

Latest developments for small footprint CO₂
application:

CAREL CO₂



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CAREL Japan Co., Ltd.

CAREL CO₂ in OUR booth



CAREL BOOTH
RECEIVED A LOT
OF VISITORS
DURING
CHILLVENTA AND
CO₂ APPLICATION
PANEL WAS PART
OF THIS SUCCESS



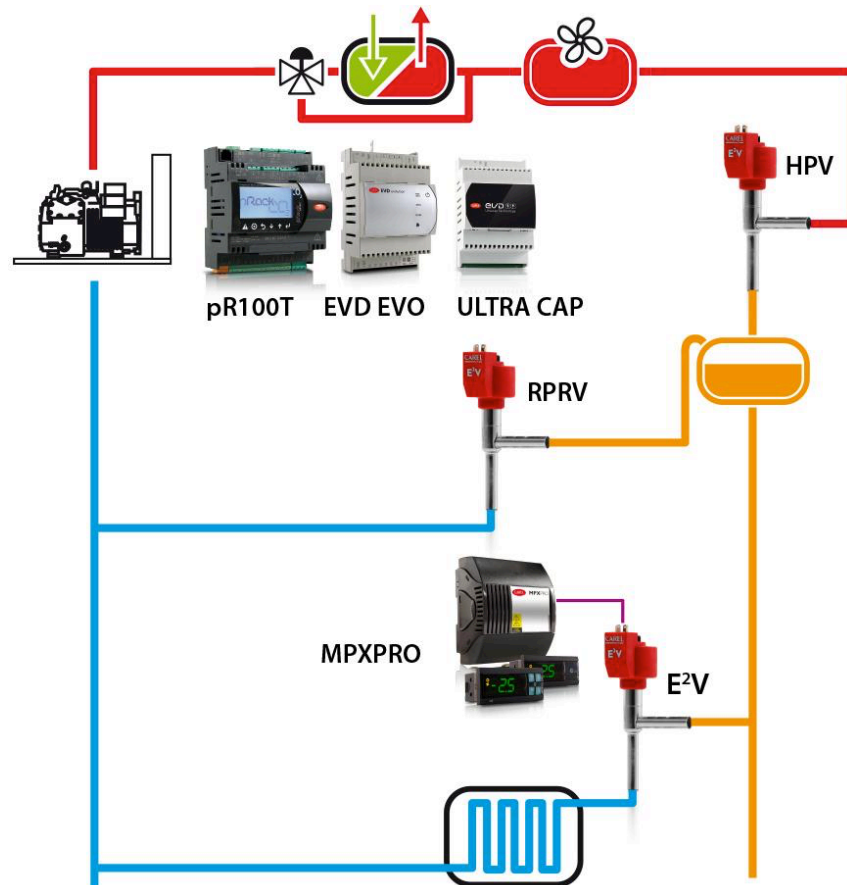
CAREL CO₂ in other booths



WHAT ABOUT
OTHER BOOTHS?
CO₂ WAS PRESENT
IN ALL ITS POSSIBLE
APPLICATIONS



CO₂ Condensing Unit



MOST OF THE OEM EXPOSING CAREL CONTROLLERS WERE BUILDING SMALL UNITS WITH ONE COMPRESSOR AND ONE OR TWO FANS AND CO₂ CAREL VALVES



