

יישומים מתקדמים של קררים ראשוניים ומשניים במערכות קירור ברות קיימא
Advanced refrigerants apps in sustainable refrigeration systems



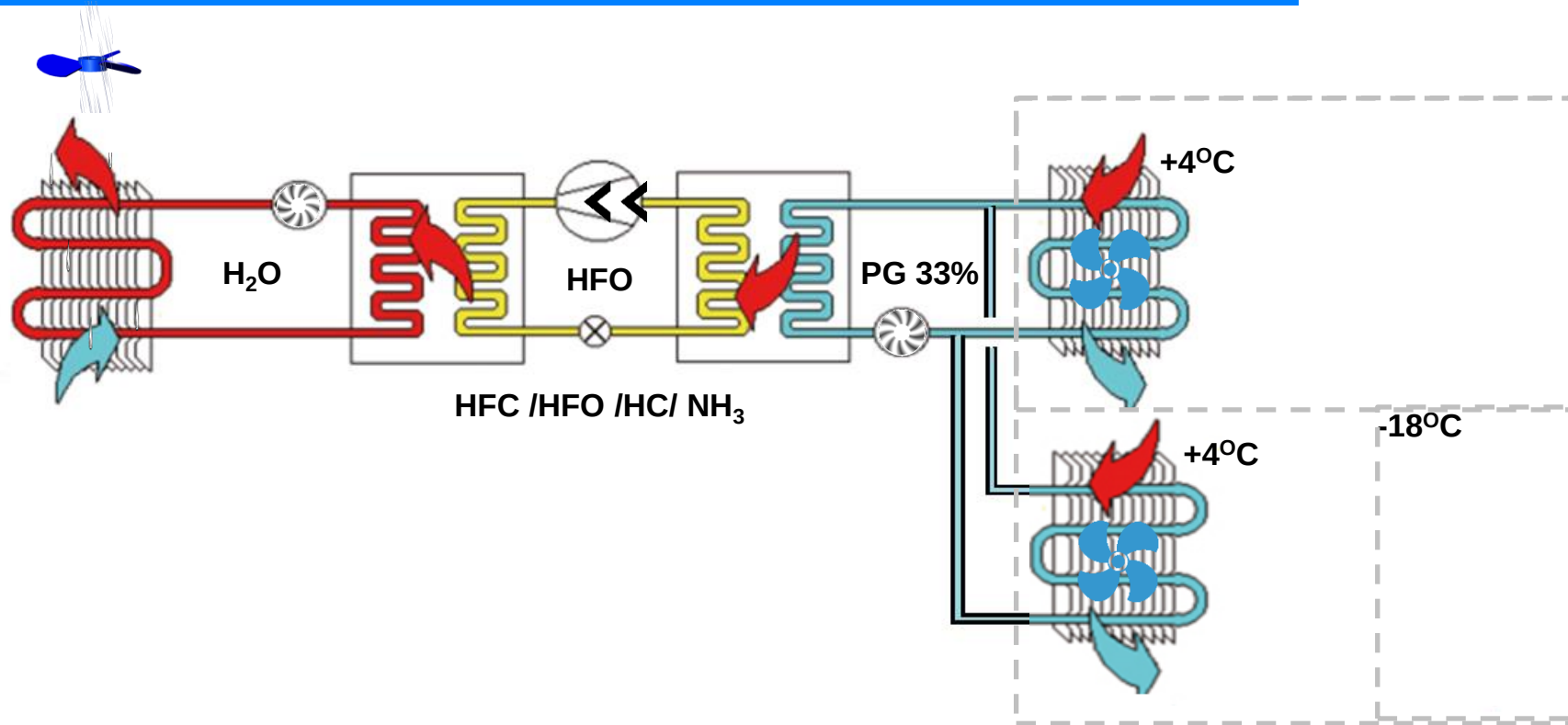
Topics

1. A Sustainable refrigeration system-
What does it mean?
2. Past refrigerants' applications
3. Advanced refrigerants' applications
4. Case study at Soglowek 2000 plant



Eng. Jonny Malachi
Electricity and Energy, Eilat, 2019
WPM 8.1-1

A Sustainable refrigeration system- What does it mean?

