

GREEN[®]
& COOL

Green Refrigeration Systems



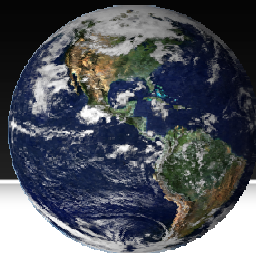
Green & Cool

Micael Antonsson



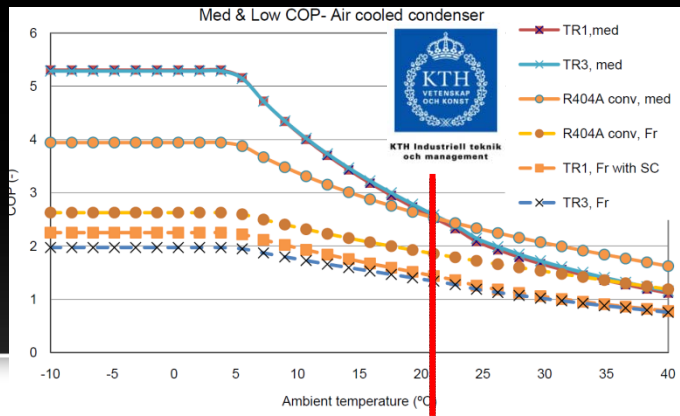
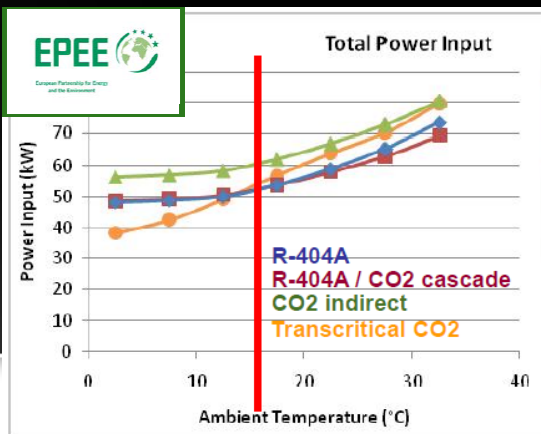


Carbon dioxide, CO₂, is now established as a refrigerant in store applications.





With efficiencies better or equivalent to R404A.
 Results reported by EPEE, Royal Institute of Technology Stockholm and many more ...



