


The logo for COOLtec is displayed in a 3D, light blue font against a dark blue background with a starry space pattern. The letters 'COOL' are larger and more prominent, with a '2' integrated into the second 'O'. The letters 'tec' are smaller and positioned to the right of 'COOL'.

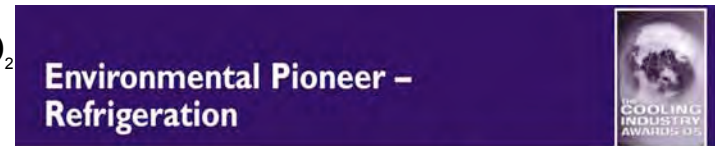
COOLtec

A photograph of the Earth's surface as seen from space, showing the curvature of the planet and the blue oceans. The image is used as a background for the text.

*CO₂ systemet løsning for kjøling fra
Carrier Linde !*

CO₂ – naturlig løsning for din dagligvarebutikk

- Høsten 2004 installerte Carrier Linde det første CO₂ anlegget med CO₂ direkte ekspansjon både på kjøll og frys.
- Det er frem til i dag installert over 70 komplette anlegg transkritiske anlegg (kjøl).
- Det er frem til i dag installert over 200 subkritiske anlegg (frys)
- Erfaringene er gode og løsningen vil helt klart være meget aktuell for fremtiden.
- Med CO₂ på både kjøll og frys blir sekundæremedier overflødige.
- Miljøavgiftene blir tilnærmet 0.



Hvorfor bruke **CO₂** som kuldemedium ?

” Naturlig” kuldemedium

” Relativt” uskadelig kuldemedium

Ikke eksplosivt og ikke brennbart.

Optimal energi effektivitet.

Ingen avgifter.

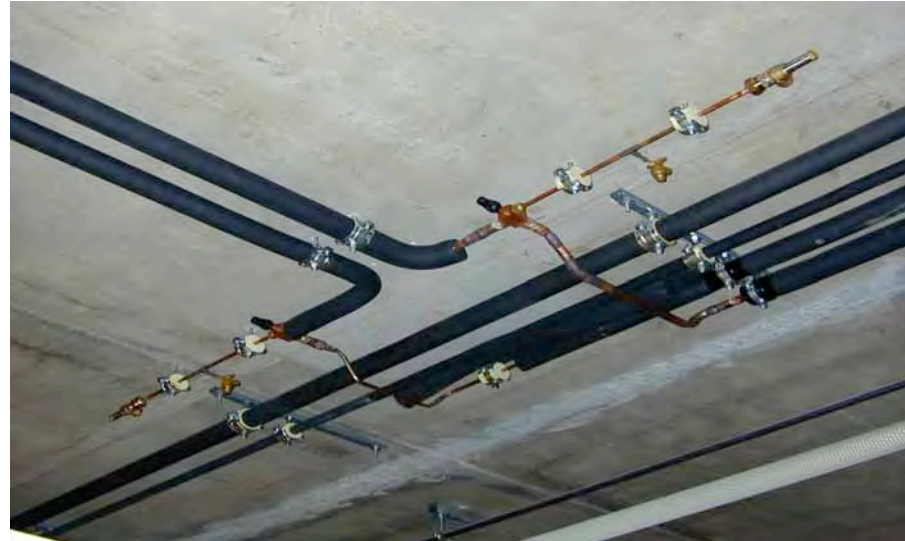
Enkel og kompakt løsning med:

Små dimensjoner på rør, ventiler, isolasjon etc.

Standardisert løsning.

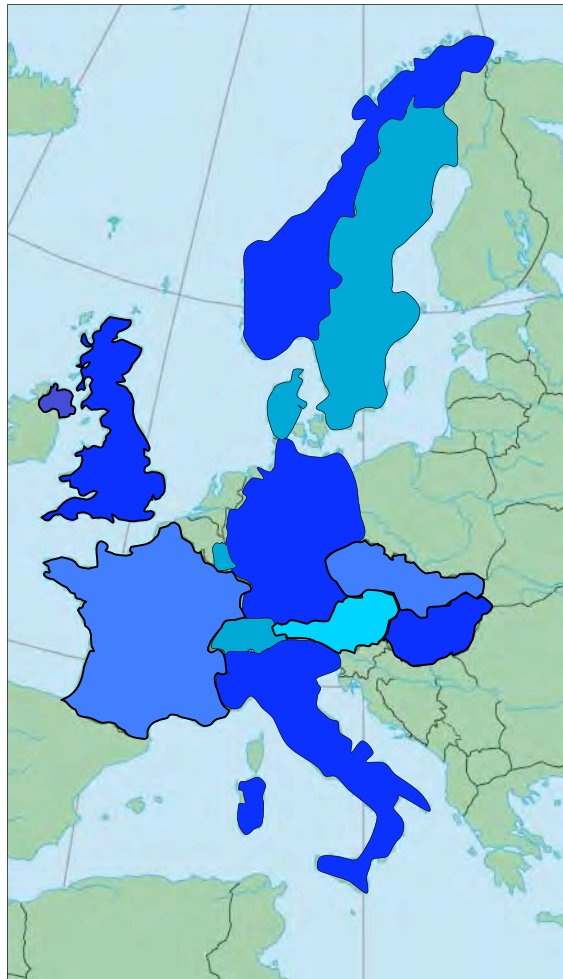
Design som vanlige maskinpakker for kjøling og air.condition.