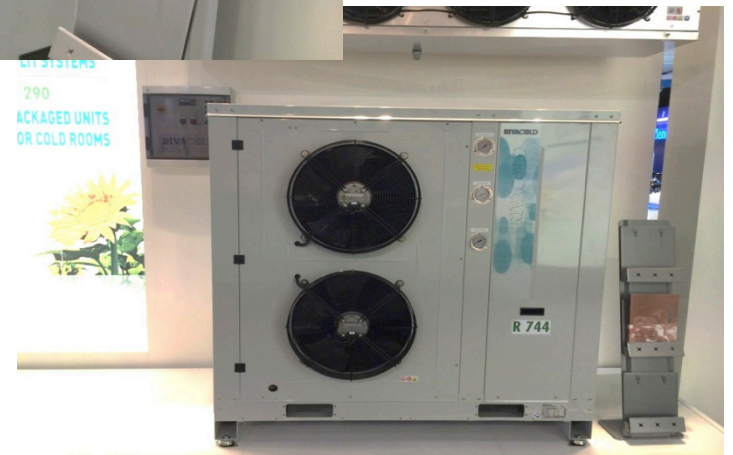
Advansor CO₂ CDU



Rivacold CO₂ CDU



Beijer Ref DE CO₂ CDU

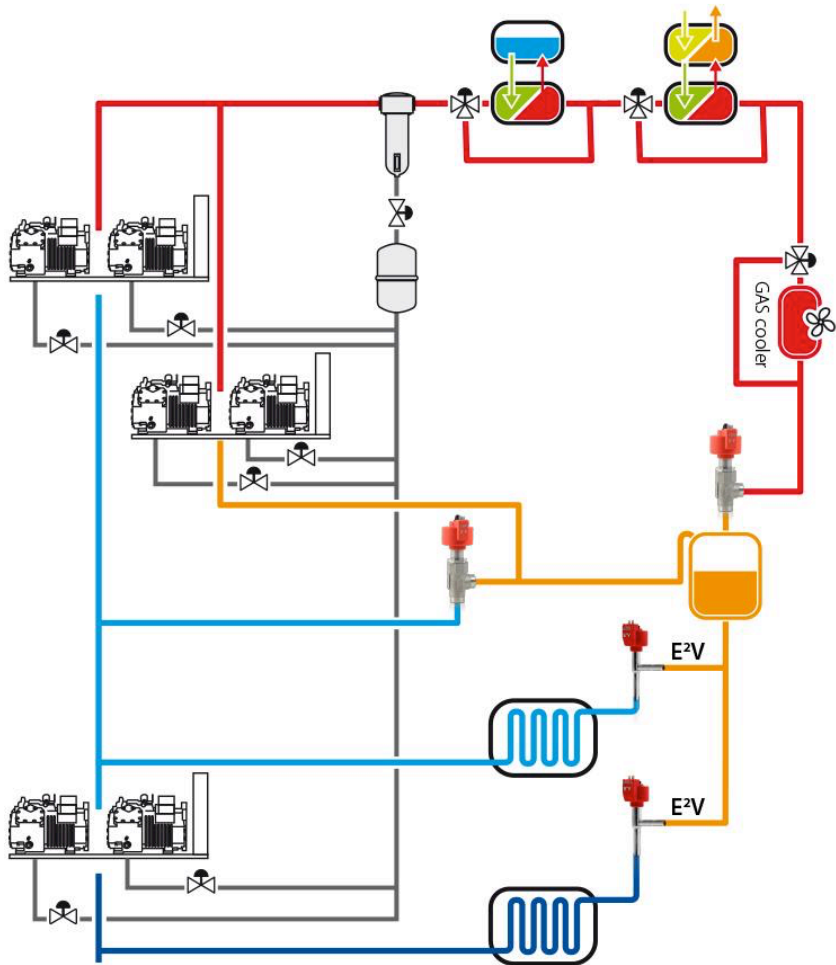


Area Cooling CO₂ CDU

Bicold CO₂ CDU



CO₂ Transcritical Booster



PRACK PR300T HAS BEEN DESIGNED TO MANAGE THIS SPECIFIC APPLICATION AND IT WAS SHOWN TOGETHER WITH OUR MAGNET



Sinop CO₂ Booster



SCM CO₂ Booster



Refra CO₂ Booster



Bicold CO₂ Booster



SWC and Carel Japan are together learning from European experiences and trying to import such kind of control technology in Japan. Being Japanese market very focused on convenience stores or supermarket format, the most applicable solution is middle to small footprint CO2 transcritical compressor rack.



Test unit at SWC's R&D Center



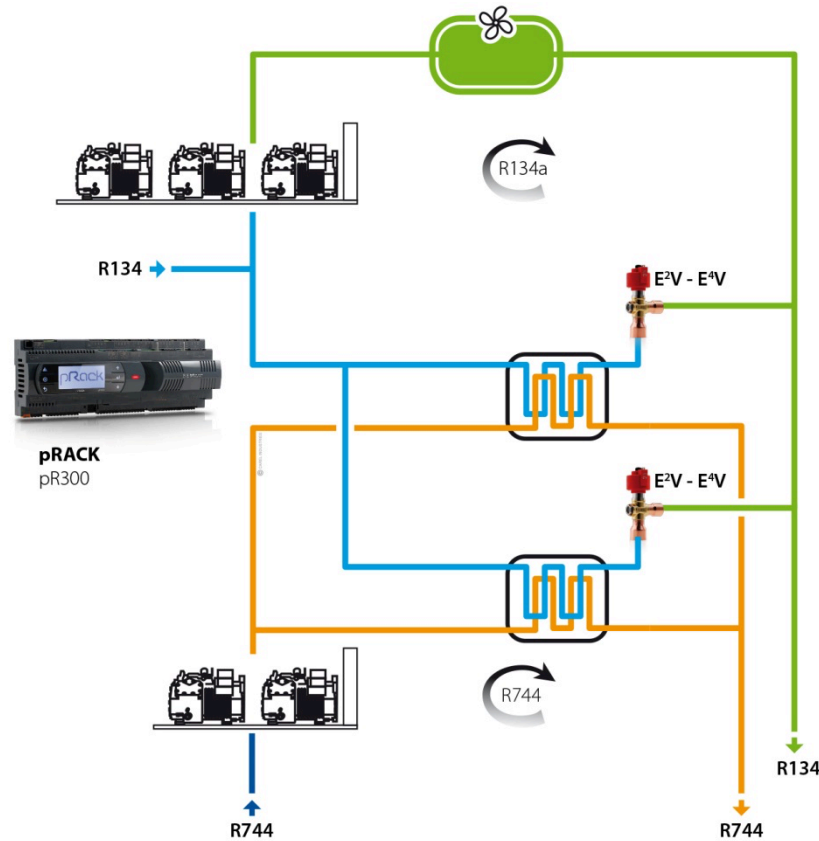
SWC provided its CO2 TC-Booster UNIT to a Japanese customer for test and development.