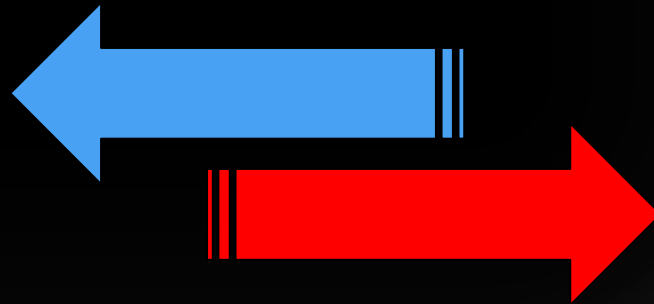


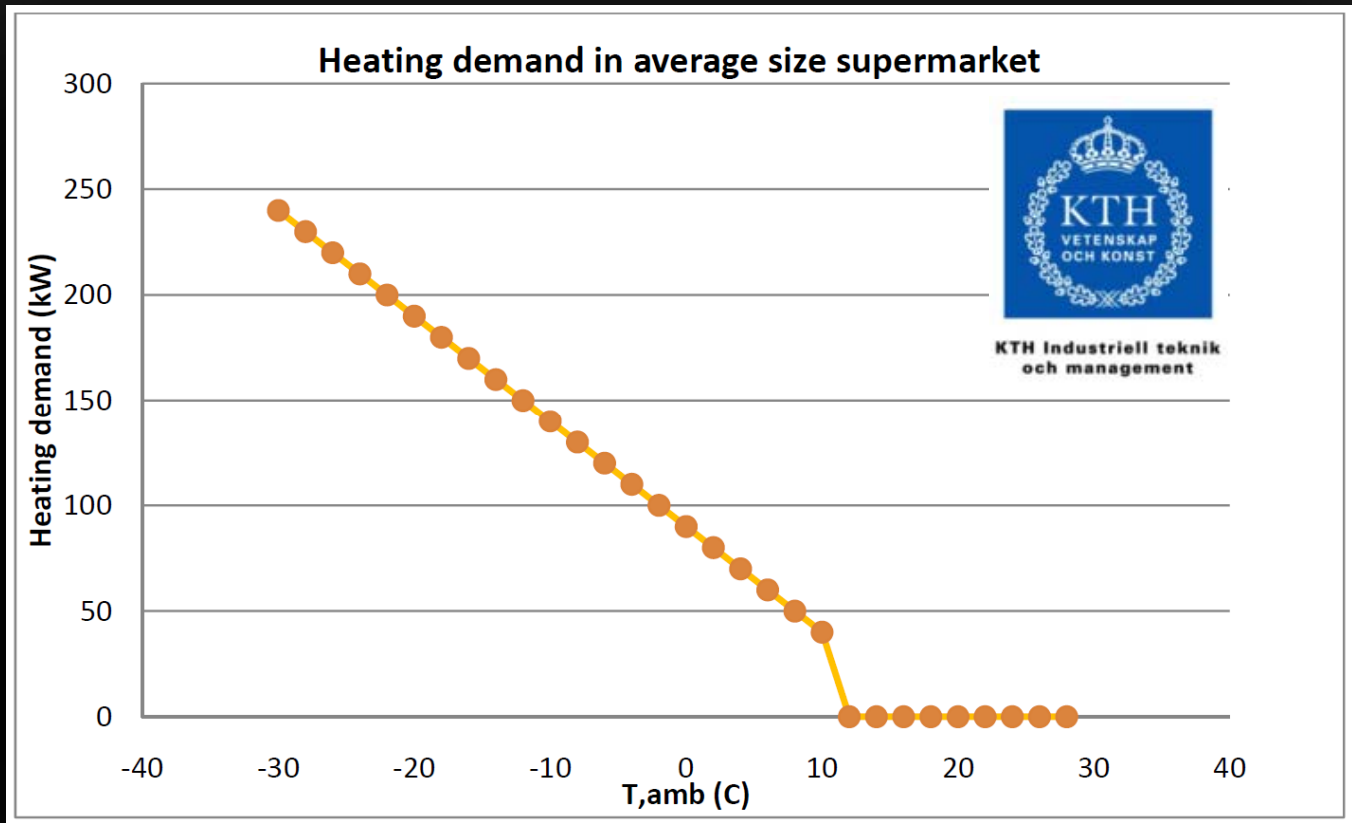
Beyond this, environmental benefits and unique features for heat recovery will make this refrigerant even more attractive.