Samme installasjonskostnad som tradisjonelle HFC løsninger med tørrkjøler



DX-anlegg for dypfrysning

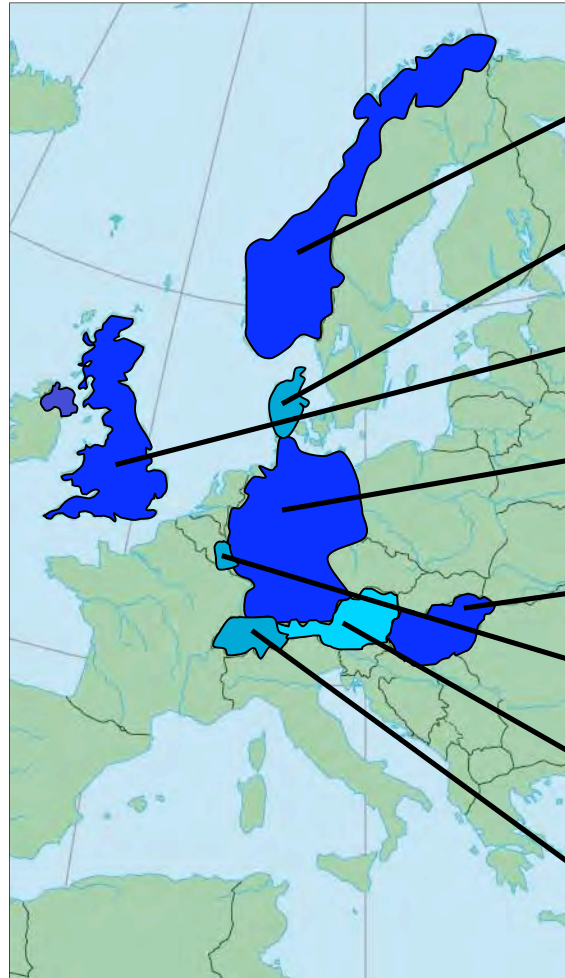
Subkritisk



Ca. 7500 kW Dypfrysning i 220 butikker

DX-anlegg for normalkjøling

Transkrittisk



Norge 7 butikker

Danmark 16 butikker

Storbritannia 4 butikker

Tyskland 25 butikker

Sveits 10 butikker

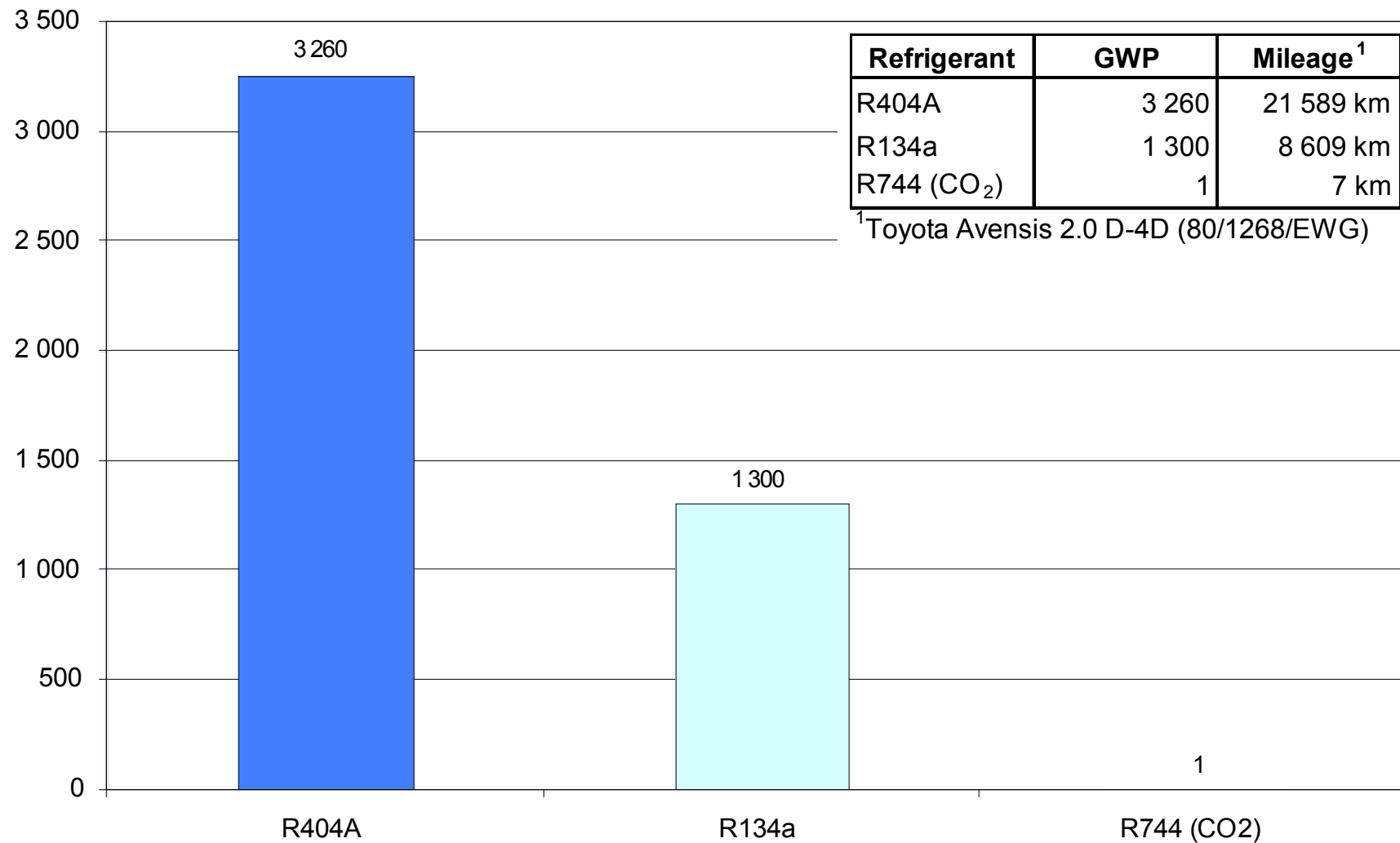
Luxemburg 2 butikker

Østerrike 5 butikker

10.000 kW Kjøling i 70 butikker