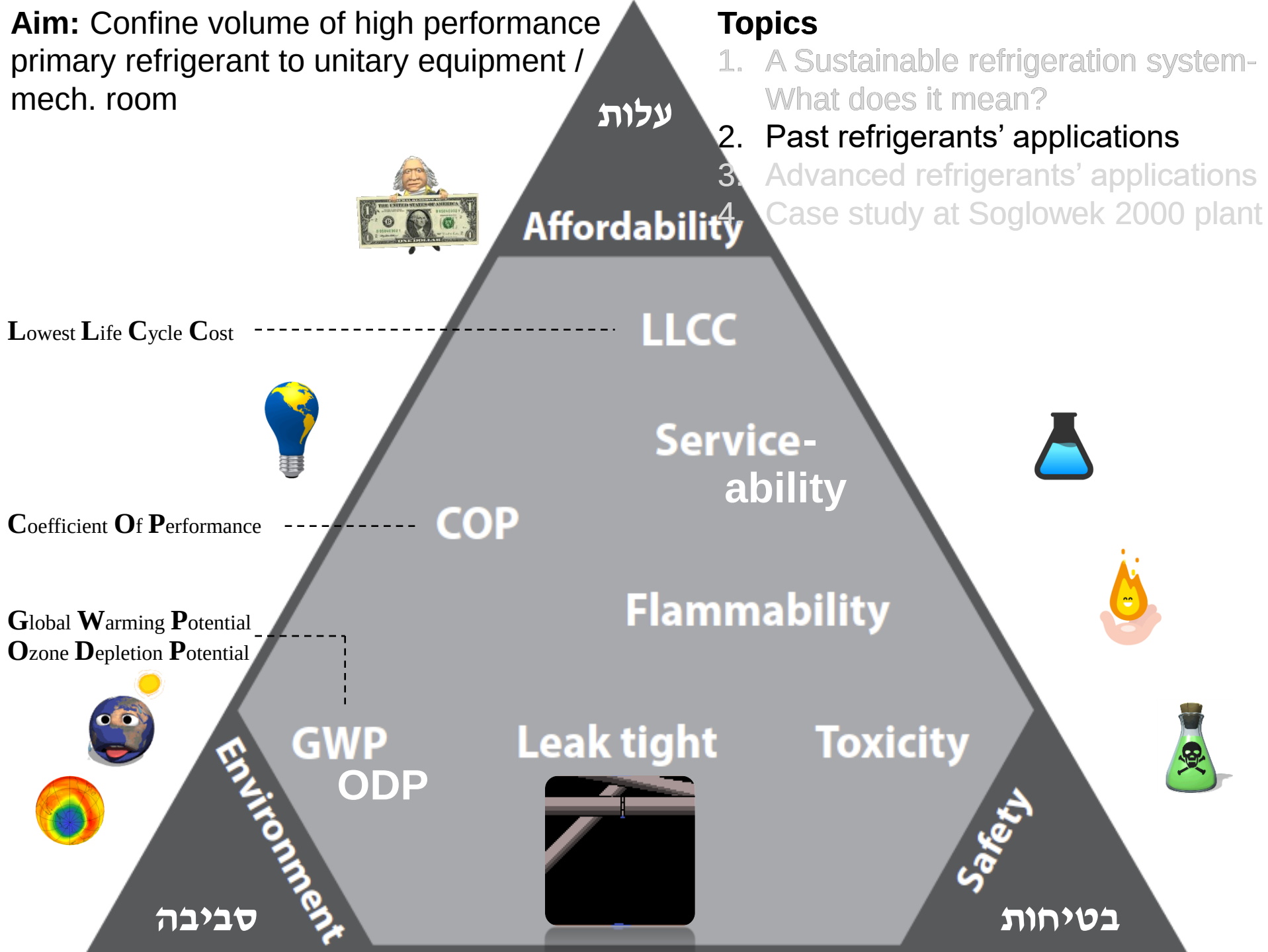


Aim: Confine volume of high performance primary refrigerant
to unitary equipment / mech. room

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