



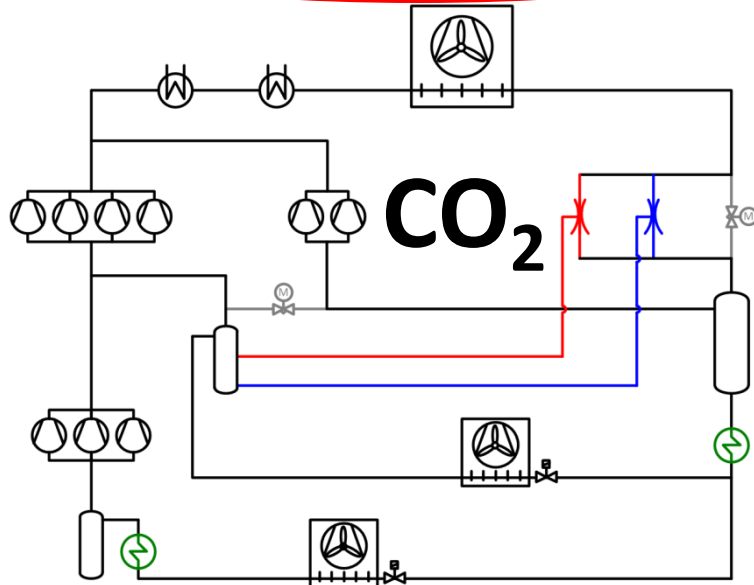
CO₂-Refrigerating Systems for southern climate

Jonas Schoenenberger

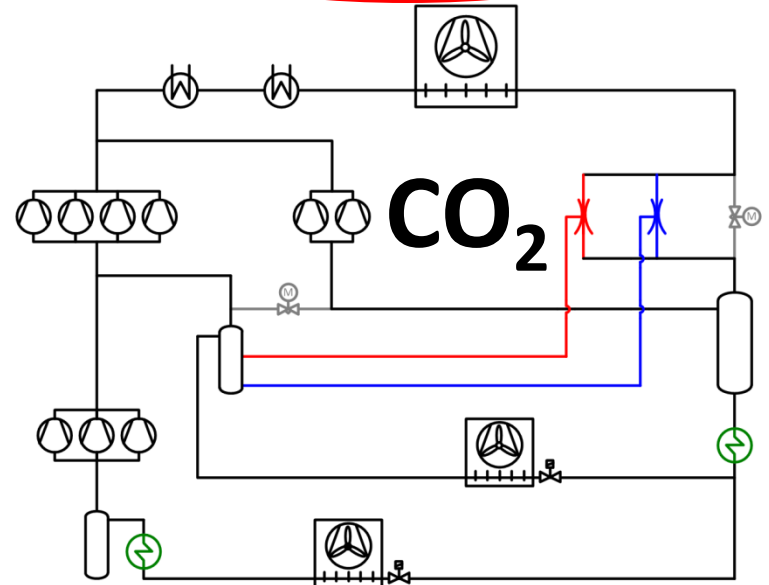
19. April 2016

What's the difference?

