



solutions for europe

natural refrigerants

16-17 March 2015 in Brussels



ATMOsphere Europe 2015

CO₂-Refrigeration system for tropical regions

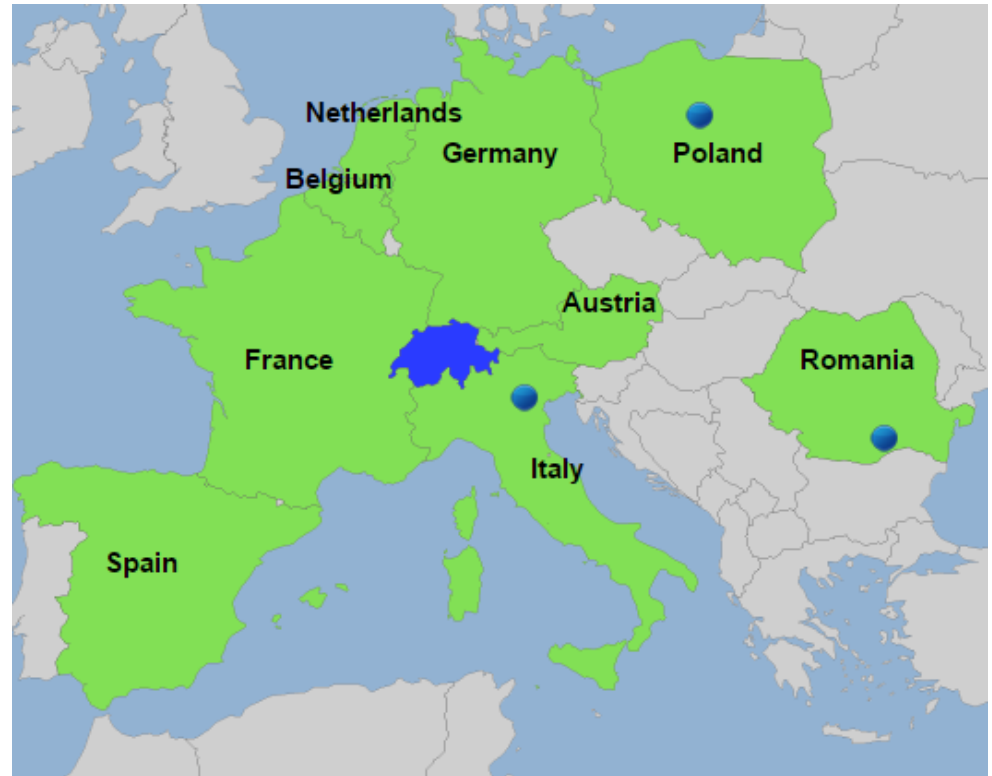
17.03.2015

Erik Wiedenmann

Who we are...