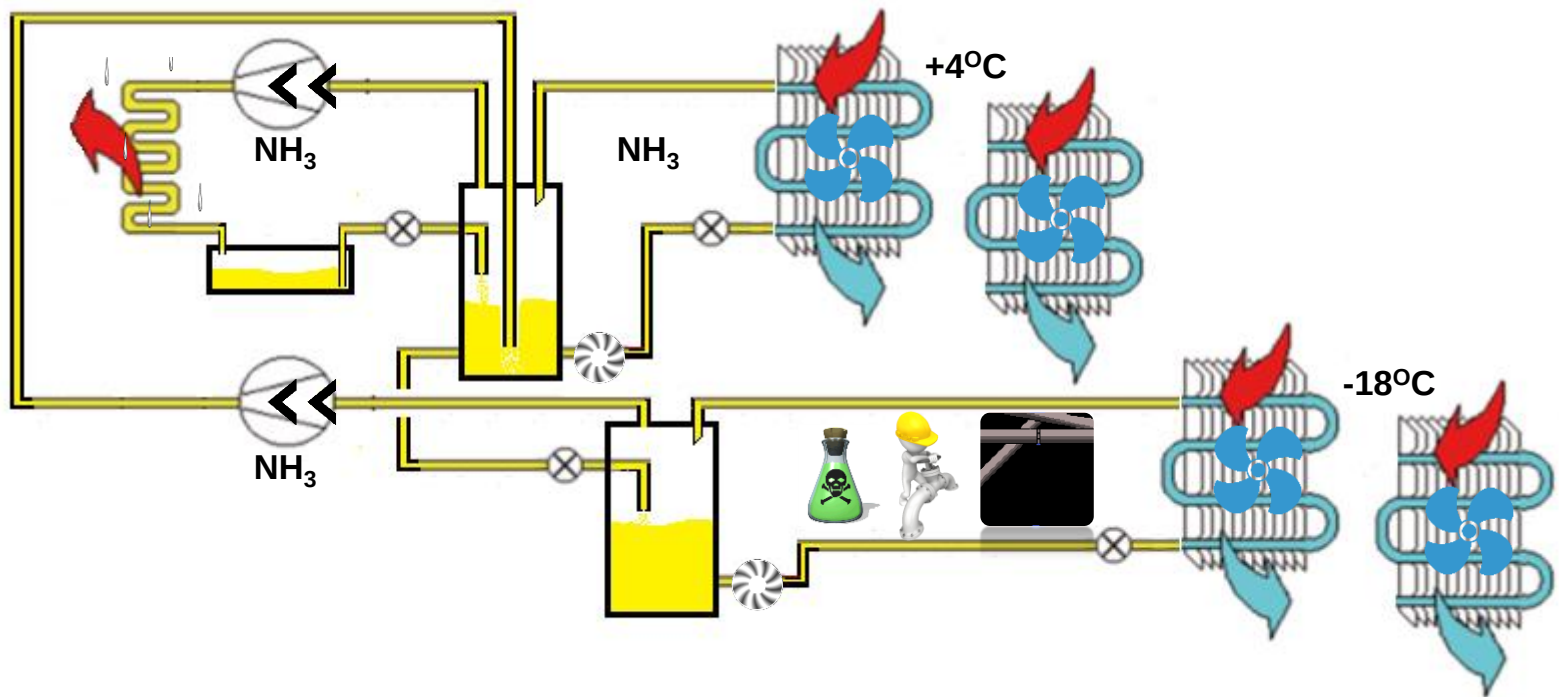
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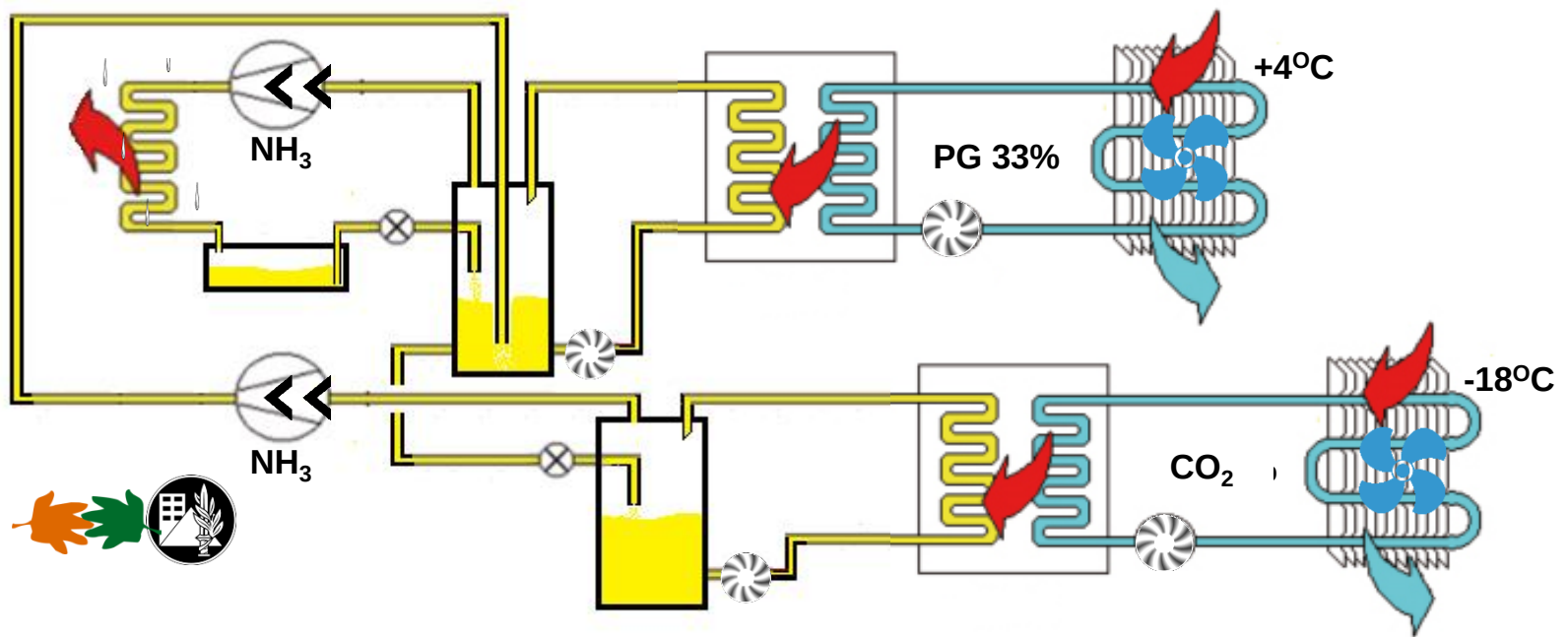
Past refrigerants' applications