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Heat reclaim Solution



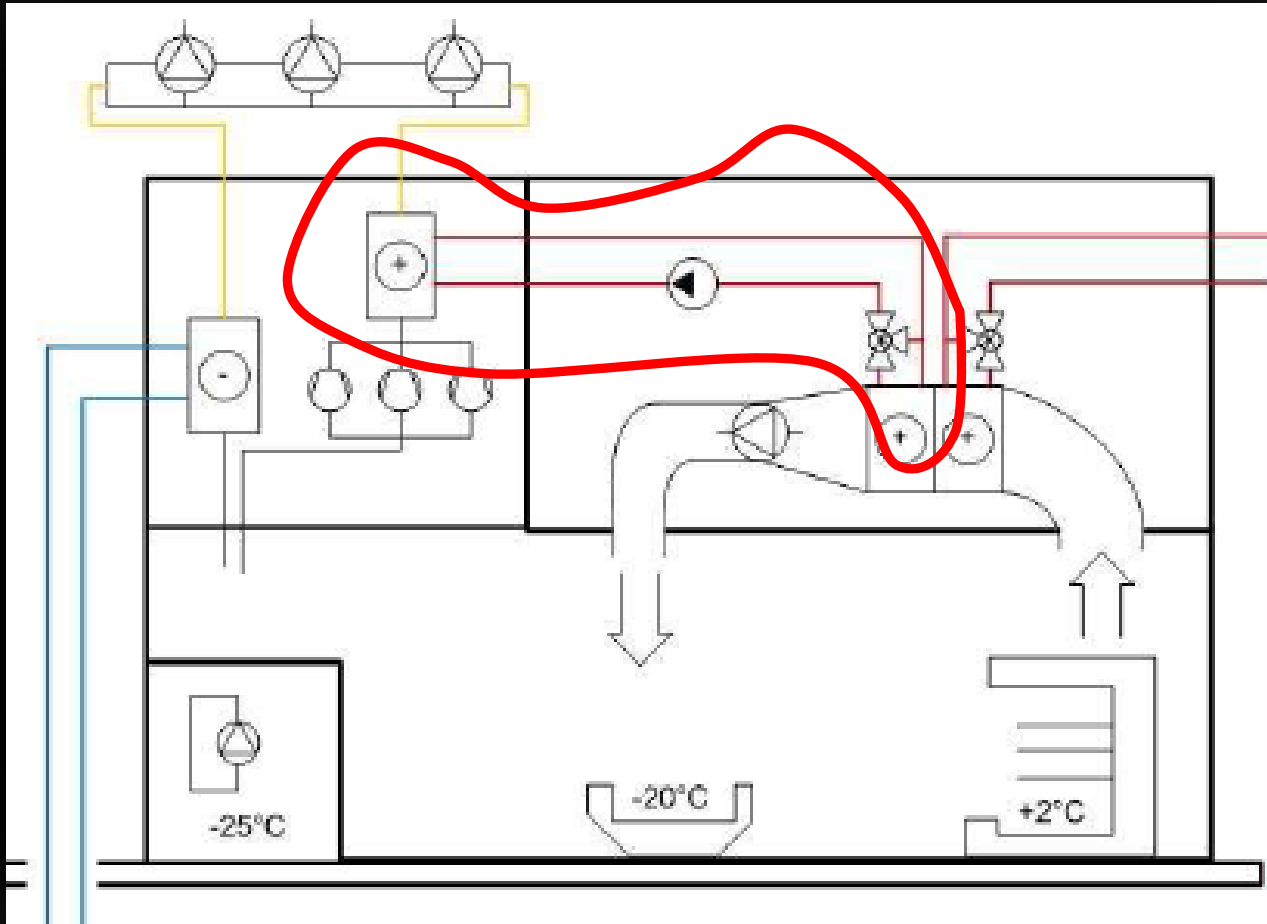


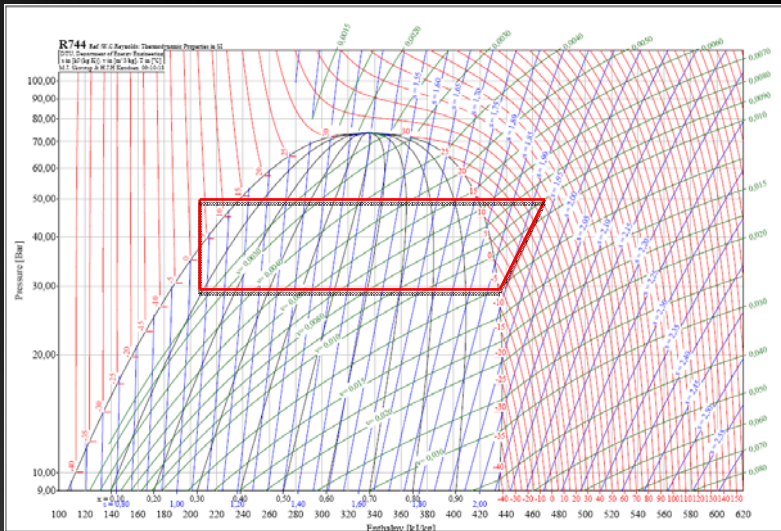
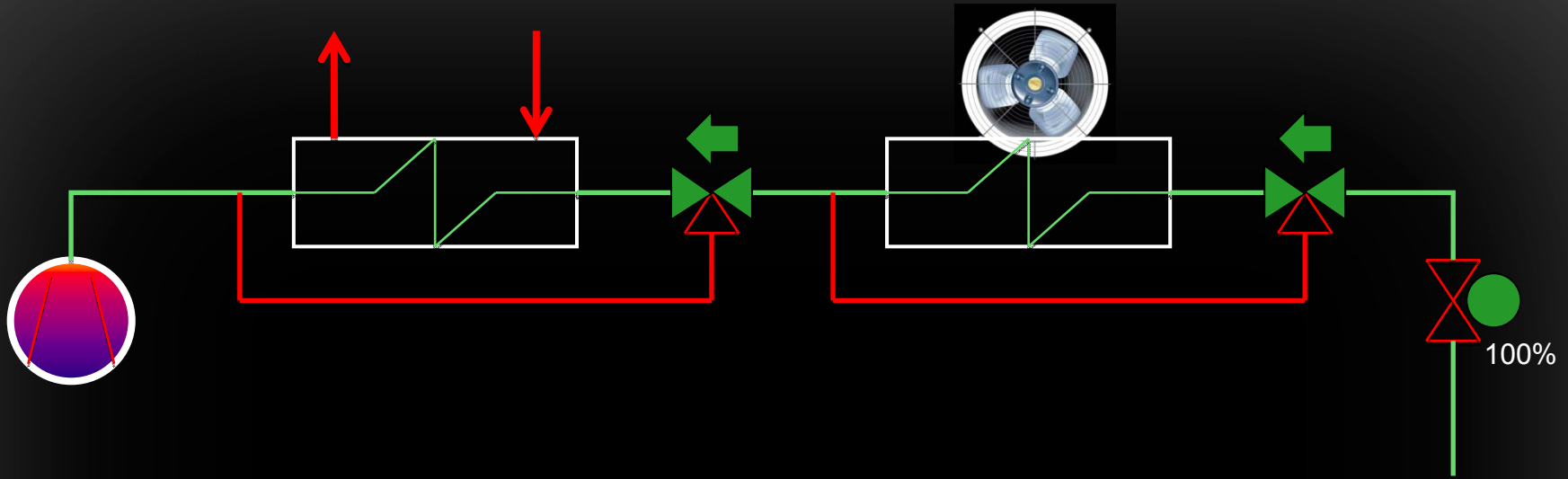