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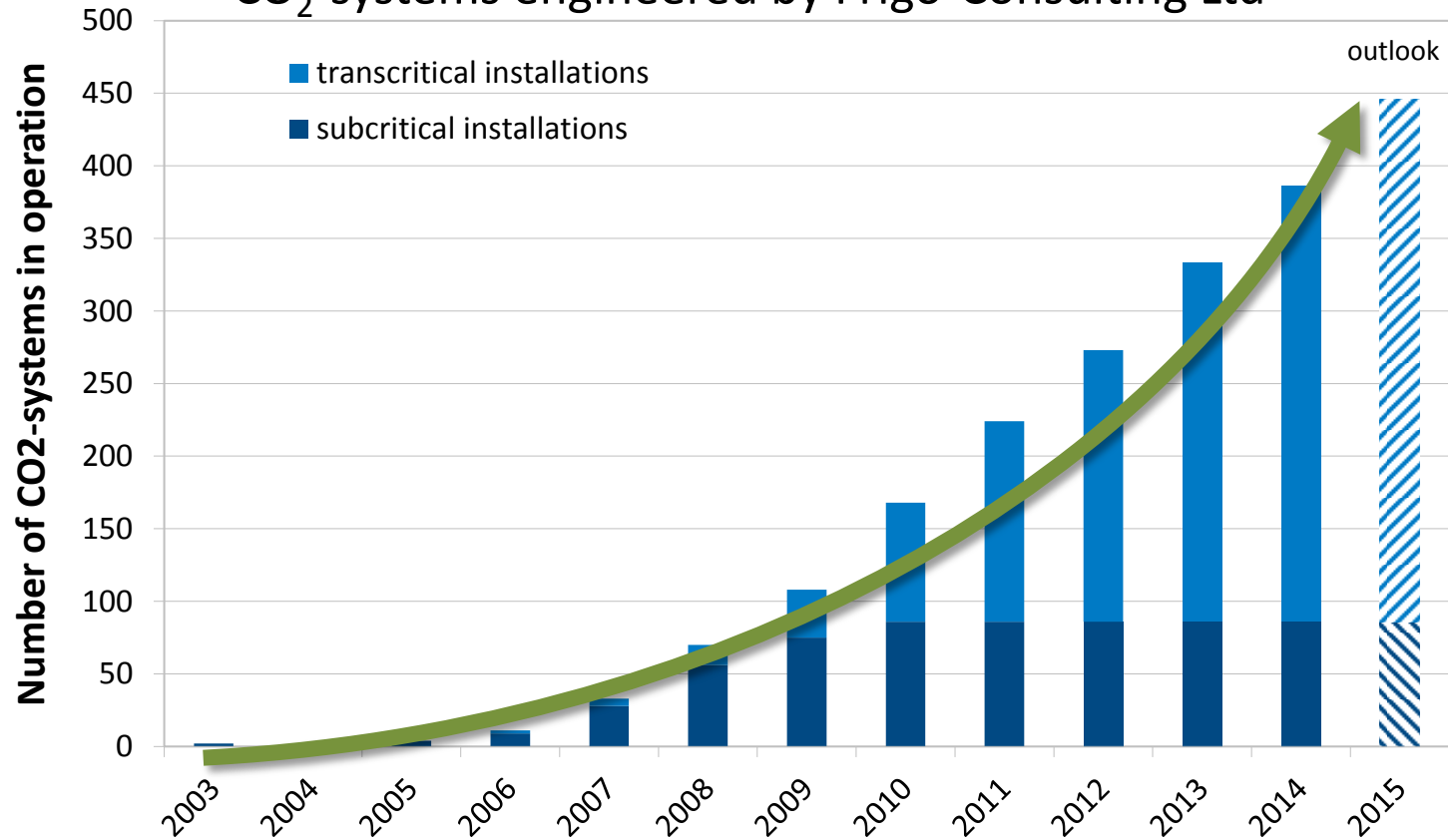
- ❑ In business since 1988
- ❑ 32 employees
- ❑ 6 locations across Europe
- ❑ Internationally connected