Two stage pumping Ammonia refrigeration plant



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Two stage Ammonia as primary refrigerant plant with secondary Brines



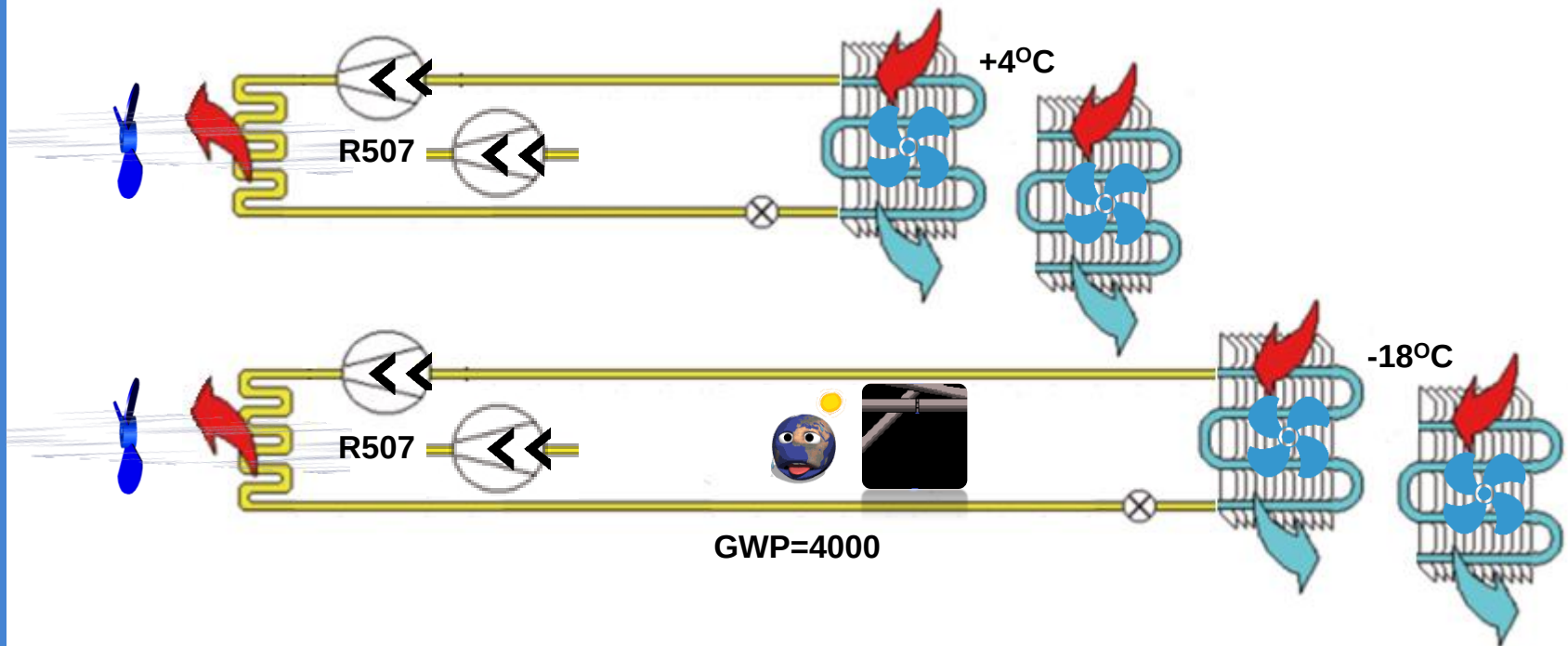
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Advanced refrigerants' applications