SWC's New development: All-in-one Air-cooled Transcritical Booster unit (To be exhibited at Supermarket Trade Show 2015)



CO₂ Transcritical, Subcritical&more



THE LAST PART OF THIS PICS' PRESENTATION WILL SHOW SOME SPECIFIC MACHINES WHERE PRACK WAS USED IN A "DIFFERENT" WAY.



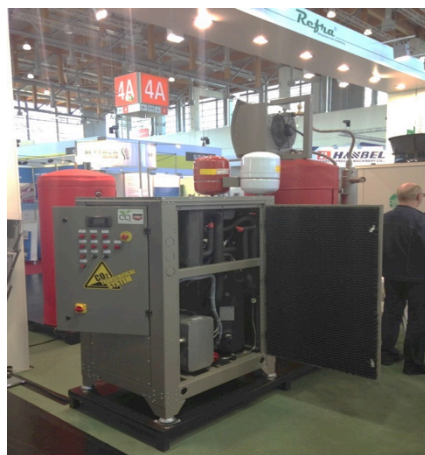
Bicold CO₂ Cascade



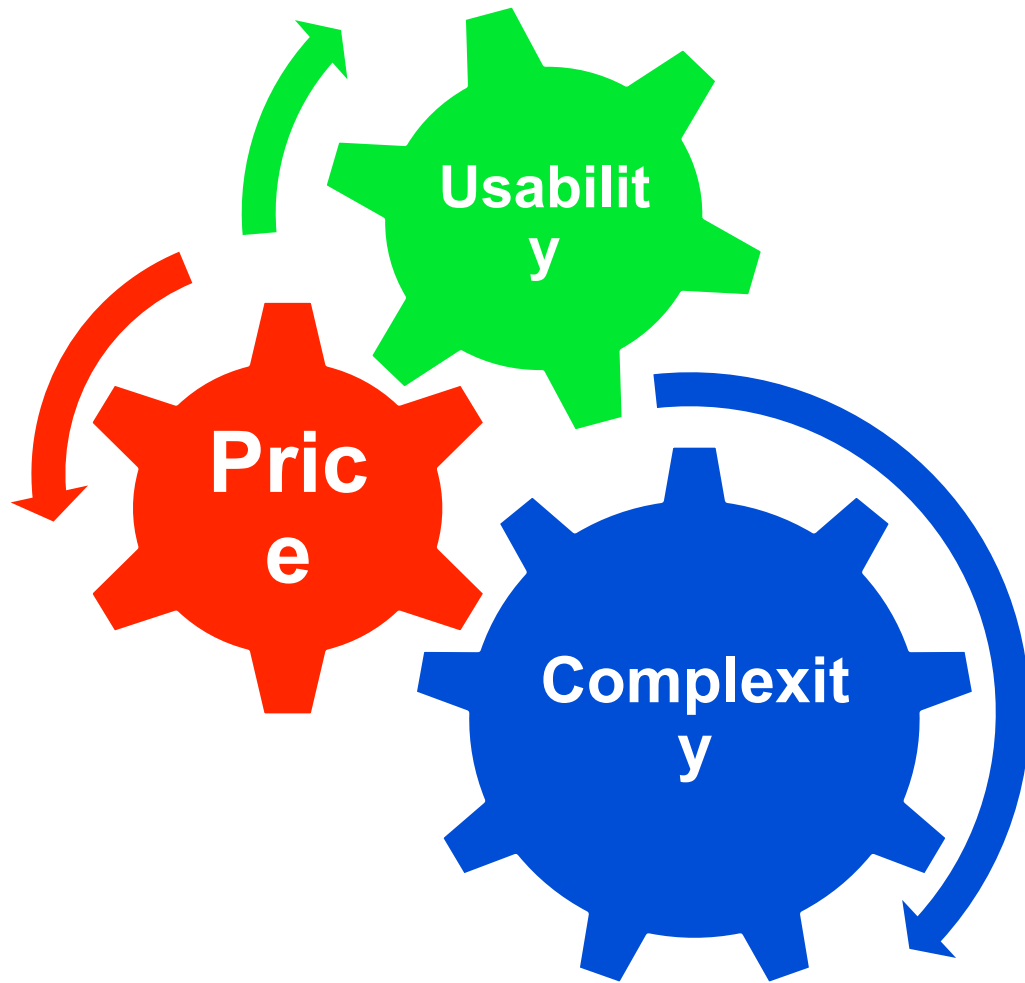
Rivacold 4Y CO₂ Cascade



Refra CO₂ Chiller