Hot gas de-superheat heat reclaim a cost effective solution

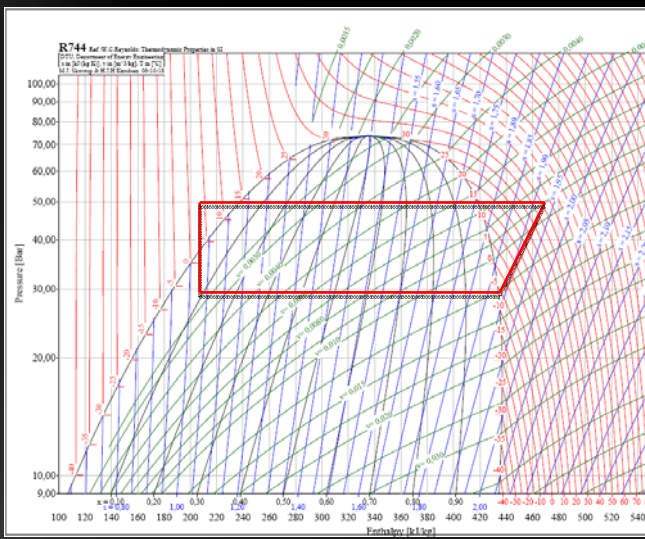
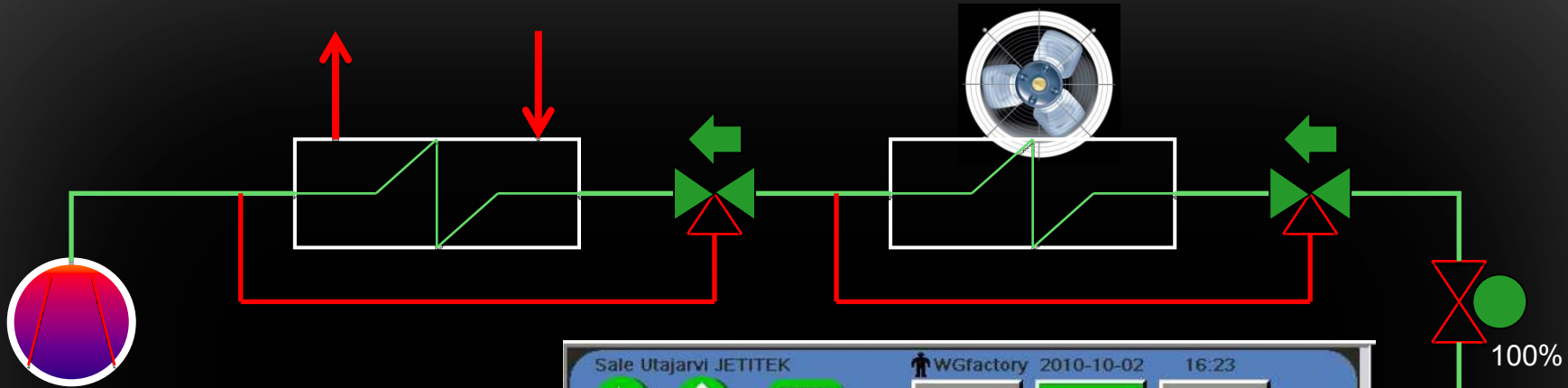
Energy can be used in several types of heating systems

- Under floor heating, **low return temp.**
- Air heating, **high outlet temp.**
- Radiators, **high outlet temp.**
- Air curtains, **high outlet temp.**
- Snow melting, **low return temp.**





Winter operation
No heat reclaim



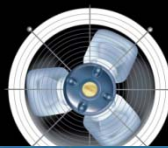
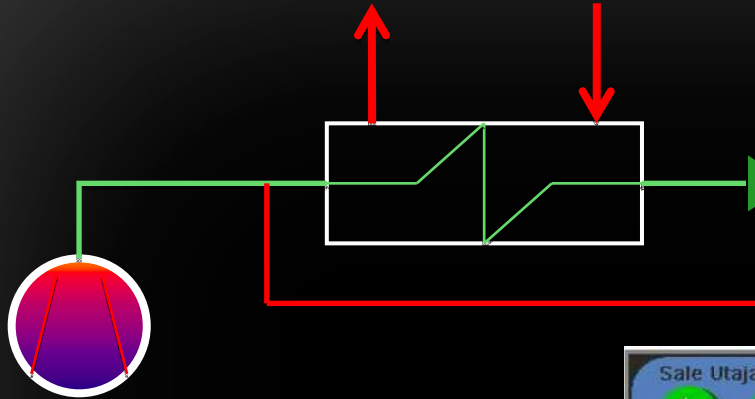
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Condenser/Gas Cooler

Frequency converter output: 89 %
 MV1 Motor valve 1 Bypass: 0 %
 TT2:1 Gas cooler out: 7.9 °C
 PT1 High pressure: 41.2 Bar, 7.4 °C
 TT2 Gas cooler out: 8.0 °C
 TT6 Ambient temp: 6.1 °C
 TT1 Discharge: 79.2 °C