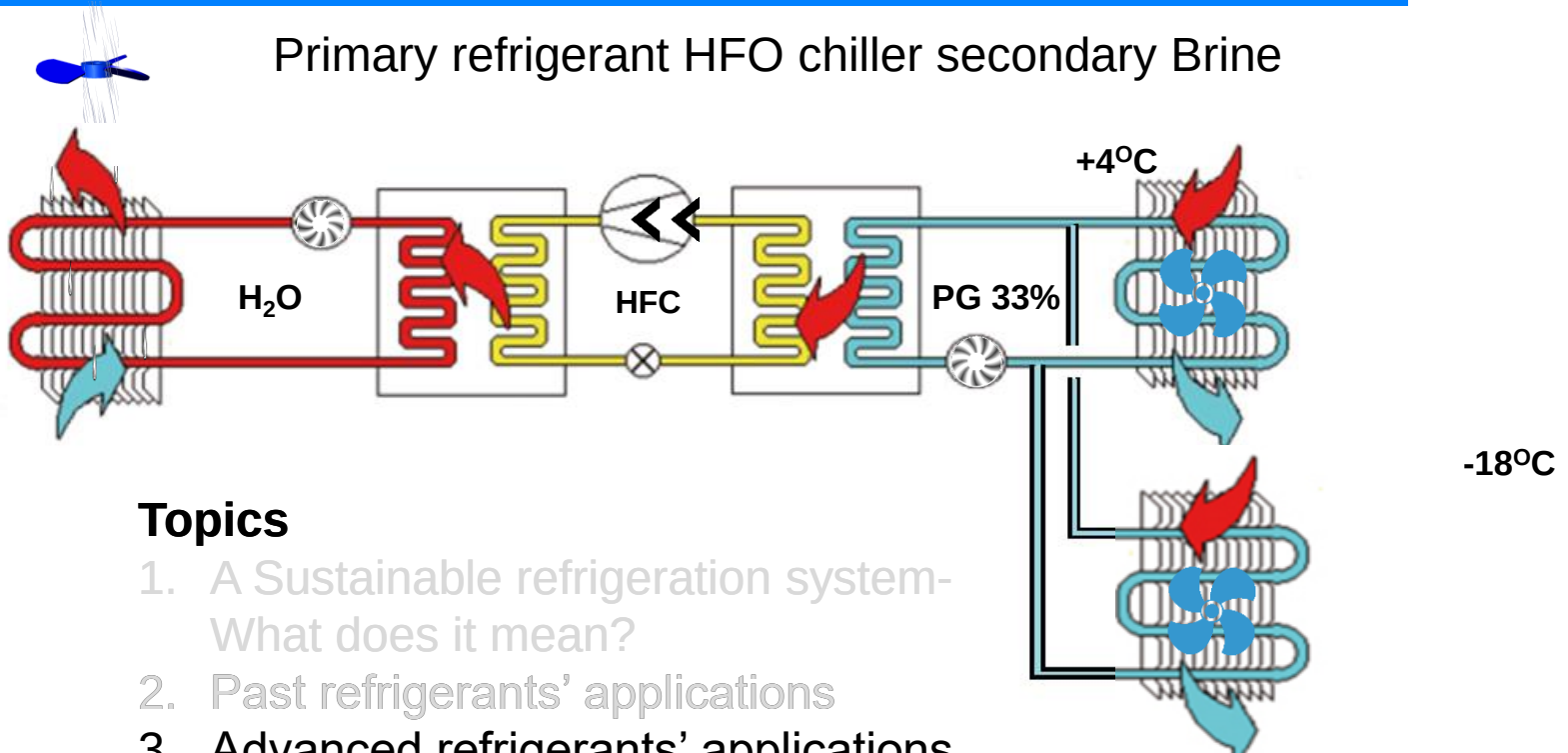
Past refrigerants' applications

Direct Expansion HFC refrigeration plant



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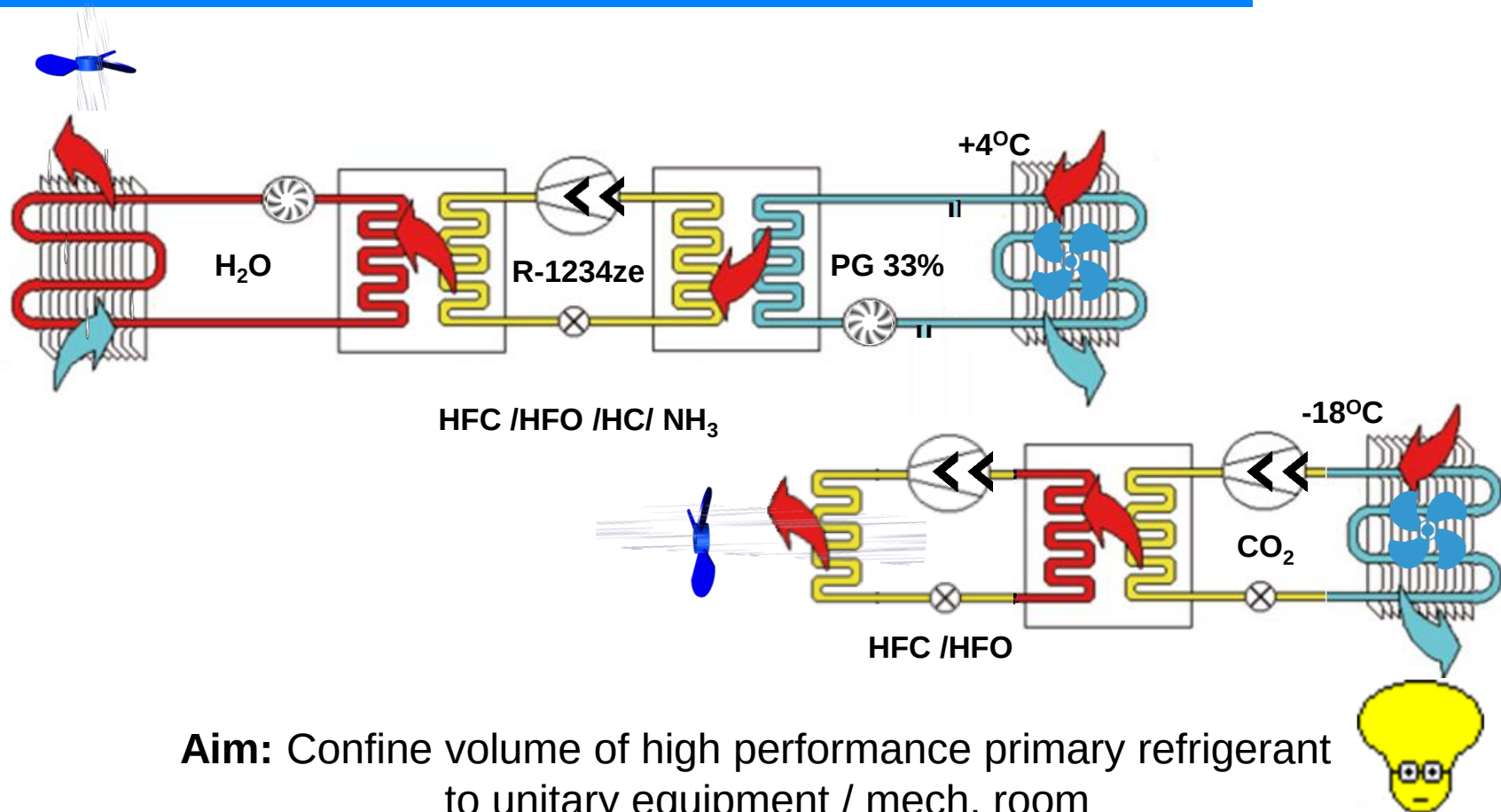
Past refrigerants' applications