Barriers in the small installations



Whenever compared with the conventional systems the use of CO₂ as primary refrigerant faces some barriers to be widely adopted in the small installations, mainly for:

- Extra investment cost
- Usability for installers
- System complexity

Field experience

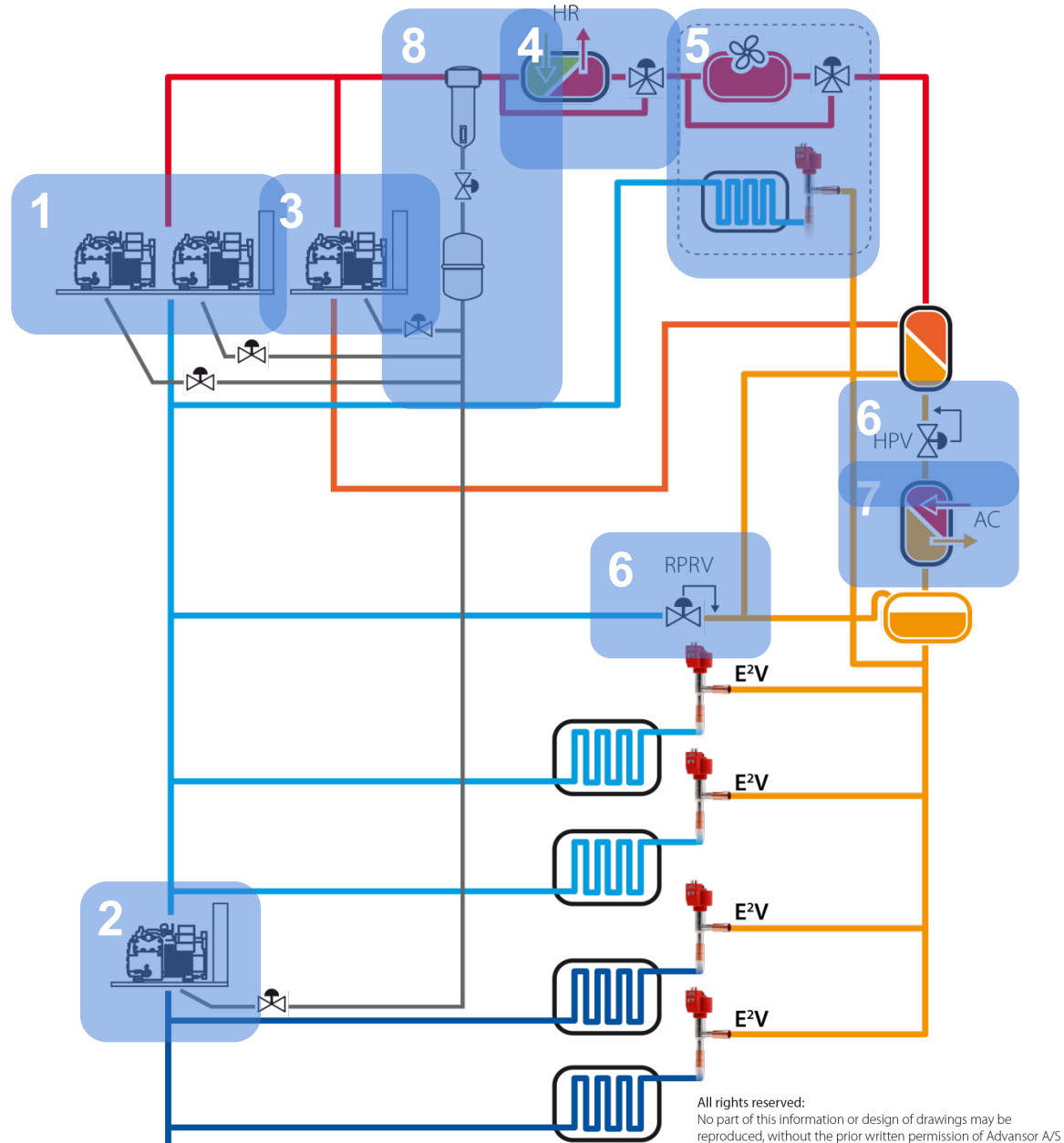
Integrated compressor rack for medium-sized supermarket in southern Germany
Refrigeration, air conditioning & heat recovery loads