CO₂ commercial references



CO₂-systems engineered by Frigo-Consulting Ltd



Job site Migros Ibach, Switzerland

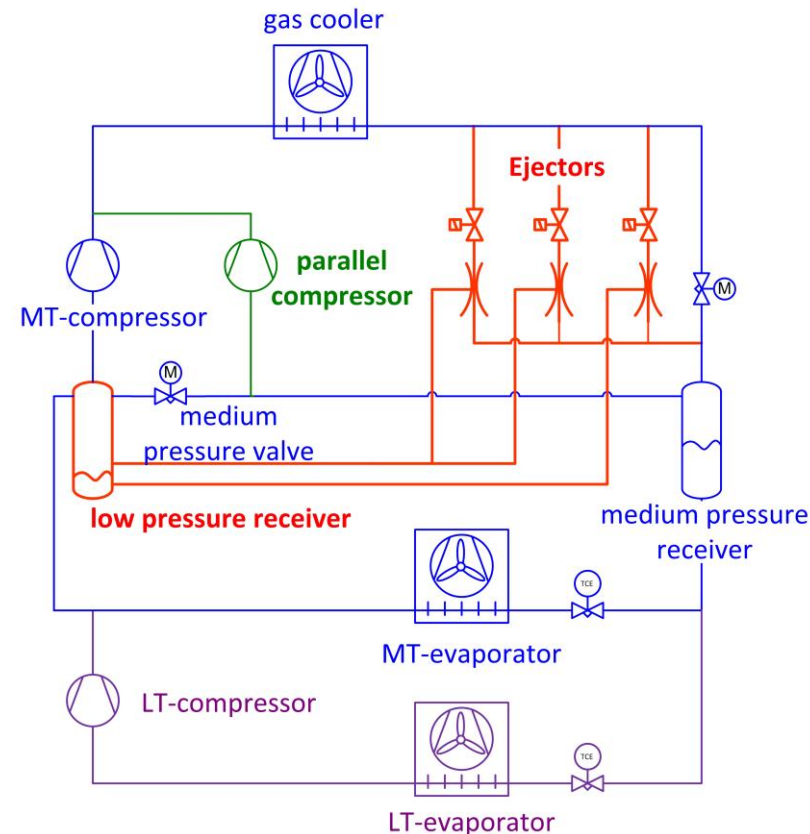
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- ❑ Supermarket: Migros Ibach, Switzerland
- ❑ Sales area: 5300 m²
- ❑ Total length of cabinets: 130 m
- ❑ Medium temperature cabinets without glass doors
- ❑ Cabinets with LED-lighting
- ❑ Walk-in-cooler/freezer: 9 pcs
- ❑ Medium temperature capacity: 190 kW
- ❑ Low temperature capacity: 60 kW
- ❑ Number of Booster-Racks: 2

First transcritical CO₂-booster with EJECTOR in 2013 in Migros Bulle, Switzerland

