating efficiency
increased by
20 – 25 %

Comparison of AC-modes



AC efficiency
increased by up to
50 %

Life-Cycle-Cost reducing benefits



- Less components & piping
- No heat / cold storage
- No pumps
- Reduced space requirements
- In-/outdoor placement
- High efficiency due to direct heat & cold distribution
- High efficiency due to separate evaporation level for air conditioning
- All from one hand
 - Less interfaces
 - Clear responsibility
 - Maintenance

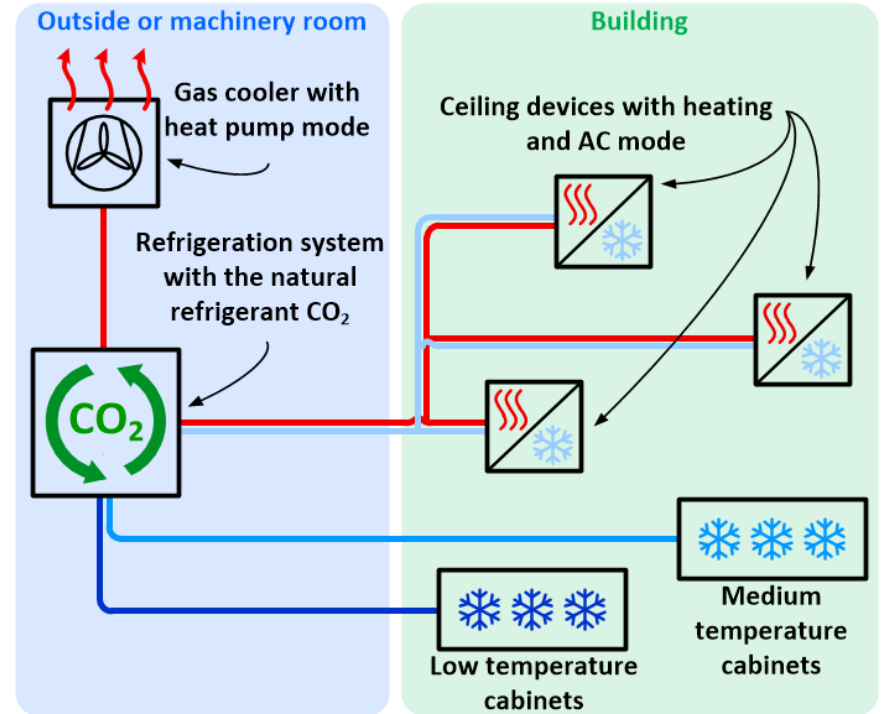
**Estimated LCC
reduction potential:
30 %**



Challenges



- Develop control strategy
- Heat and cold distribution
- Part load characteristics
- System dynamics
- Optimization of flow directions
- Failure of 3-way-valve
- Competent Partners needed
- Training of staff



Summary



- System successfully in operation since July 2017
- Efficient heating & air conditioning operation
- Cost-effective solution with several options
- Customer standardisation with necessary job site specific flexibility
- Additional flexibility with vacuum drainage
- No technical barriers for implementation in southern climate
 - Ejectors / Parallel compression



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Thank you!

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