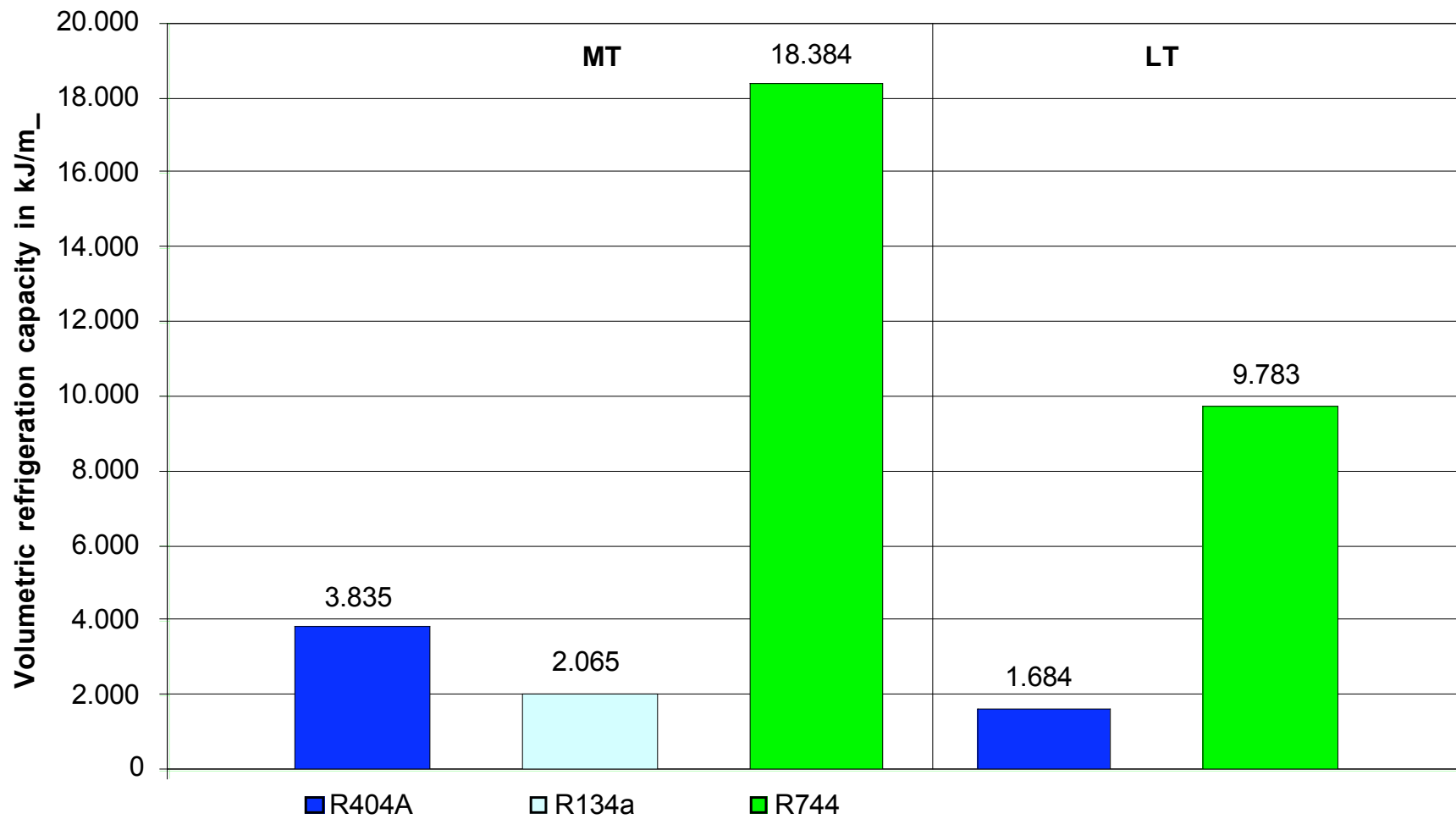
CO₂ som kuldemedium

Økologisk aspekt: Global oppvarmings potensial



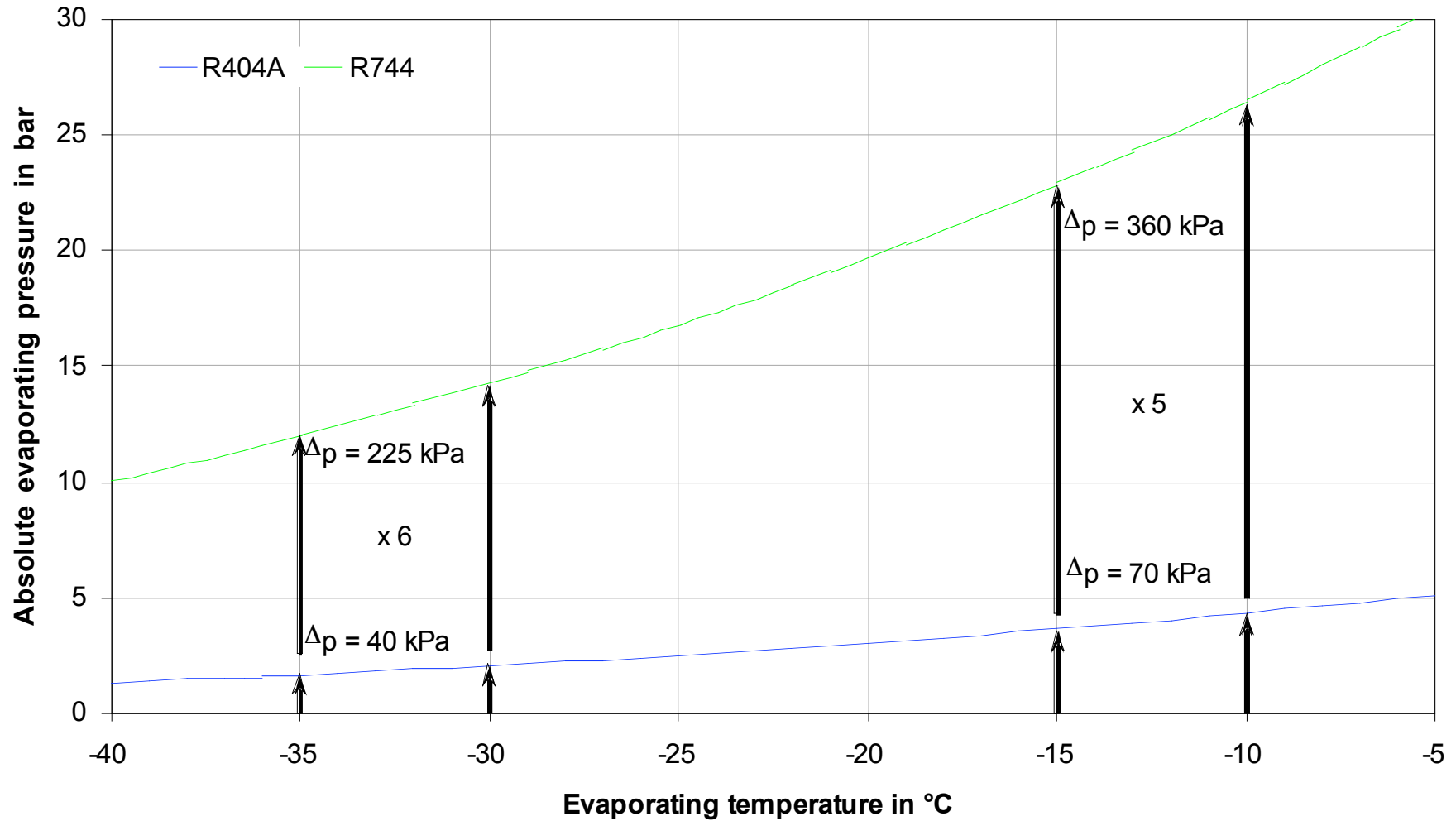
CO₂ som kuldemedium

Fordel: Høy volumetrisk kjøle kapasitet











CO₂ som kuldemedium

Fordel: Tilnærmet upåvirkelig for trykktap i rørledning



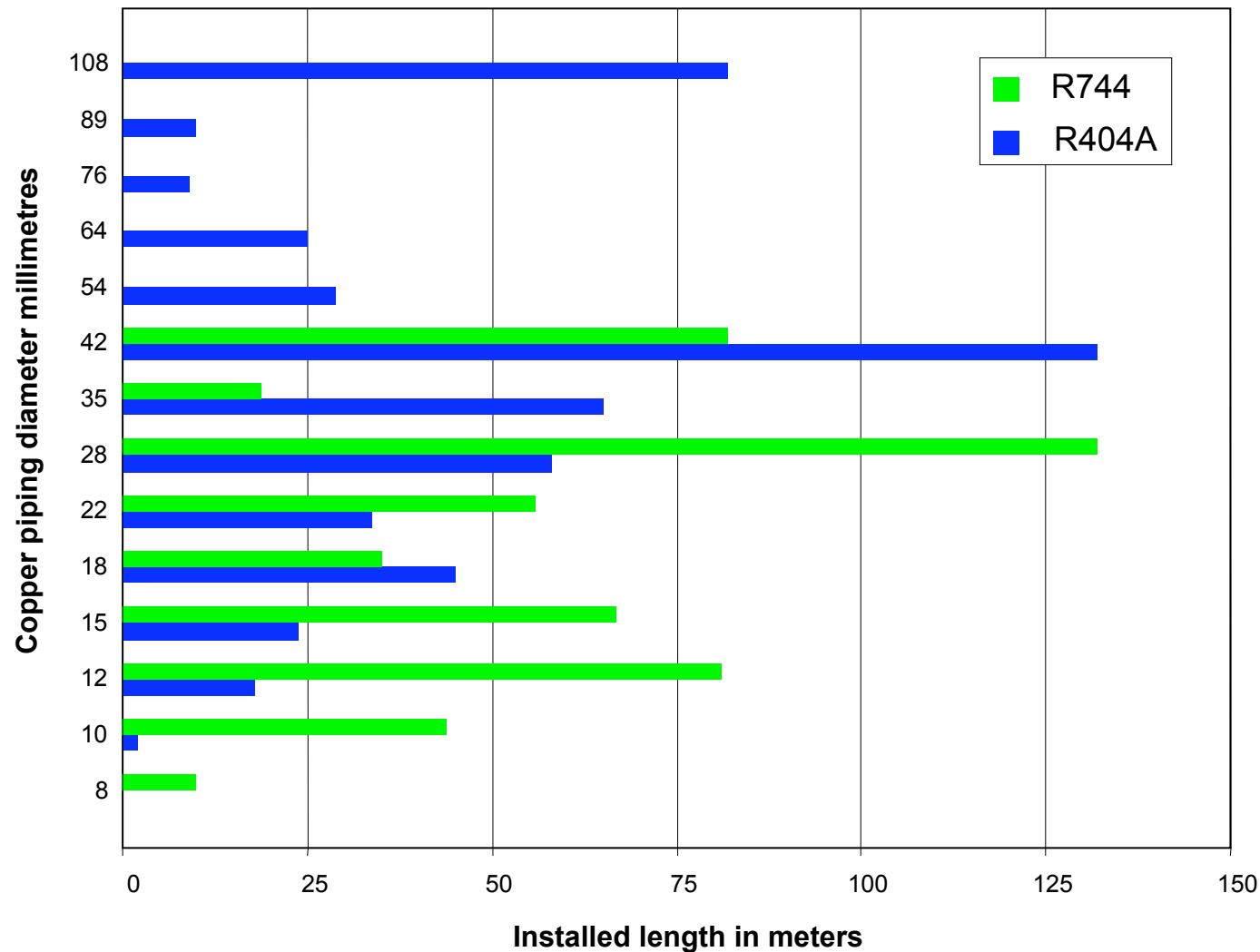
CO₂ som kuldemedium

Fordel: Mindre rørdimensjon

Refrigeration system	Suction/ return line	Liquid/ supply line	Ratio of area	
Refrigeration system	Art des Kältesystems	Saugleitung/ Rücklauf	Flüssigkeits- leitung/ Vorlauf	Flächen- verhältnis
Direct expansion, R404A refrigerant	Direktverdampfung mit R404A als Kältemittel	 76/102mm	 35mm	100%
Indirect, brine as secondary refrigerant	Indirekt mit Sole als Kälteträger	 76/140mm	 76/140mm	337%
Indirect, CO ₂ as secondary refrigerant	Indirekt mit CO ₂ als Kälteträger	 54/118mm	 35/73mm	166%
Direct expansion, CO ₂ refrigerant	Direktverdampfung mit CO ₂ als Kältemittel	 42/68mm	 22/48mm	60%