TT2:1 Gas cooler out	PT1 High pressure
Calc.SP: 7.9 °C	SP: 35.0 Bar
External Ref: 7.9 K	External Ref: 0.0 Bar
Min SP: 7.0 °C	Calc Offset: 0.0 Bar
Max SP: 7.9 °C	SP: 35.0 Bar
SP: 7.9 °C	PV: 41.1 Bar
PV: 8.0 °C	OUT: 100 %
OUT: 89 %	

HE1 Heat reclaim



Green & Cool Web Gate

Sale Utajarvi JETITEK WGfactory 2010-10-05 11:04

← ↑ [Grid Icon] AUTO ON OFF

Detaljer fryns
Detaljer kyl

P-h diagram

Tryck [Bar] COP
Kyl 7.02
Frys 3.40

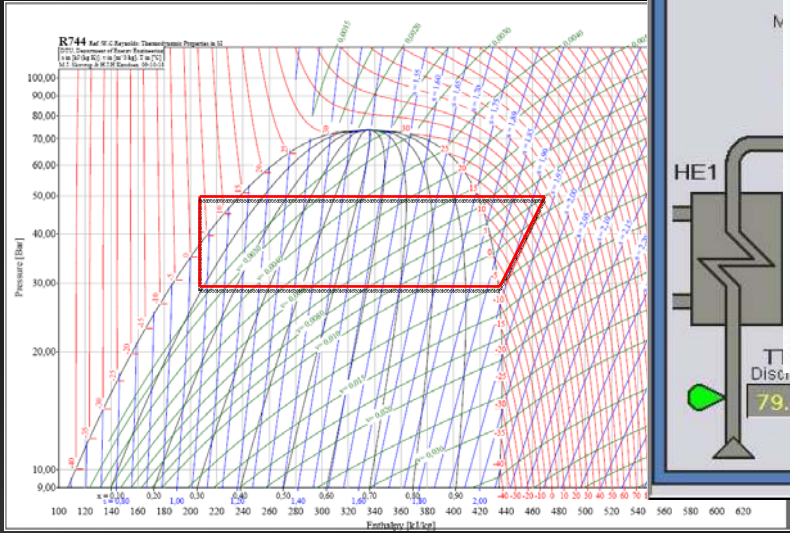
HE1

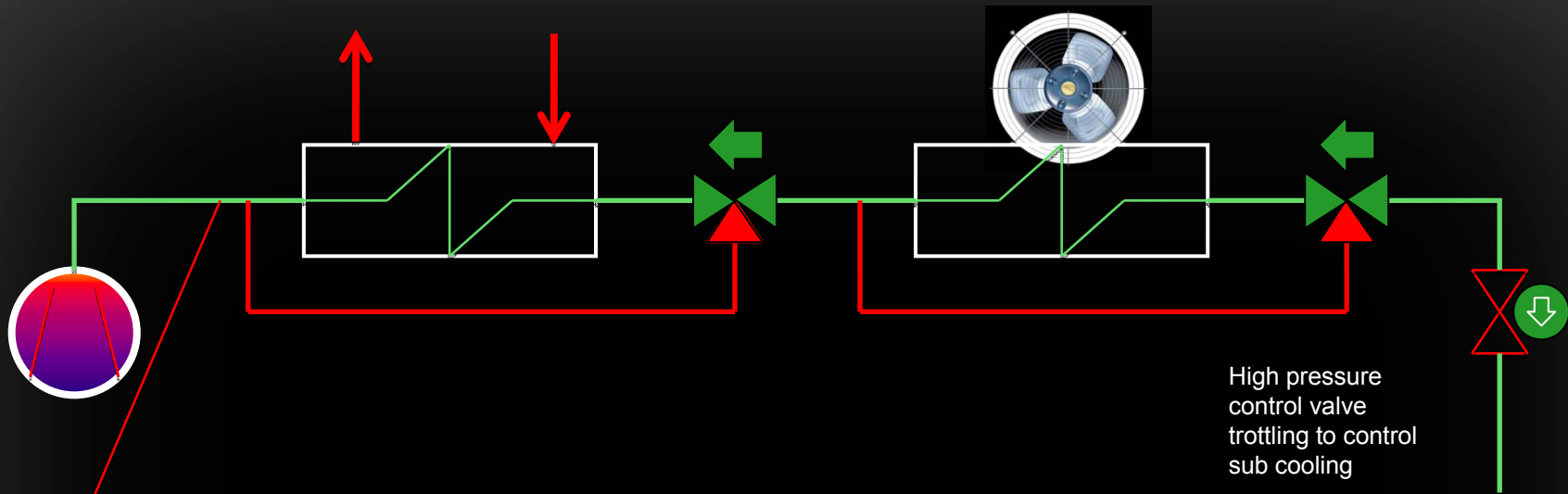
T Discharge 79.2 °C

SP=	7.9 °C	SP=	35.0 Bar
PV=	8.0 °C	PV=	41.1 Bar
OUT	89 %	OUT	100 %