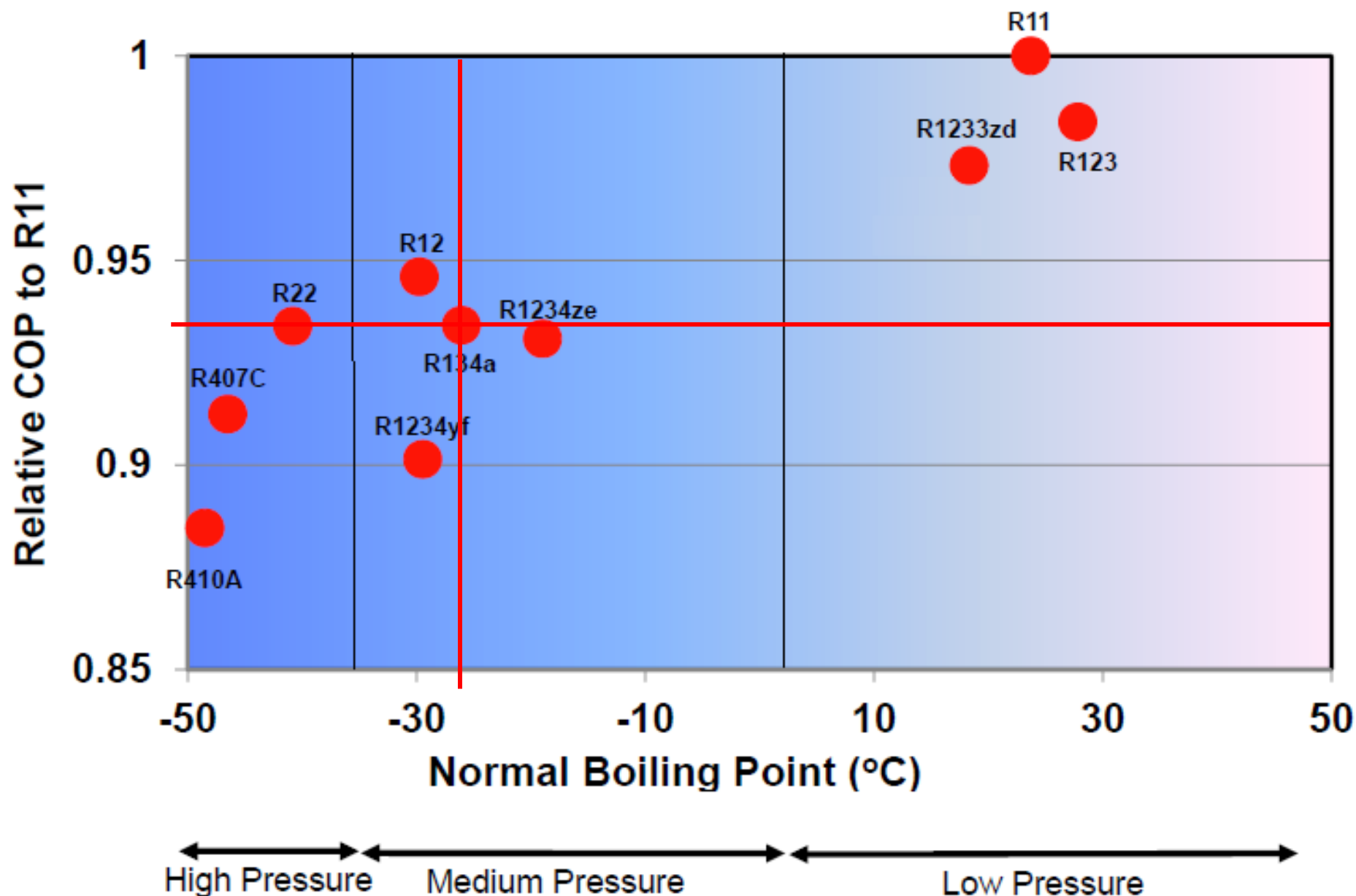
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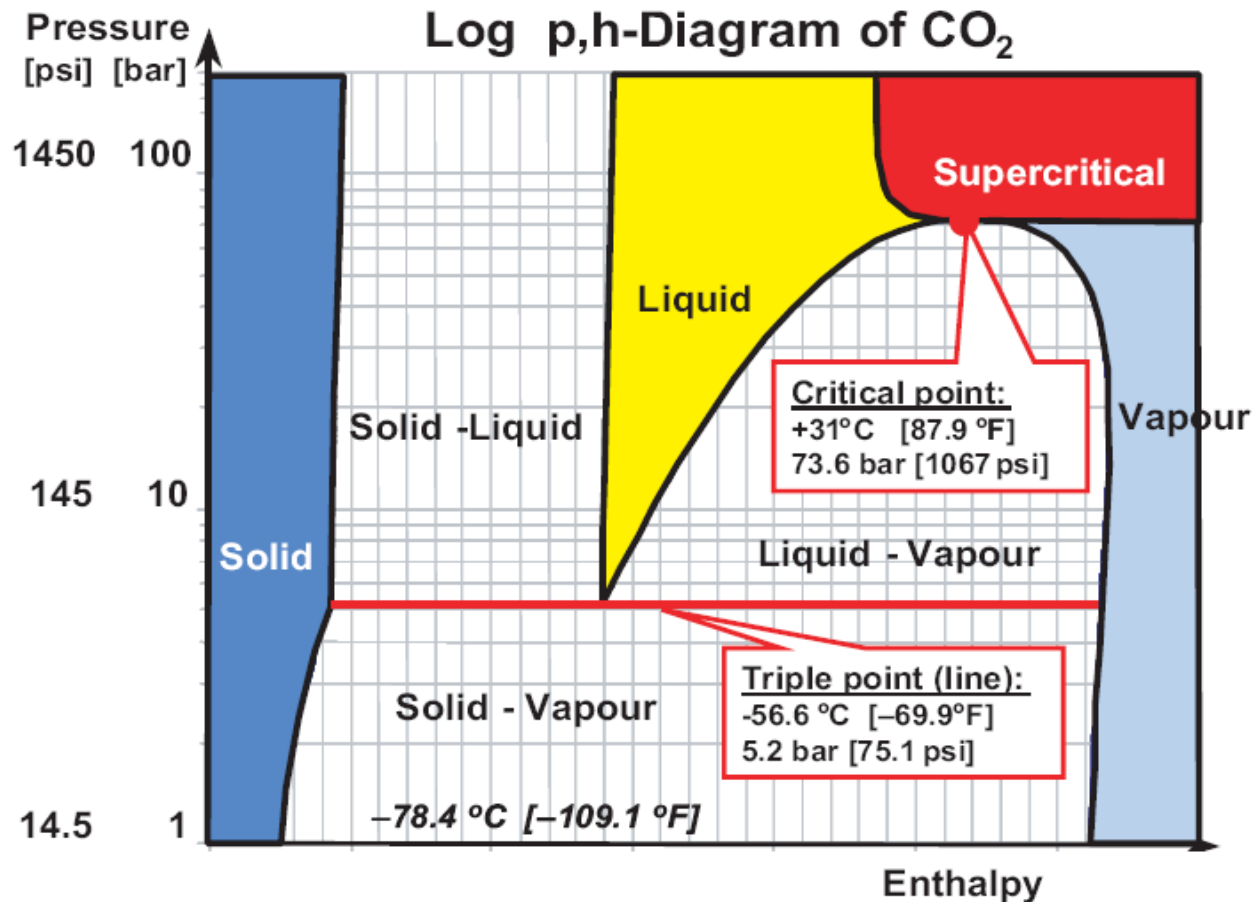
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Advanced refrigerants' applications