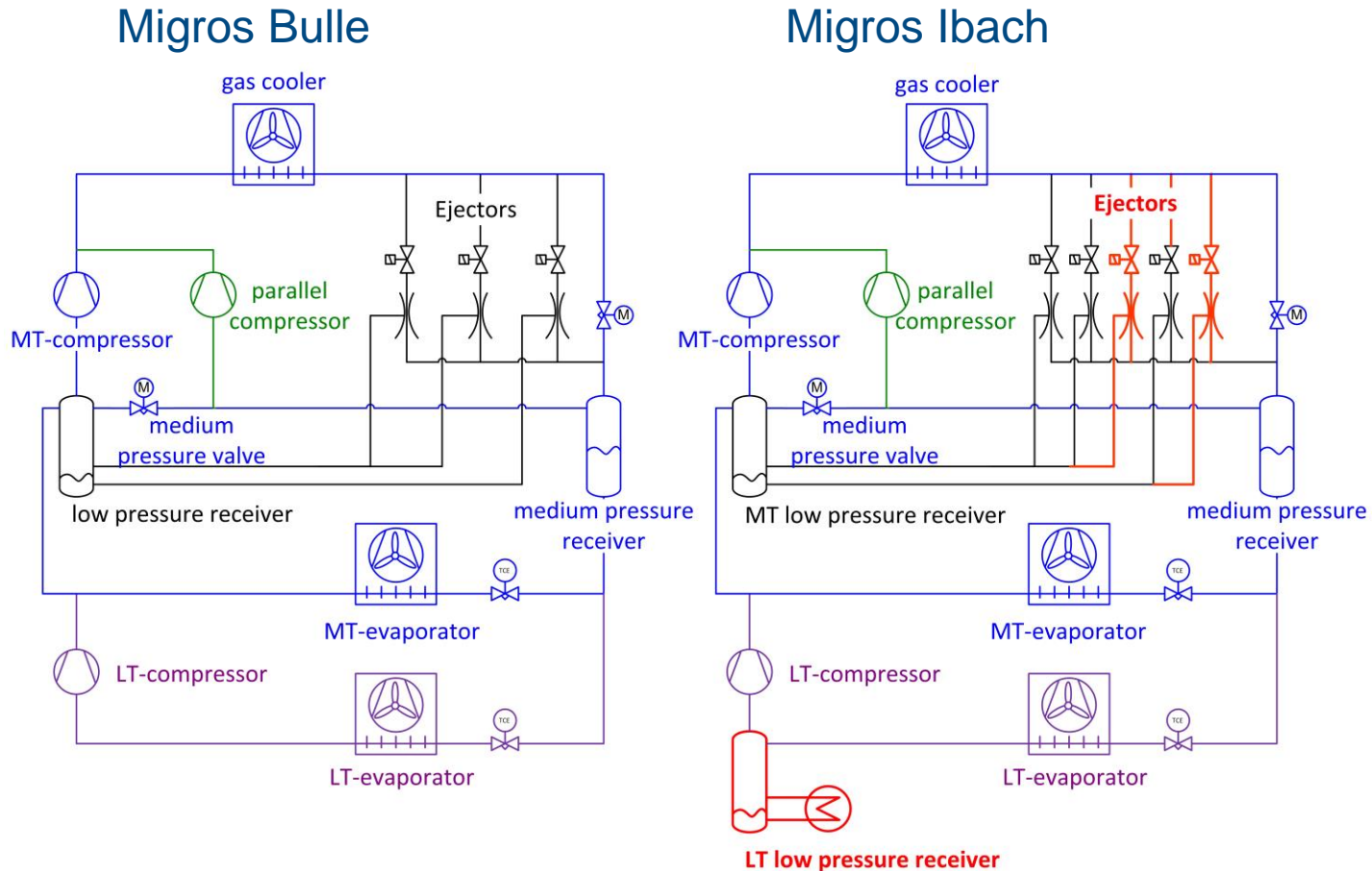
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- Liquid in suction line acceptable
- Reduced superheat at cabinet: 0 K
- Flooded evaporators
- High heat exchange efficiency
- Increased evaporation temperature by 6 K in MT ($T_0 = -2\text{ °C}$)
- Increased medium pressure by 5 bar ($p = 40\text{ bar}$)



Source: ATMO Europe 2013, Jonas Schönenberger: <http://www.atmo.org/media.presentation.php?id=306>

Enhanced transcritical CO₂-booster with EJECTOR in Migros Ibach