2 - MT : 60 kW
1 - LT : 8 kW
1 - Par : 12 m³/h
1 - H/R : 75 kW
1 - AC : 30 kW



Field experience

1. MT Compressors
2. LT Compressor
3. Parallel Compressor
4. Heat recovery heat ex.
5. Gas Cooler & “false load”
6. Transcritical & flash gas valves
7. Air conditioning heat ex.
8. Oil return



Integration



Complete control of the entire unit on one single device

- Lower installation costs/ space
- Faster commissioning
- Increased usability (one point of access)
- Improved efficiency

Integration

How to divide total energy consumption between REF – AC – HR?

One unit providing REF+AC+HR

Compressor power consumption [kW]

- P_{MT} : Medium temperature compressors
- P_{LT} : Low temperature compressors
- P_{PC} : Parallel compressors
- P_{GC} : Gas cooler

Heat transfer

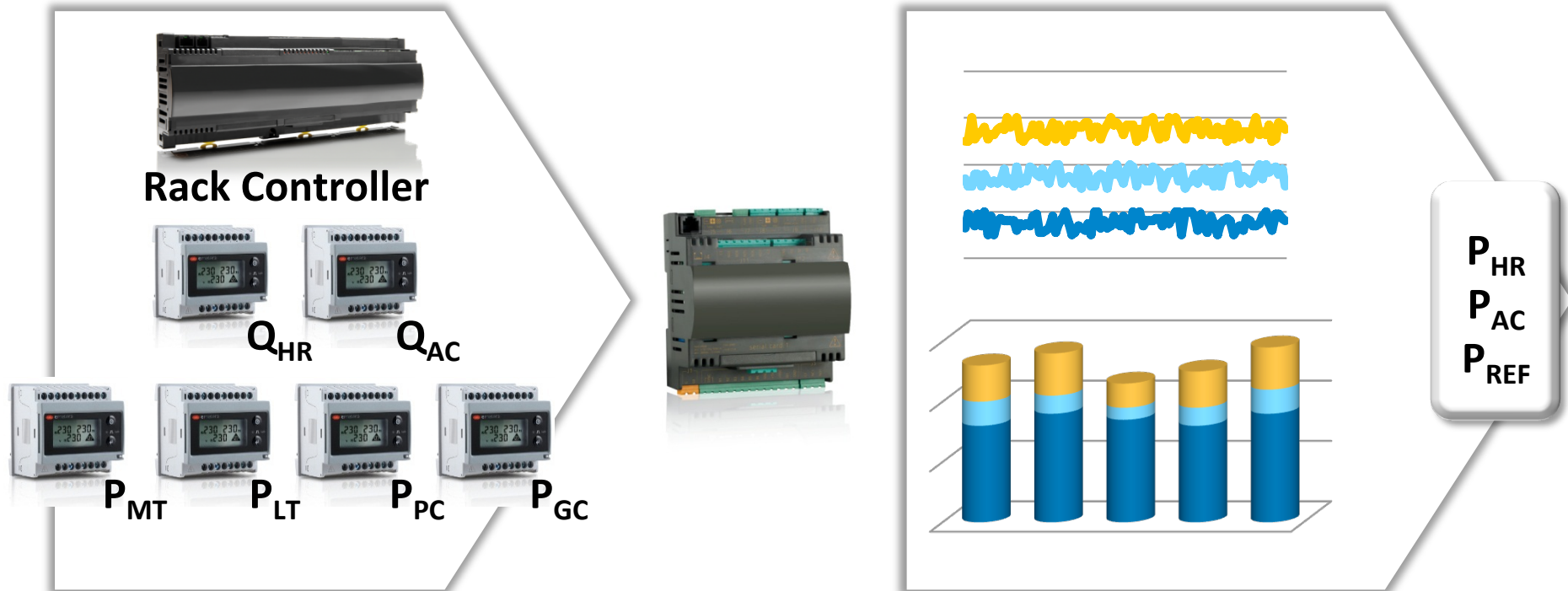
- Q_{AC} : Air conditioning heat
- Q_{HR} : Heat recovery heat



Integration

How to divide total energy consumption between REF – AC – HR?