Refrigerant Cycle Efficiency





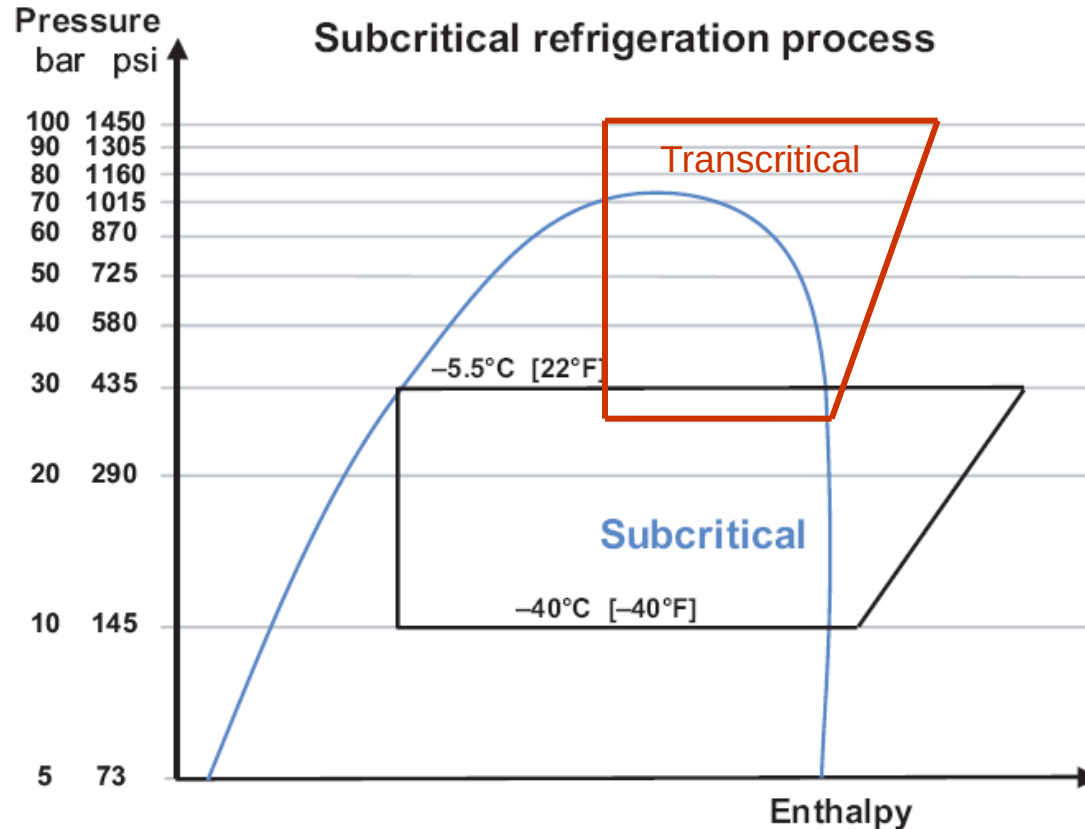
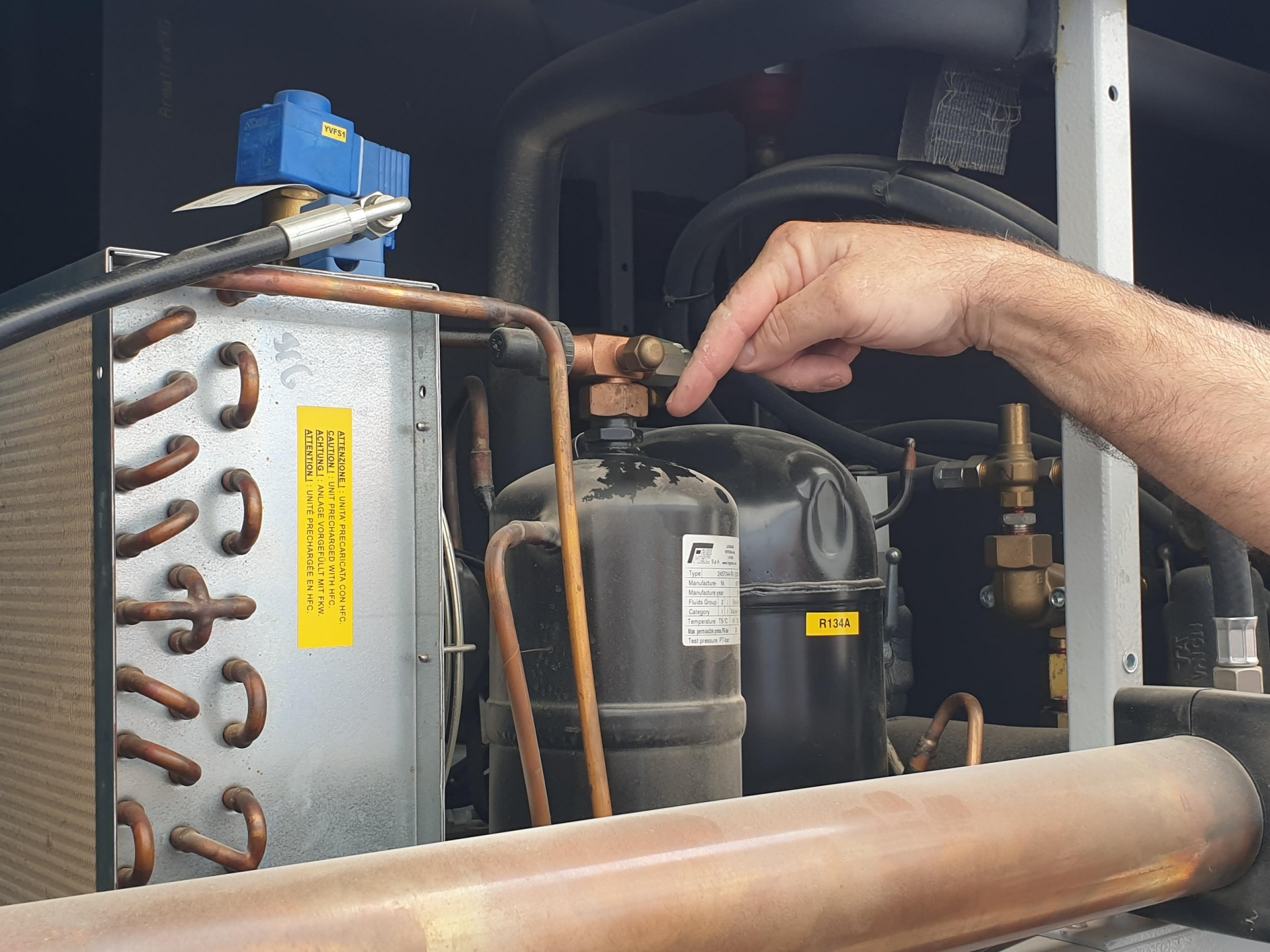