Enhanced transcritical CO₂-booster with EJECTOR in Migros Ibach

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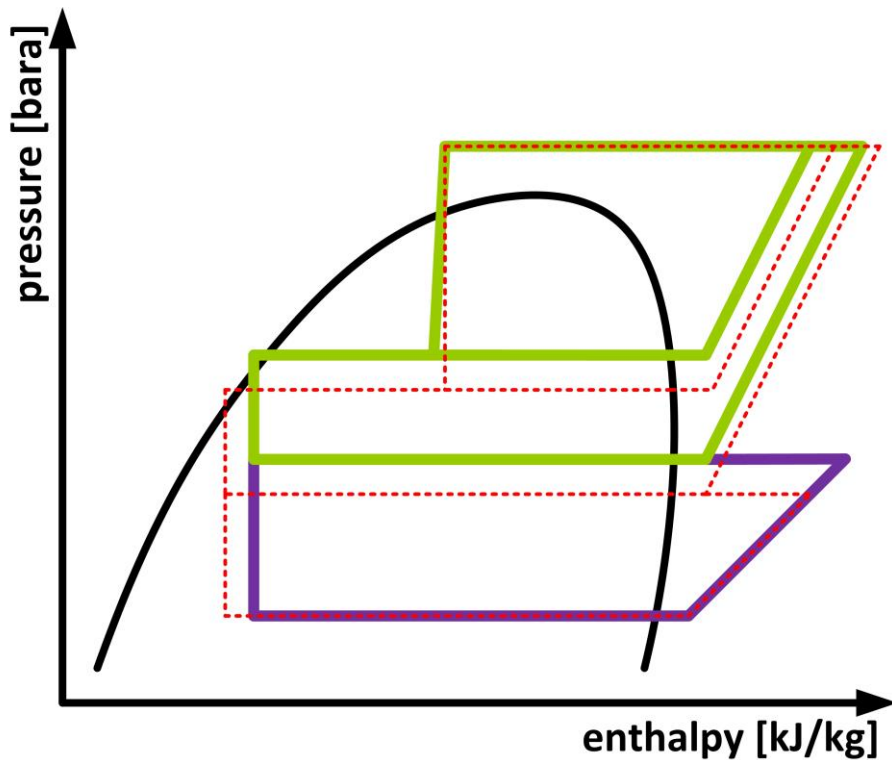
- ❑ Liquid in suction line MT and LT acceptable
- ❑ Reduce superheat at cabinet: 0 K
- ❑ Flooded evaporators in MT and LT
- ❑ Increased evaporation temperature by 6 K in MT ($T_0 = -2 \text{ °C}$)
- ❑ Increased evaporation temperature by 8 K in LT ($T_0 = -26 \text{ °C}$)
- ❑ Increased medium pressure by 5 bar ($p = 40 \text{ bar}$)