Site status reading: main variables, energy consumption, heat transfer
Real time COP calculation, division of power consumption



Integration

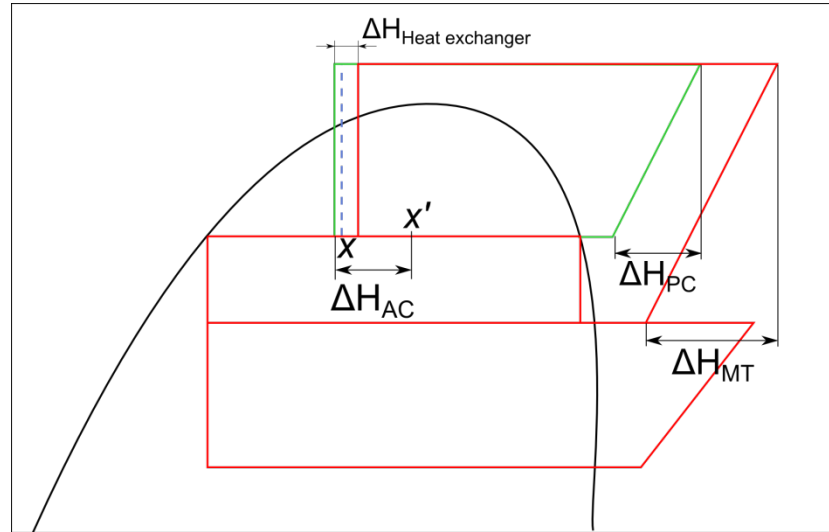
Temperatures
Pressures
Comps data

Enthalpies
Qualities

COP_{HR}
 COP_{AC}
 COP_{REF}

P_{HR} P_{AC}
 P_{REF}

Air conditioning mode

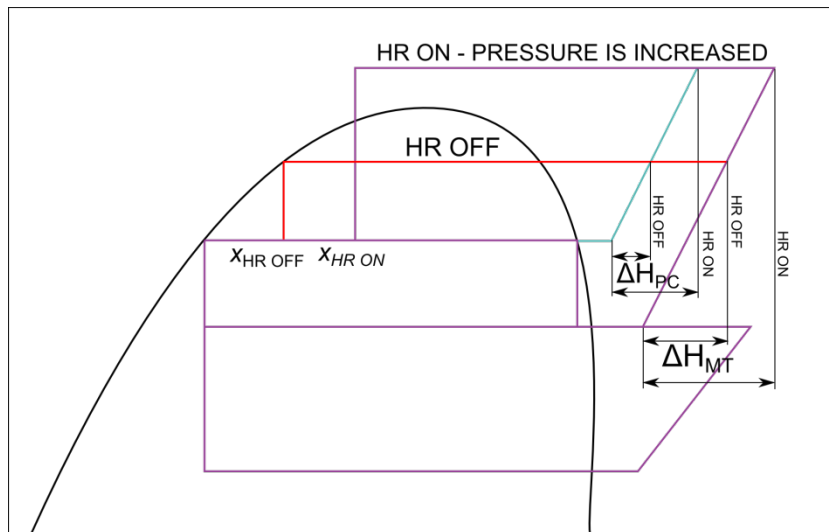


Higher quality of vapour

Mass refrigerant flow m

$\downarrow AC$

Heat Reclaim mode