CO₂ som kuldemedium

Sammenligning av en installasjon med 160 kW kjølekapasitet



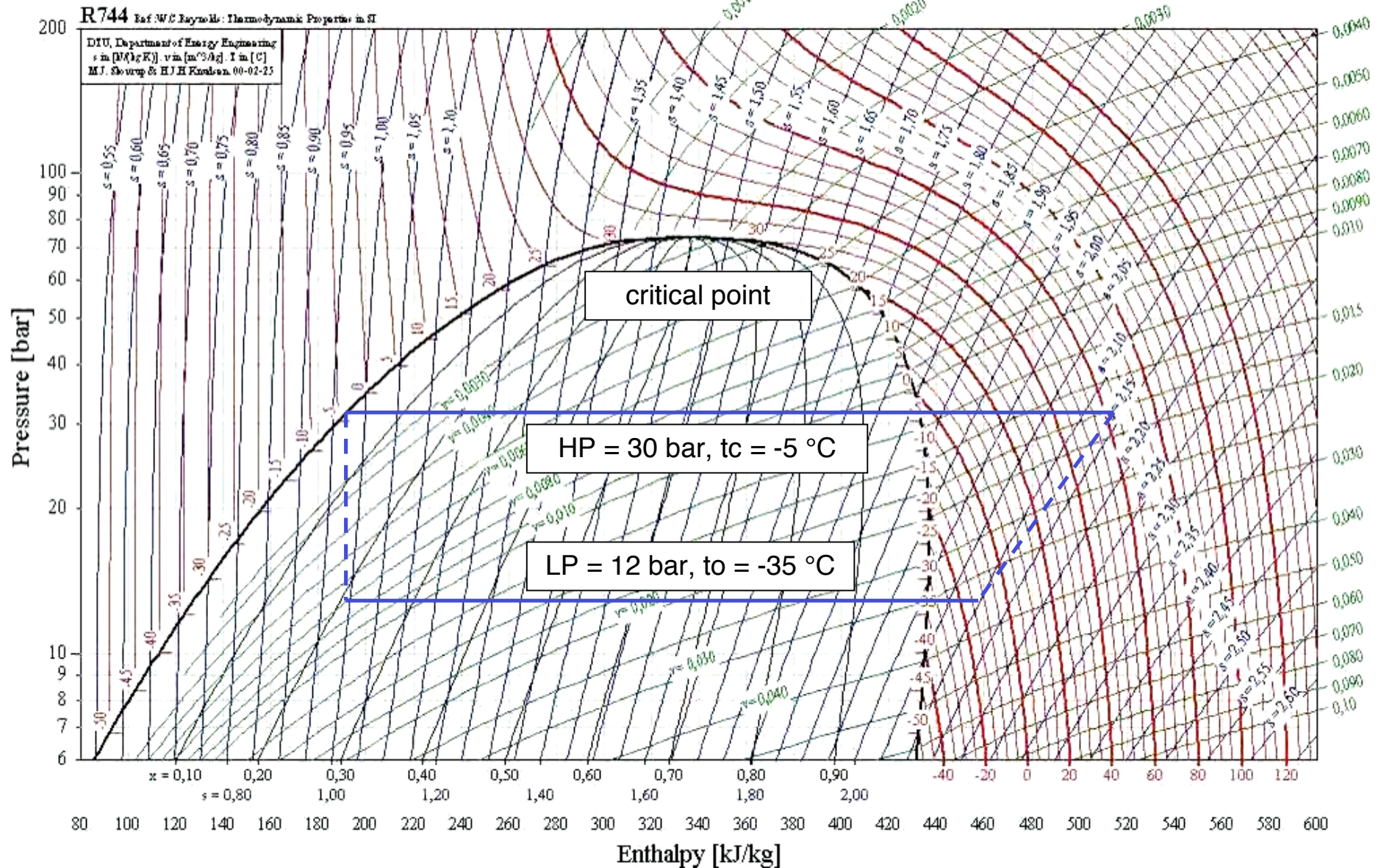
Kjølevæske fylling
R404A: 188 kg
R744: 80 kg