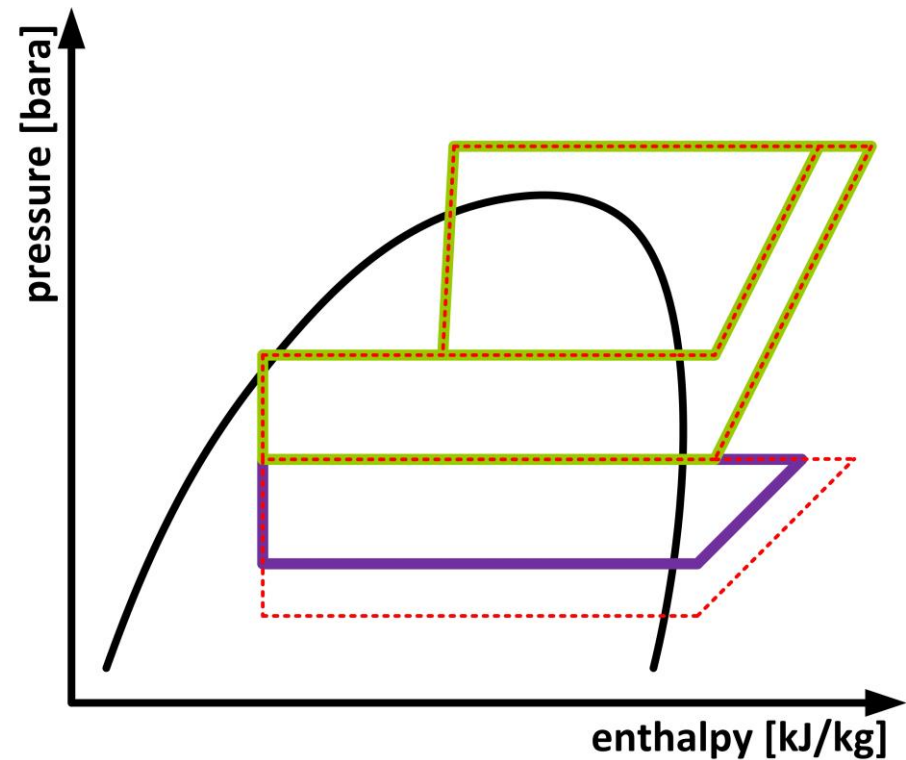
Process in pressure enthalpy diagram

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CO₂-Ejector System „Bulle“



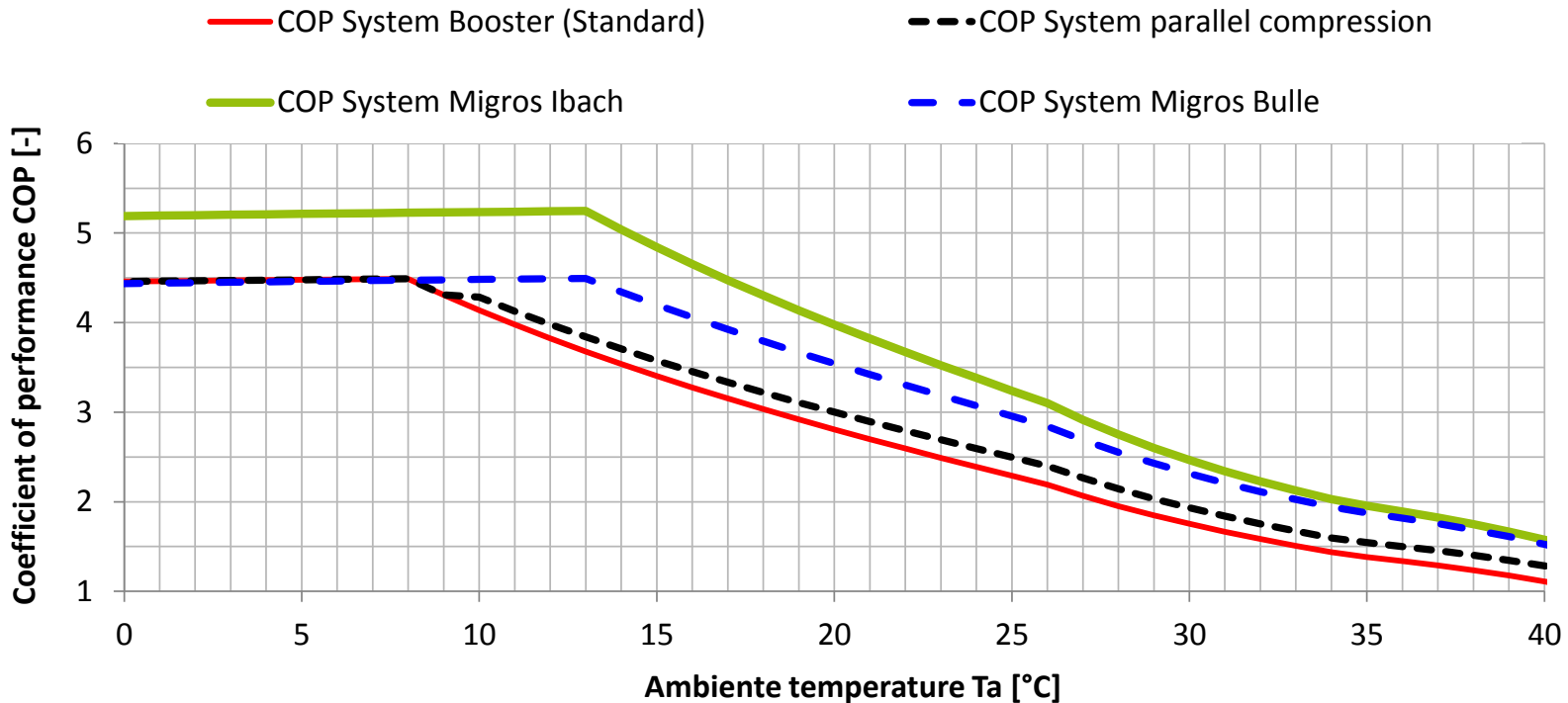
CO₂-Ejector System „Ibach“