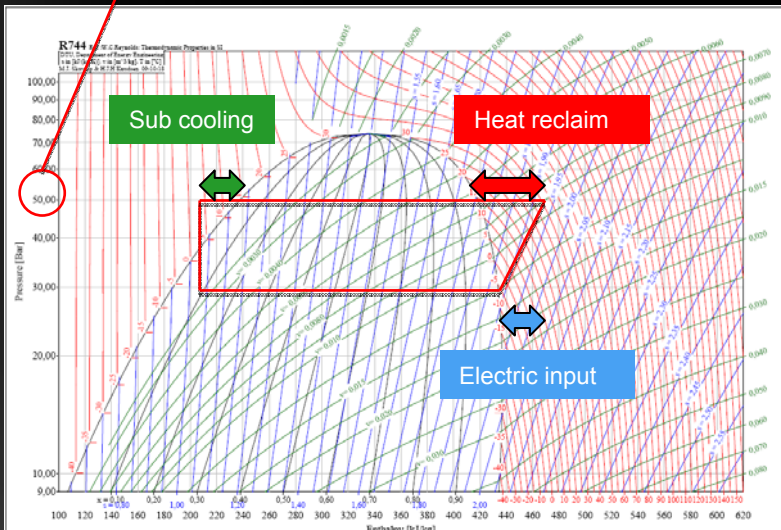
0.1 °C

10%

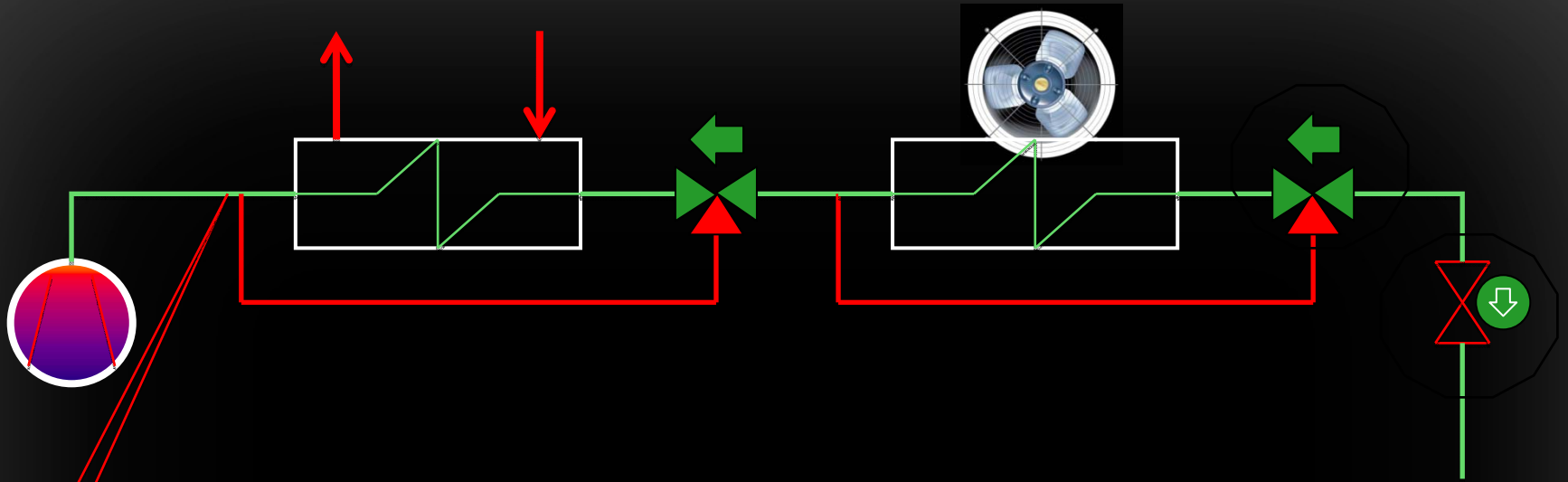




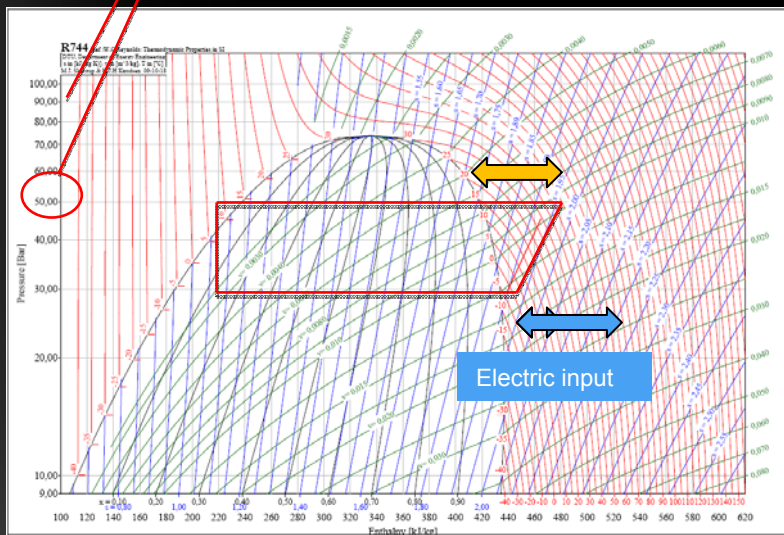
High pressure control valve throttling to control sub cooling



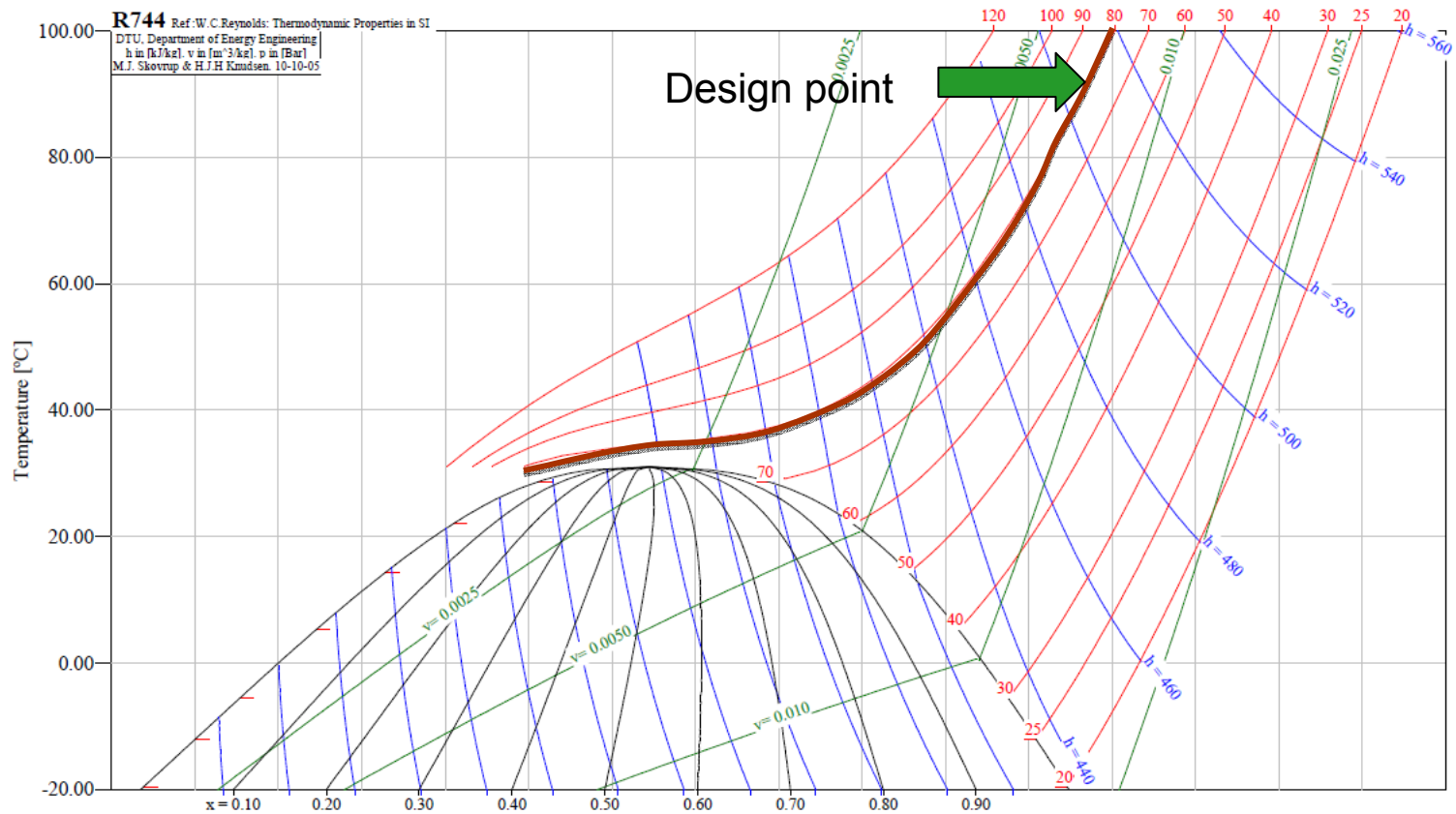
Winter operation
Part heat reclaim
Sub cooling