Northern & central climate



Southern climate



Migros Mythencenter, Switzerland

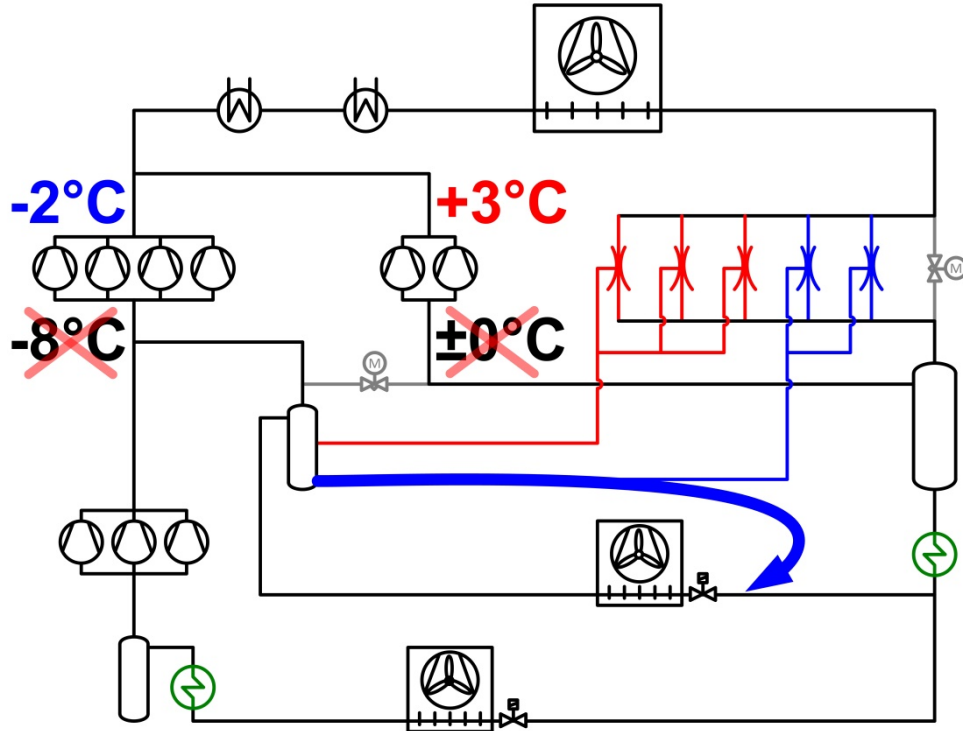


- Total sales area: 5'250 m²
- Total length of cabinets: 135 m
- Medium temperature cabinets without glass doors
- Walk-in-cooler/freezer: 9
- Medium temperature capacity: 2 x 100 kW
- Low temperature capacity: 2 x 30 kW
- 2 identical racks
 - Unique possibility for energy benchmarking
 - Supported by Swiss federals for energy research