Besparelse: 57 %

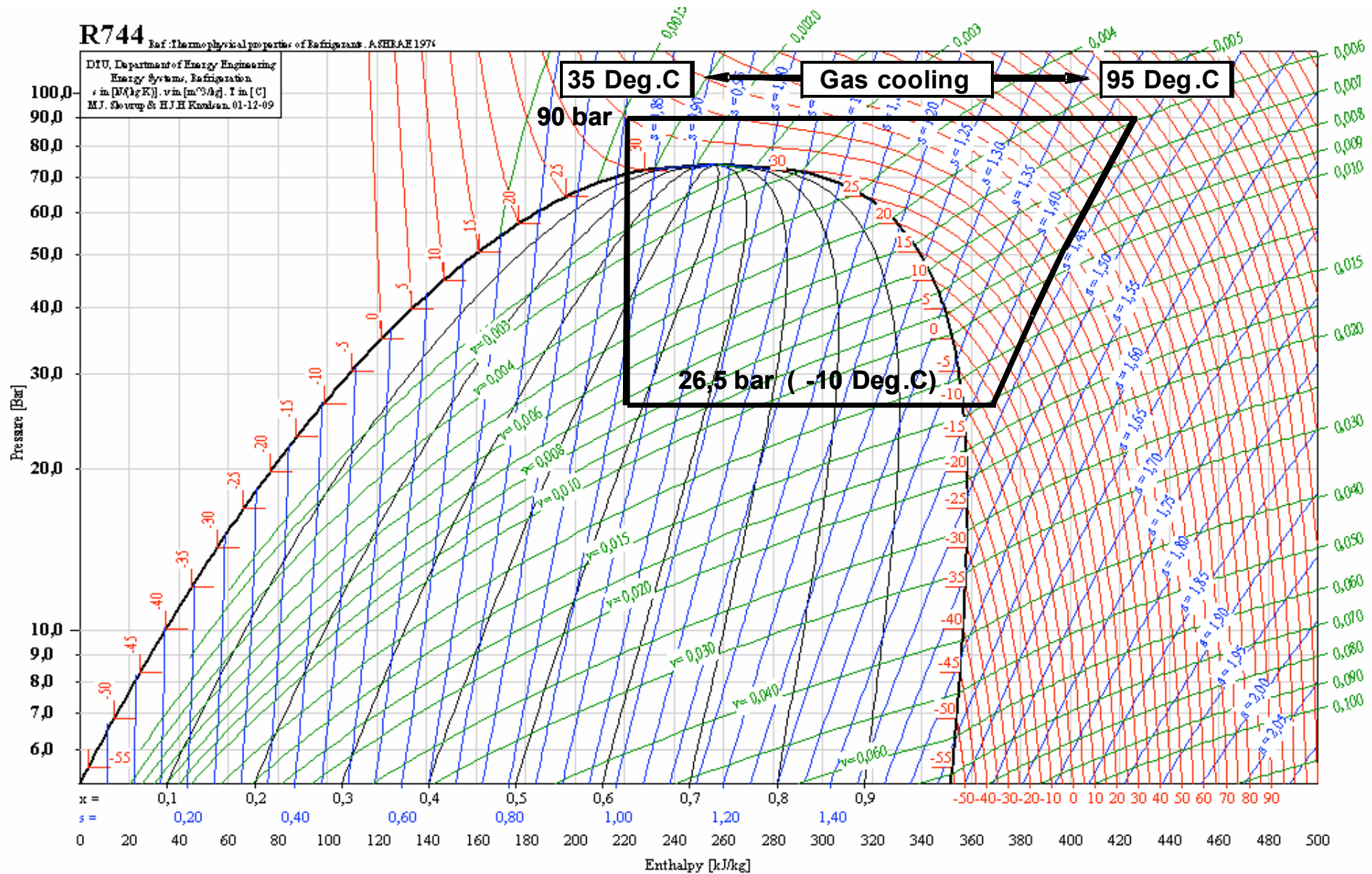
Copper rør
R404A: 1,300 kg
R744: 427 kg

Besparelse: 67 %

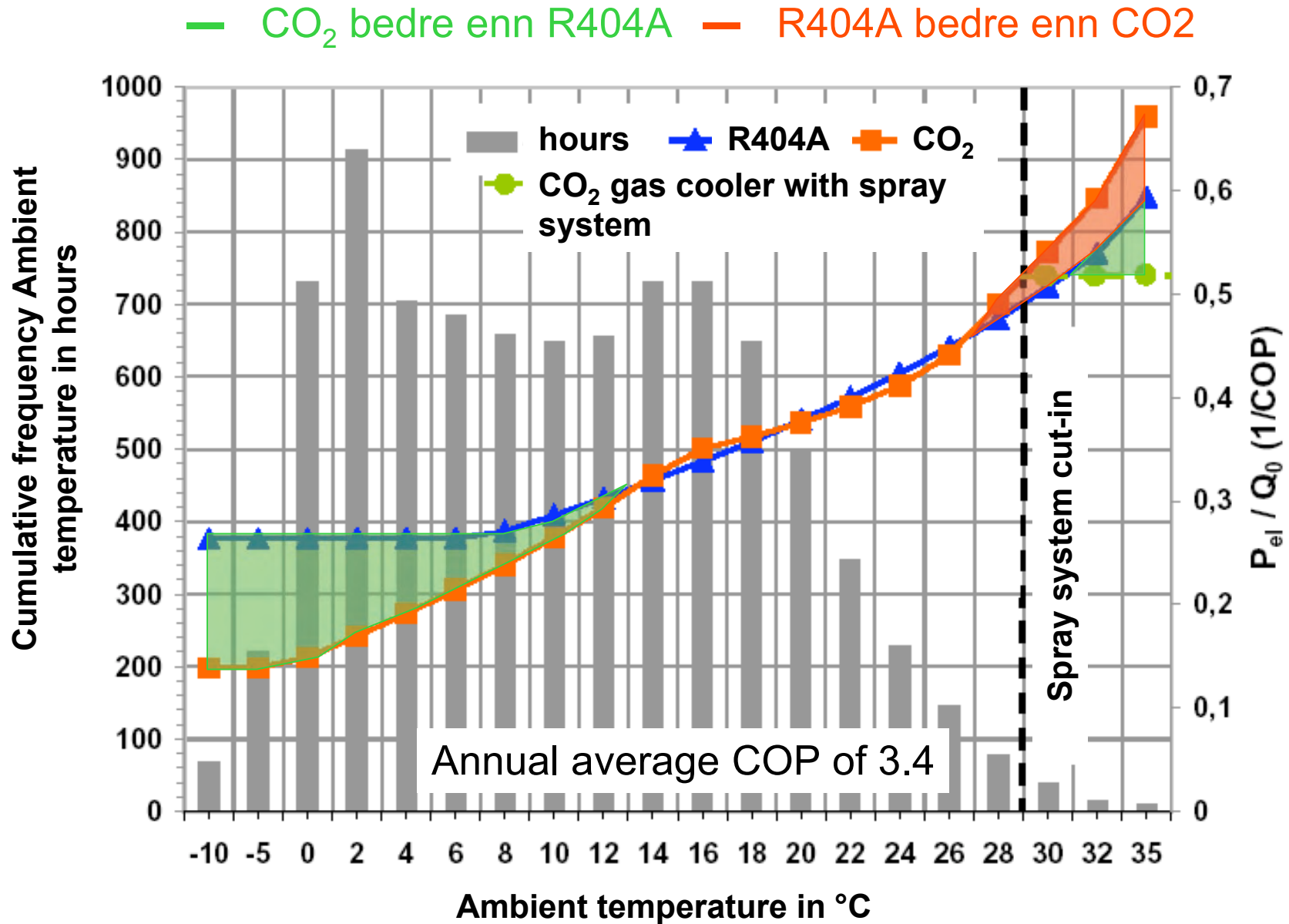
LT kaskadeanlegg med CO₂



MT transkritisk kuldeanlegg CO₂ - gasskjøling

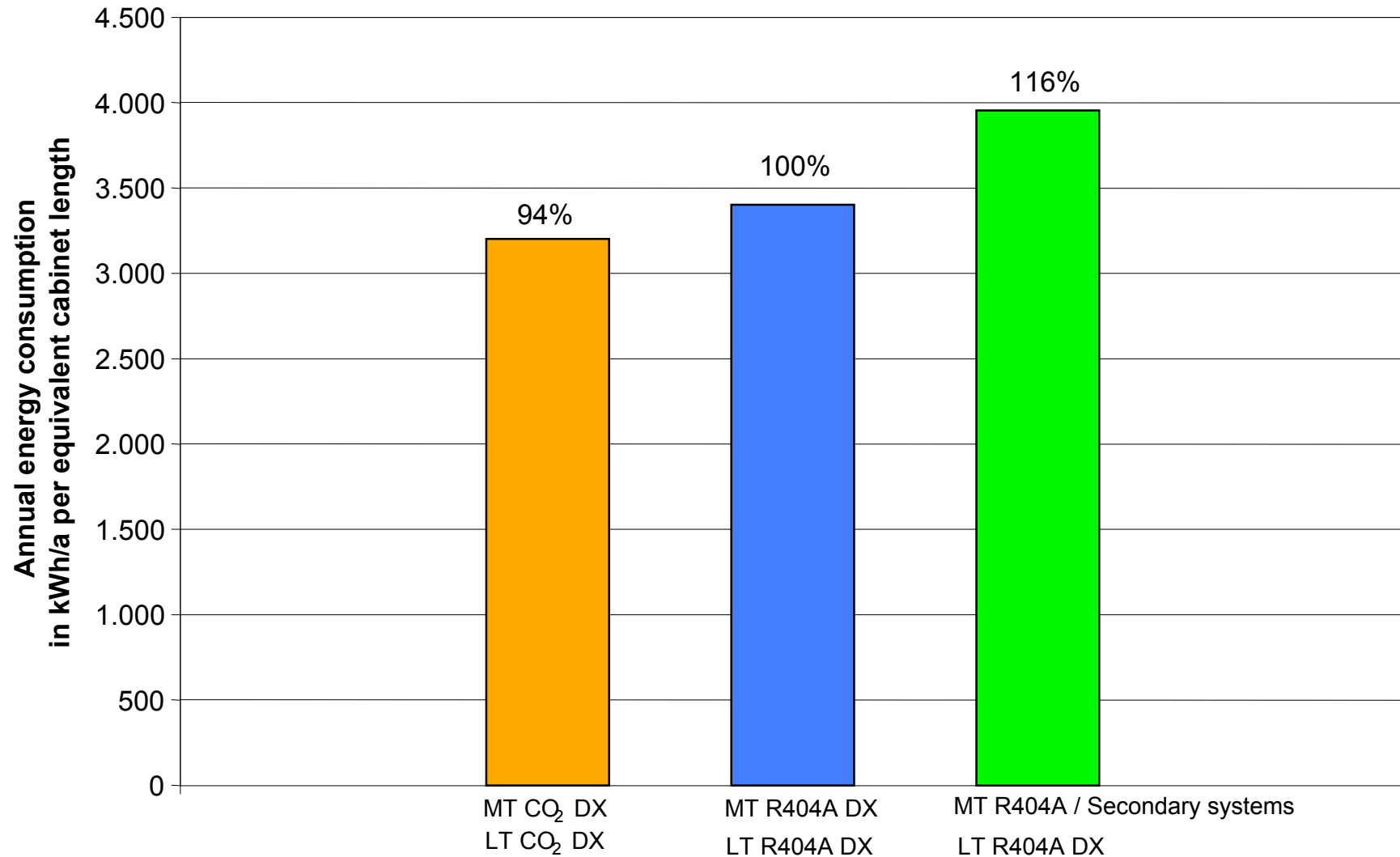


Effektivitets fordeler og potensial



Effektivitets fordeler og potensial

Sammenligning av energi forbruk ved forskjellig kjølesystemer

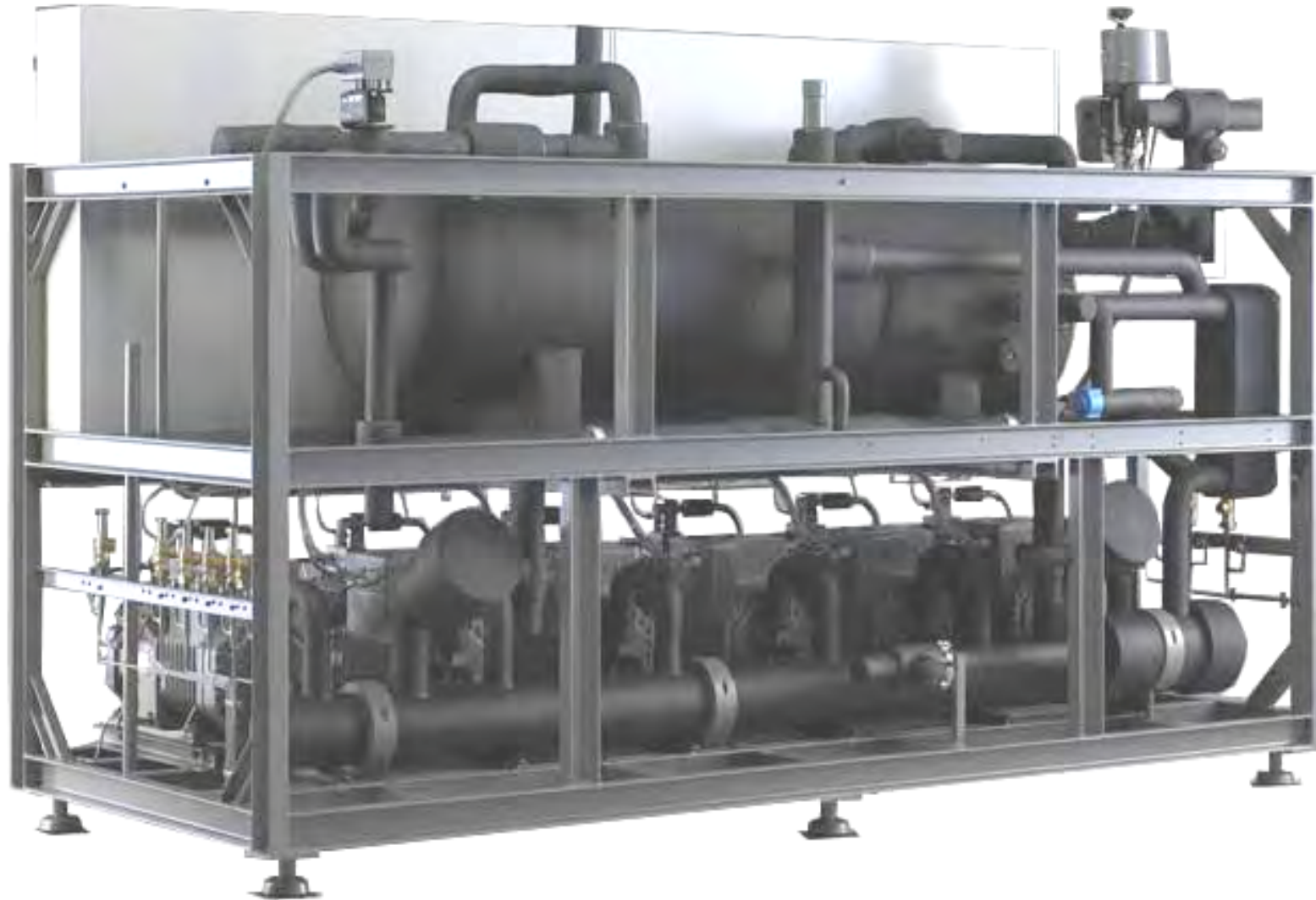


Spørsmål og Svar !!!

CO₂OLtec MT rack



CO₂OLtec MT rack



CO₂ MT Machinery room



CO₂ MT gas cooler / condenser



Sikkerhetskonsept for MT og LT

CO₂ gas monitoring

- Every room, where pipes filled with CO₂ are installed, below the practical limited has to be monitored by CO₂ gas sensors
- Two different alerts:
 - 1% pre-alarm (priority level 2)
 - 2% main alarm (priority level 1)
 - No acknowledge possible
 - Optical and acoustical signal
 - Alarm stays until the CO₂ concentration is below 2%
- Gas sensors have to be installed 30 cm above floor
 - Bumper around sensor should be installed
- Special CO₂ gas sensors for room temperatures below 0°C

Safety concept MT and LT

CO₂ gas monitoring

- Suppliers for gas monitoring systems

- GFG

www.gfg-inc.com

- Murco

www.murco.ie

- Ados

www.ados.de

CO₂ sensor with bumper



HOW THE SYSTEM WORKS

Working principle in the log(p) h diagram

Compression (1 to 2)