Efficiency increase

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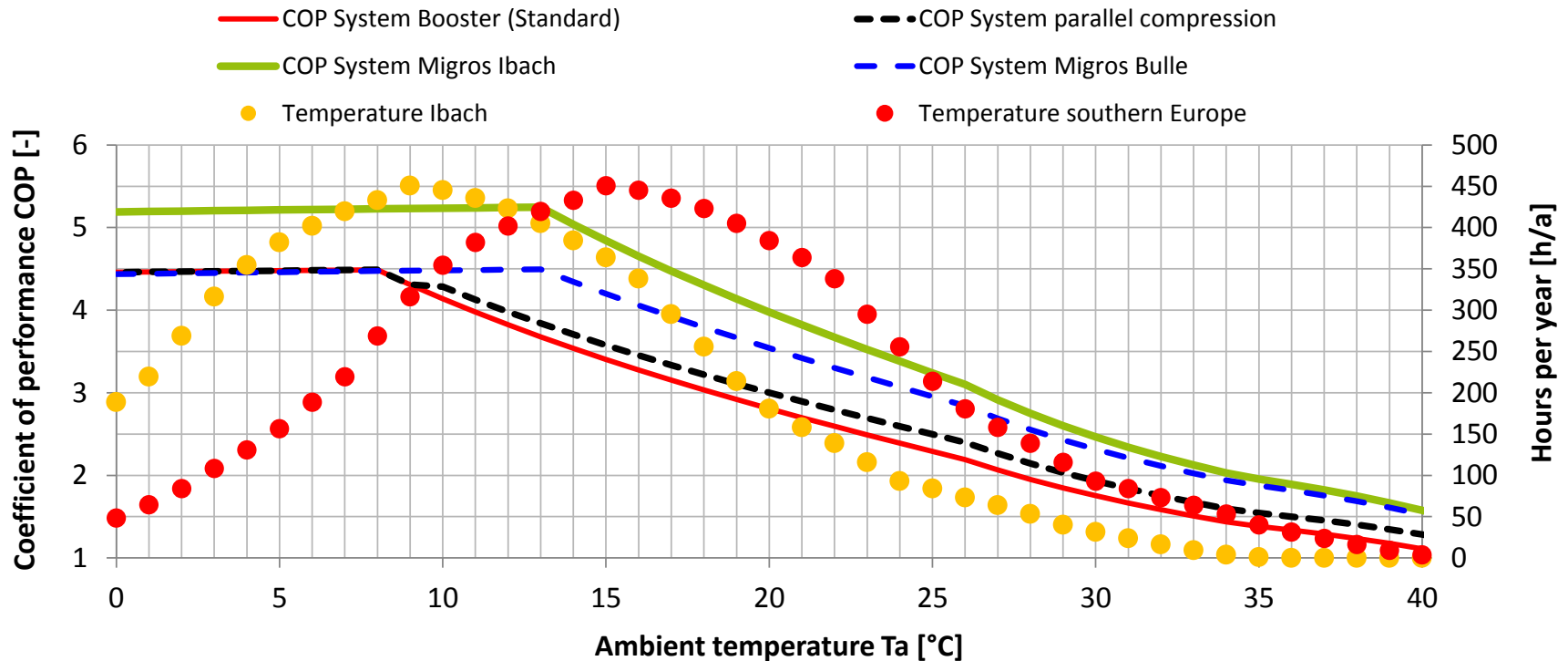
- Increased evaporation temperature in Low- and Medium-Temperature
- Shift mass flow to parallel compressor