Higher gas cooler pressure

Higher quality of vapour

$COP \downarrow HR ON /$

$COP \downarrow HR OFF$

$[T] = P \downarrow HR ON /$

$P \downarrow HR OFF$



Control technology suitable for Warm Climates

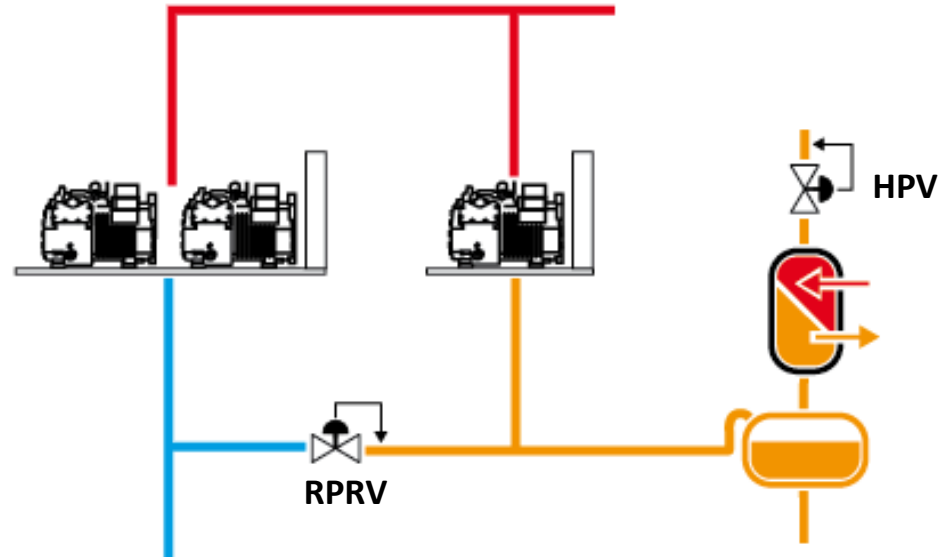
PARALLEL COMPRESSOR

Receiver pressure control
Activated with sufficient flash gas
Flash gas valve synchronisation

Higher efficiency

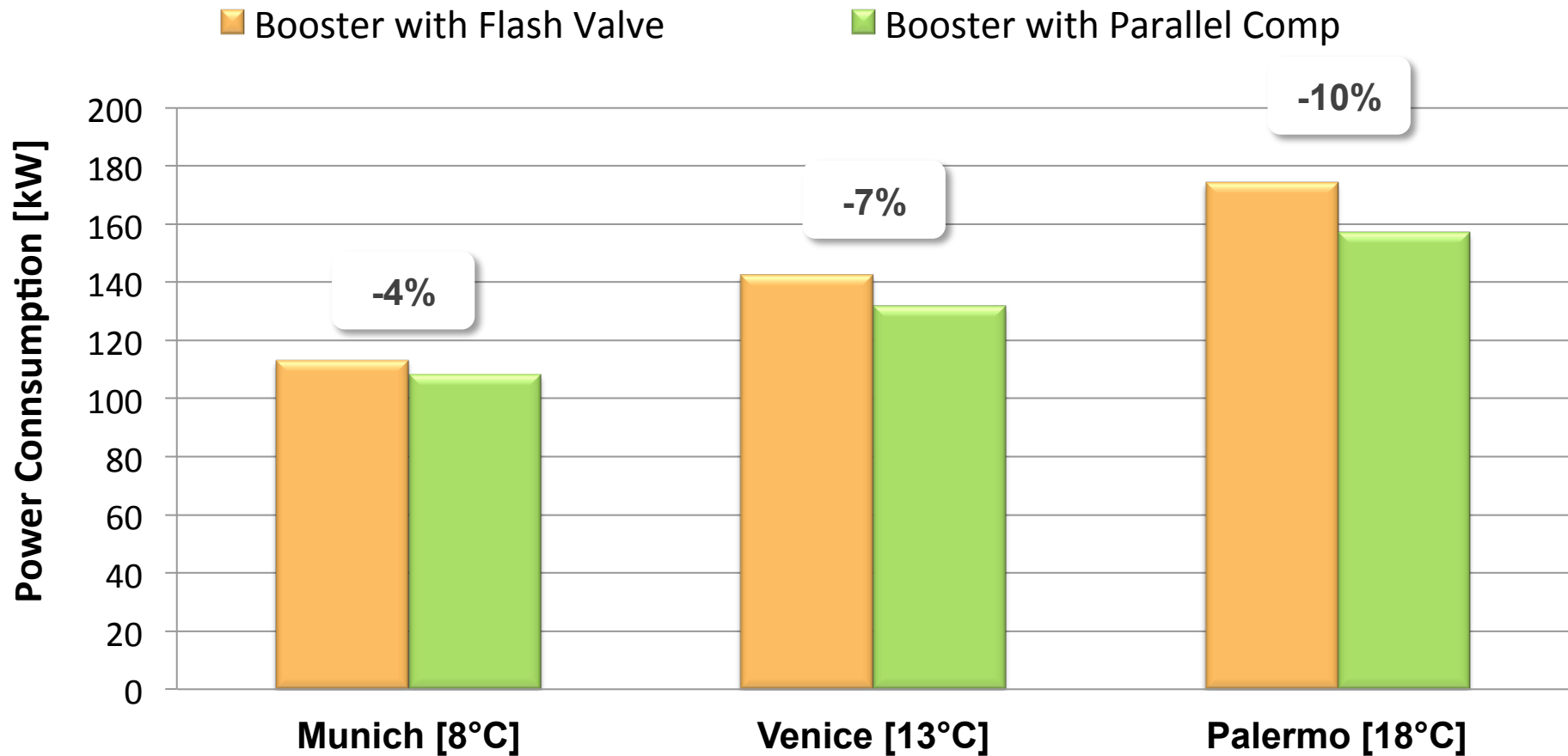
- High gas cooler pressure
- AC load
- Heat recovery