Transcritical* up to 85 bar(g)

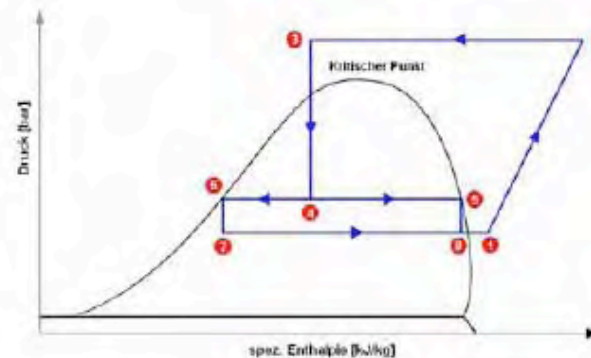
Subcritical* around 45 bar(g)

Gas cooling (2 to 3)

Transcritical approx. 3 to 6 K
below ambient temperature
by water spray system

Expansion (3 to 4)

Transfer of transcritical into subcritical CO₂
Intermedium pressure around 35 bar (g)



HOW THE SYSTEM WORKS

Working principle in the log(p) h diagram

Separation (4 to 6)

Separation of phases (liquid / gas)
takes place in receiver

Expansion (6 to 7)

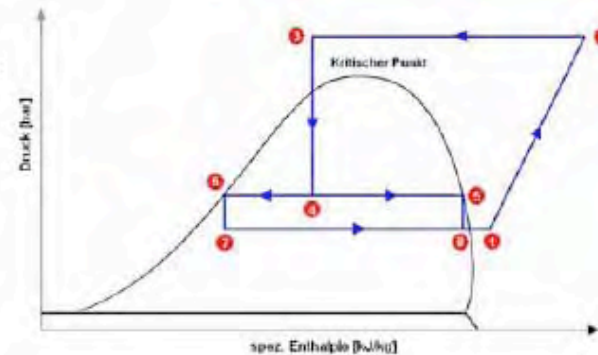
Expansion of CO₂ into
MT consumers

Evaporating and superheating (7 to 8)

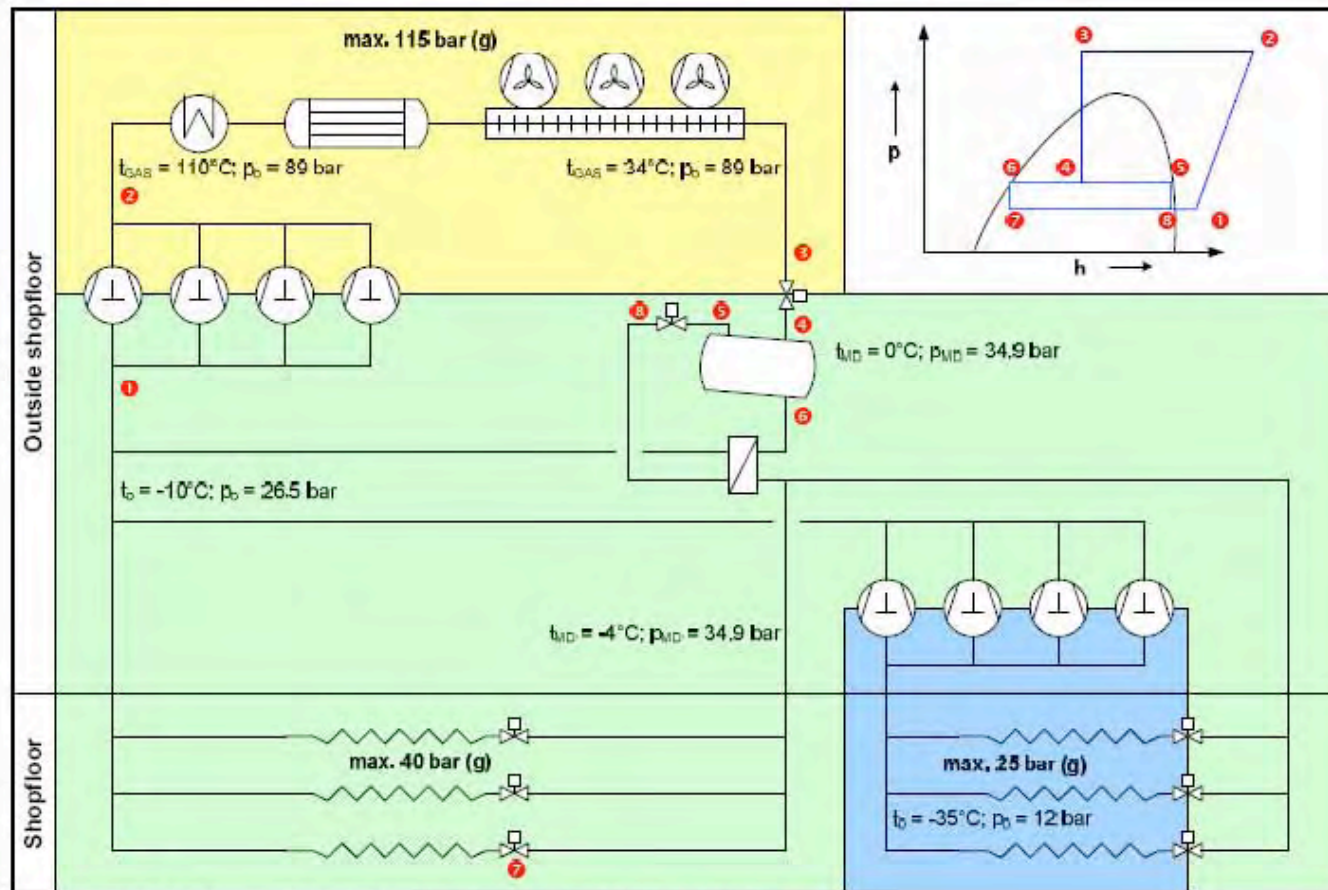
Evaporation of CO₂ within evaporator coils

Gas derating of intermedium pressure gas to suction line (5 to 8)

Control of intermedium pressure




PRINCIPLE SKETCH



The logo for COOLtec is displayed in a 3D, light blue font against a dark blue background with a starry space pattern. The letters 'COOL' are larger and more prominent, while 'tec' is smaller and positioned to the right. The number '2' is integrated into the 'O' of 'COOL'.

COOLtec

A photograph of the Earth's horizon from space, showing the blue curvature of the planet and the white atmosphere against the blackness of space.

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