Source: Genossenschaft Migros Luzern

Efficiency increase

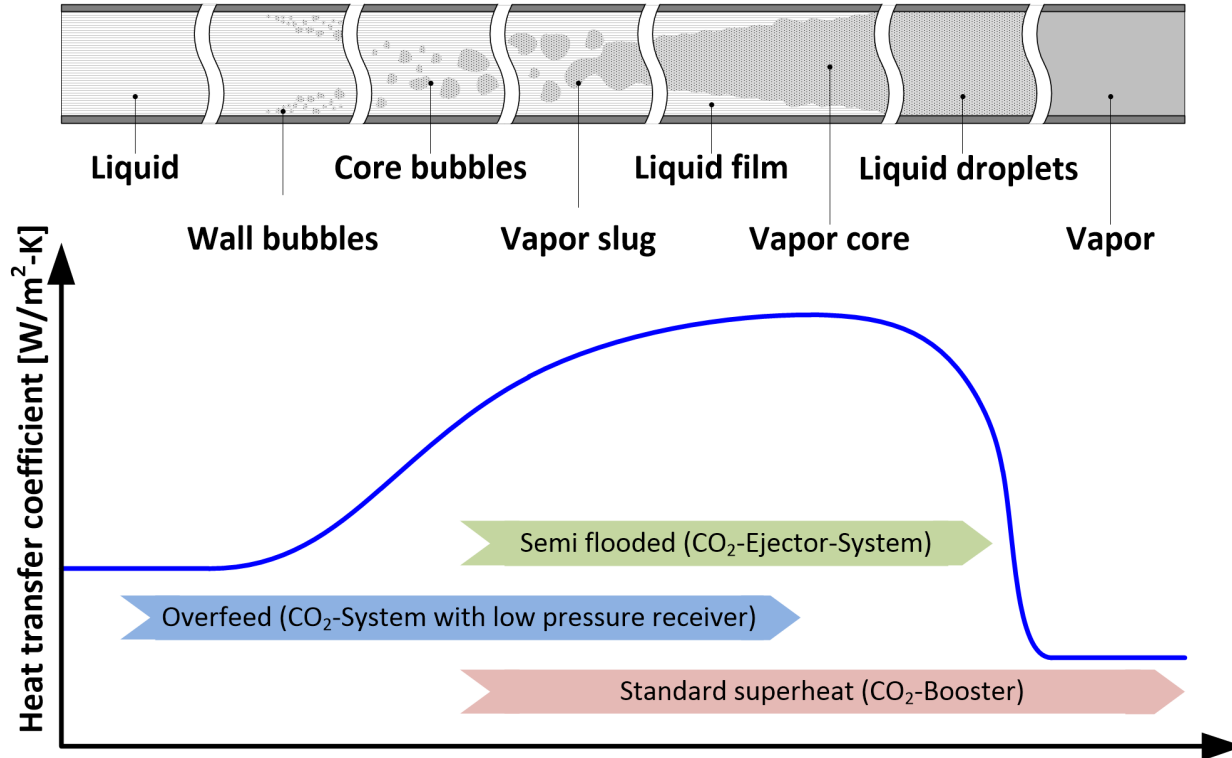


Benchmark power consumption:
rack with parallel compression

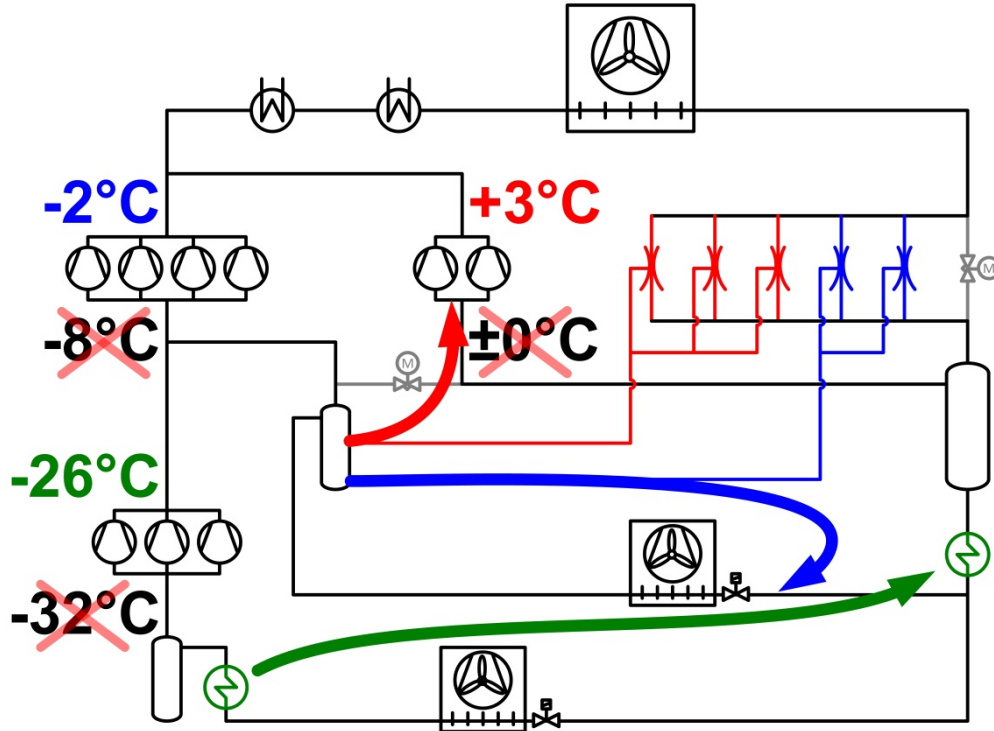
Liquid ejector

6-10%

Heat transfer coefficient of a tube



Efficiency increase



Benchmark power consumption:
rack with parallel compression

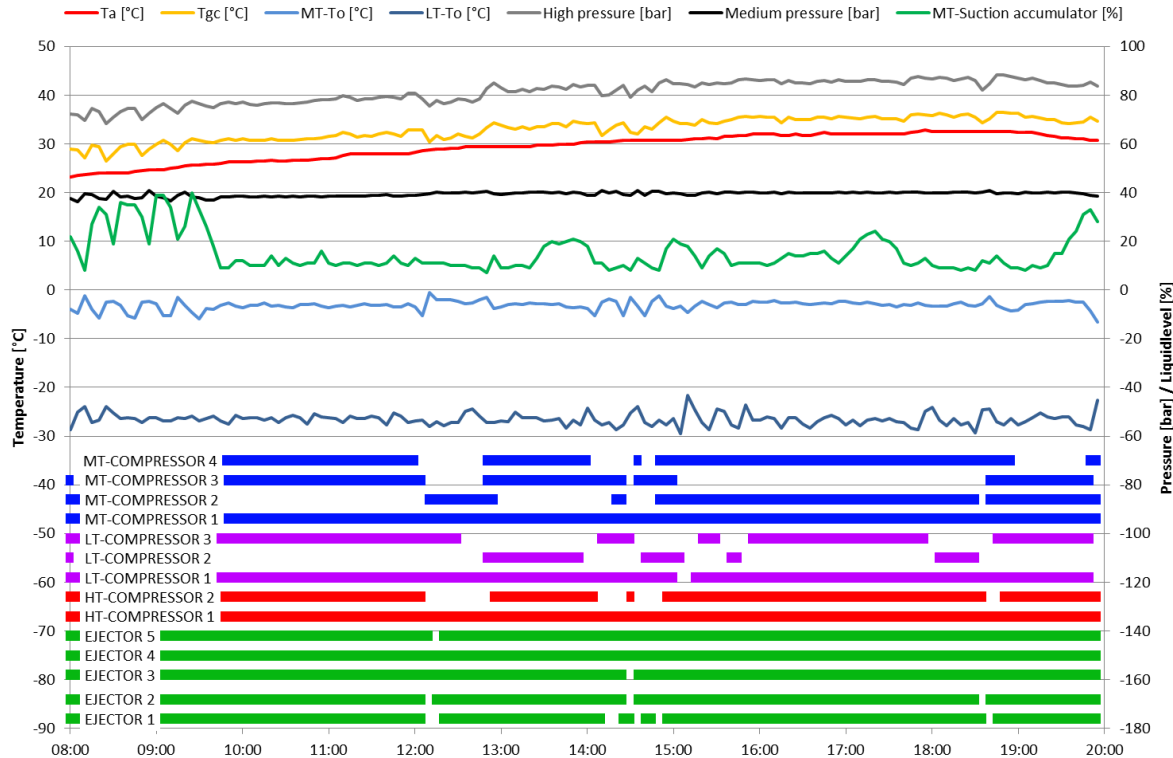
Liquid ejector 6-10%

Vapour ejector 5-8%

Heat exchanger 4-7%

Efficiency increase 15-25%

Measurement Data 2nd July 2015



Peak values
 $T_A: +32^{\circ}\text{C}$
 $p_H: 90 \text{ bar}_a$

Challenges with CO₂ ejectors



- Evaluate best suitable concept
- Design the system with focus on different operation modes:
 - Proper integration into building concept
 - Compressors / ejectors
 - Internal heat exchangers
 - Receiver volumes, Oil return
- Evaluate suitable control strategy
 - High & medium pressure control
 - Ejector prioritization for maximum efficiency increase
 - Control evaporation temperatures

Ejectors summary



- Different ejector geometries/designs
 - Liquid, gas, controllable
- Different possibility to implement ejectors
 - Dependent/independent of ejector operation
 - Job site specific evaluation



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natural refrigerants

19 & 20 April, 2016 – Barcelona