Higher efficiency at higher outside temperature



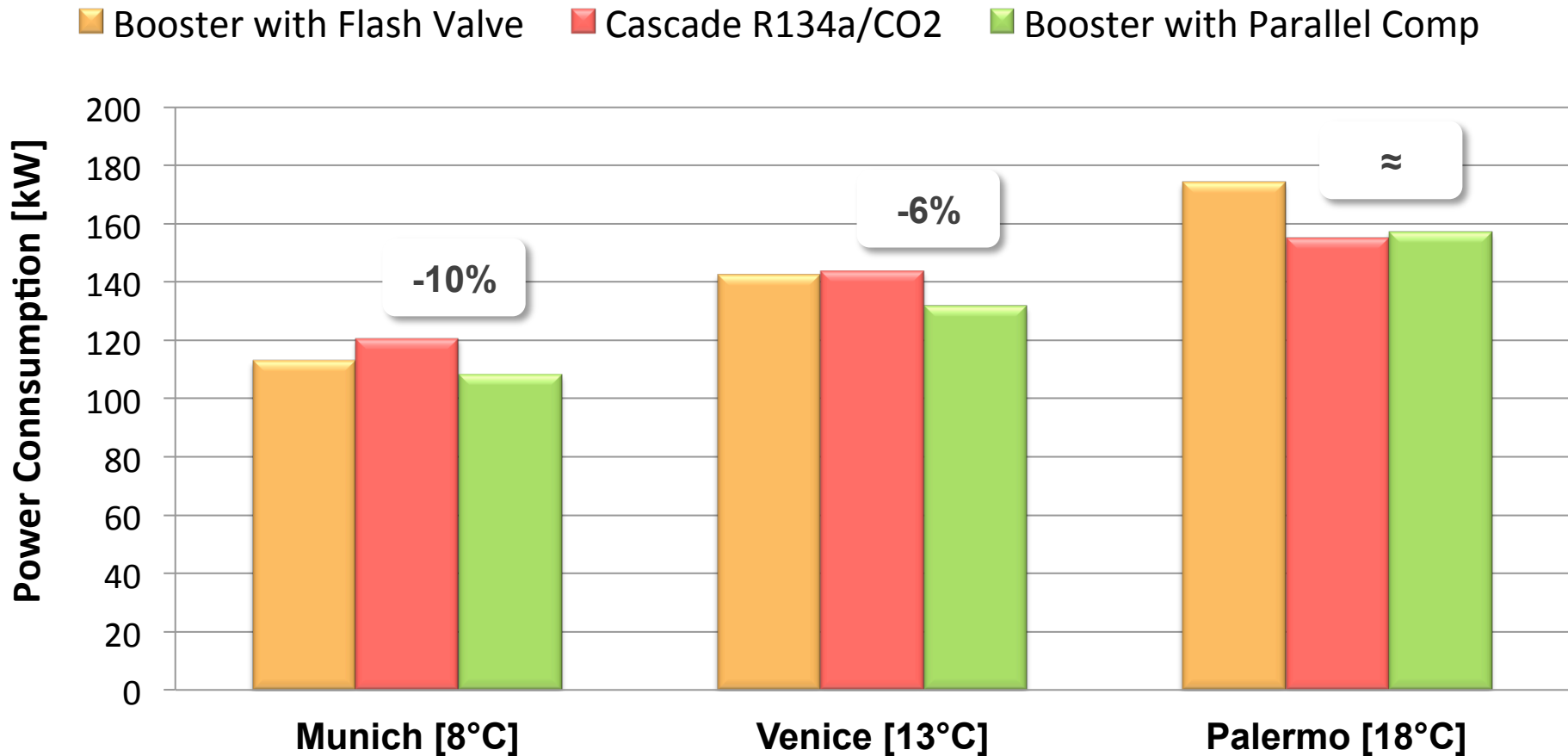
Control technology suitable for Warm Climates

Energy consumption comparison



Control technology suitable for Warm Climates

Energy consumption comparison



High
Efficiency
Solutions.

CAREL