Figure 5

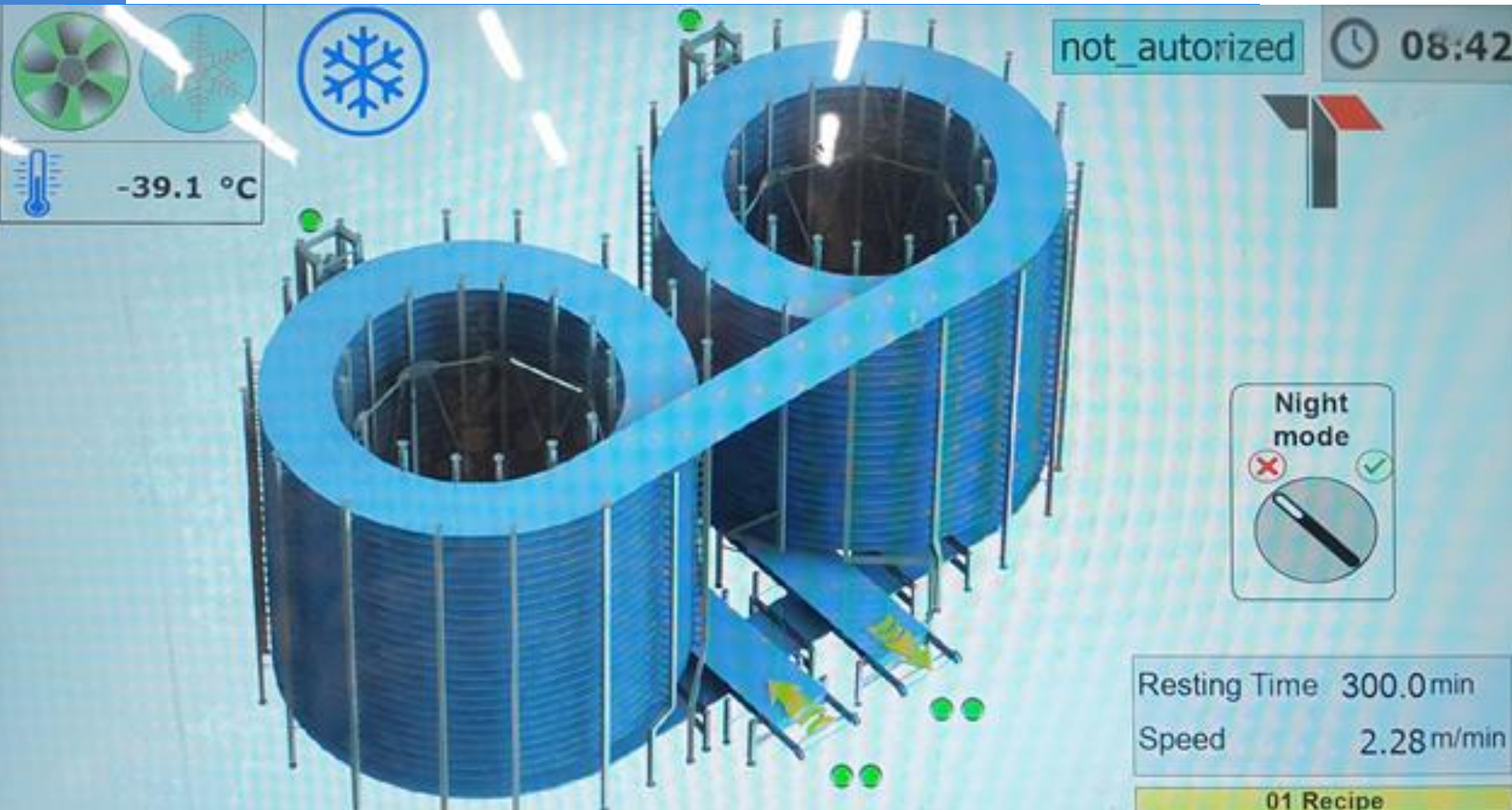


ATTENZIONE! : UNITA PRECARICATA CON HFC.
CAUTION! : UNIT PRECHARGED WITH HFC.
ACHTUNG! : ANLAGE VORGEFÜLLT MIT FKW.
ATTENTION! : UNITÉ PRÉCHARGÉE EN HFC.

Type 2457044-01
Manufacture No. 10
Manufacture year 2010
Fluids Group 21 / 22 / 23
Category 1 / 1 / 1 / 1 / 1 / 1
Temperature 75 °C / 165 °F
Max. permitted pressure 10 bar
Test pressure 27 bar

R134A

Case study at Soglowek 2000 plant



Aim: Confine volume of high performance primary refrigerant to unitary equipment / mech. room

Sustainability assessment

Primary (PG Chiller)- HFO

Secondary (Sub Critical DX)- CO₂

עלות

Affordability

LLCC

CO₂:

- 8 times smaller swept volume
- Lower size of components
- Low cost of refrigerant
- Higher COP

HFO:

- Higher cost of equipment
- Higher cost of refrigerant Vs. R134a

CO₂:

20% lower comp. power @ -40/-4°C Vs. NH₃

COP

HFO:

Make proper evaluation

Flammability

GWP

- R134a = 1300
- HFO < 1
- CO₂ = 1
- NH₃ = 0

Toxicity

- R134a = A1
- HFO = A2L
- CO₂ = A1
- NH₃ = B2L

Environment

סביבה

Safety

בטיחות

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