Winter operation
 Heat reclaim activated
 Signal from HVAC 10V

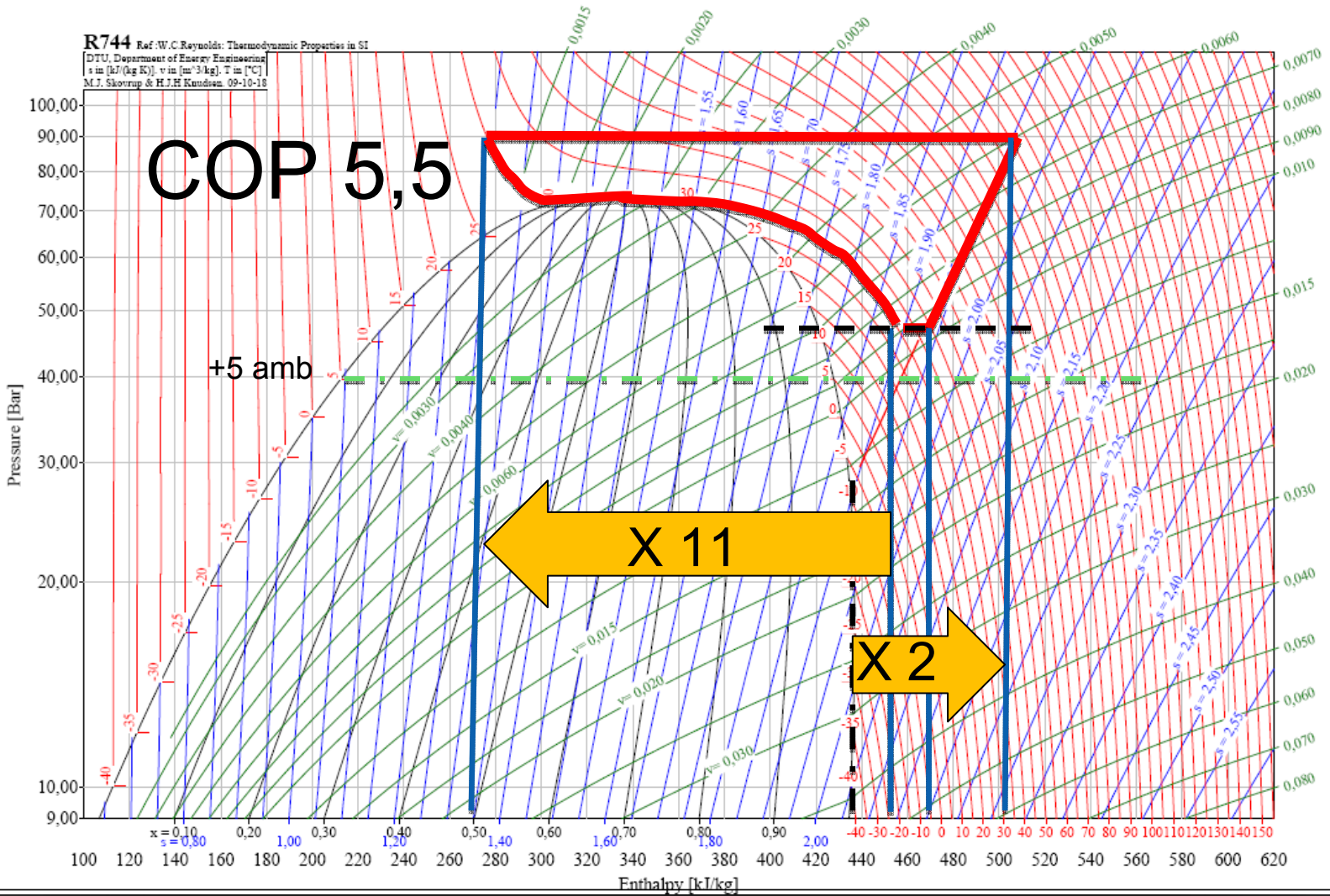



R744 Ref: W.C. Reynolds: Thermodynamic Properties in SI
DTU, Department of Energy Engineering
h in [kJ/kg], v in [m³/kg], p in [Bar]
M.J. Skovrup & H.J.H. Knudsen 10-10-05



R744 Ref: W.C. Reynolds: Thermodynamic Properties in SI

DTU, Department of Energy Engineering
s in [kJ/(kg K)], v in [m³/kg], T in [°C]
M. Z. Skovrup & H.J.H. Knudsen: 09-10-18



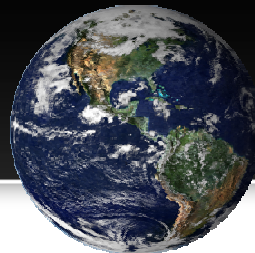


CO2 has unique properties, with a “intelligent” control system and heat exchangers with proper design high energy savings can be achieved.



Thank you!

Located in northern Europe
– with a global market



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Nuremberg 14 October 2010