Efficiency increase

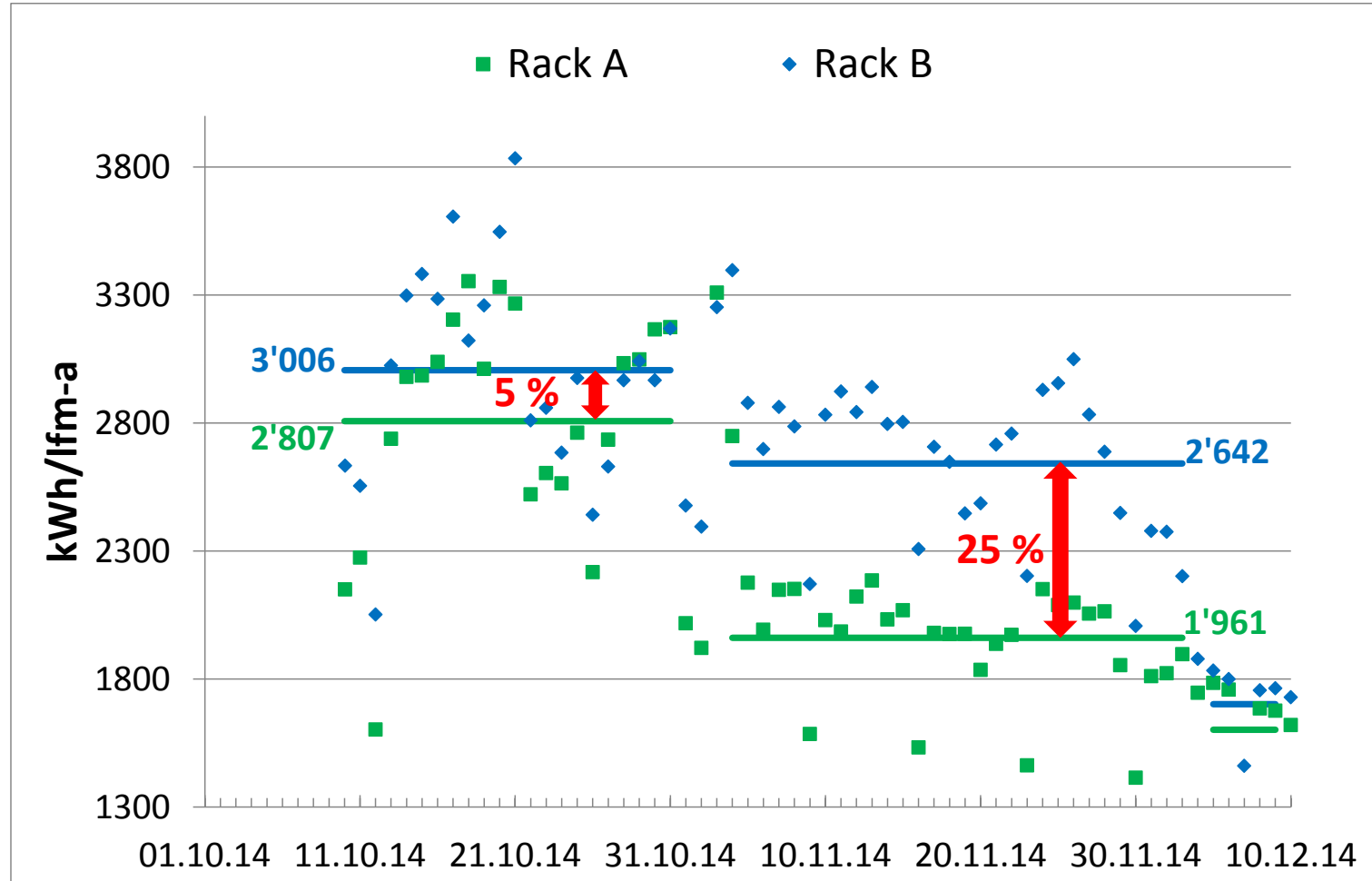
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- **>20%** less energy consumption in **Central Europe**
- **>25%** less energy consumption in **Southern Europe**



Comparison of energy consumption

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Summary

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- ❑ Installation at Migros Bulle in operation since summer 2013
- ❑ Installation at Migros Ibach in operation since November 2014
- ❑ Implementation based on standard components
- ❑ 6 K higher evaporation temperature in MT without glass doors ($T_0 = -2^\circ\text{C}$)
- ❑ 8 K higher evaporation temperature in LT ($T_0 = -26^\circ\text{C}$)
- ❑ Increased operation of parallel compressor
- ❑ Efficiency increase of more than 20% in Central Europe
- ❑ Efficiency increase of more than 25% in Southern Europe

MIGROS



ALPIQ



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Confédération suisse
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Bundesamt für Energie BFE
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