

Chillventa Specialist Forums 2024

Chillventa Fachforen 2024

**CONNECTING
EXPERTS.**





Shift your perspective

Danfoss Compressors:

Leading the way with Natural
refrigerant Solutions



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Compressors



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Head of Product Management /
BOCK® compressors

Leading the way with Natural Refrigerant Solutions



F-Gas is pushing HVAC market to adopt long term strategies and adopt natural refrigerants wherever it is feasible and makes sense.

01.



Decarbonization is key to sustainable future: for that Comfort Heat Pump is keystone solution.

02.



Industries are massive contributors to the global footprint, while many processes can be « cleaned » with existing technologies.

03.

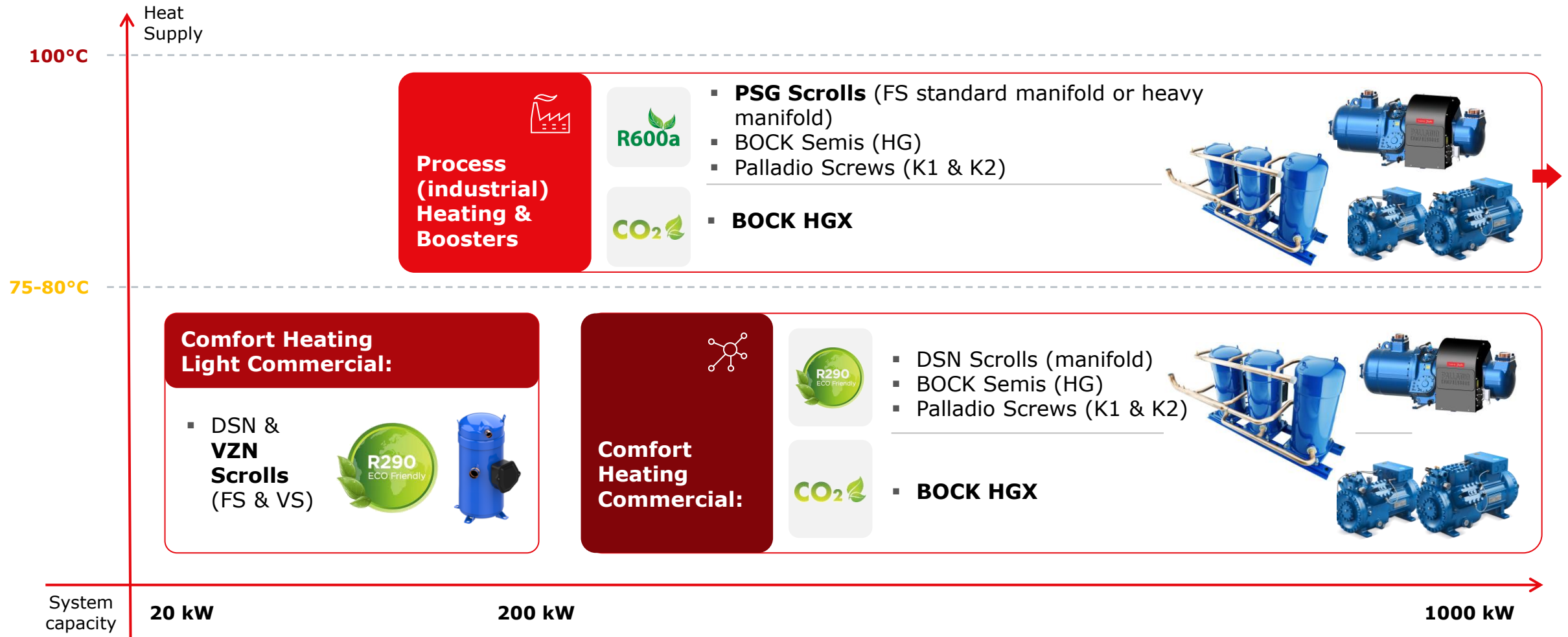
Danfoss Compressor portfolio and Roadmap answer that

Let's see how much that statement is true

What is new in the compressor field, and what about a quick field example?

Heat Pump Overview below 1 MW

A panel of compressor technologies for Natural Refrigerant



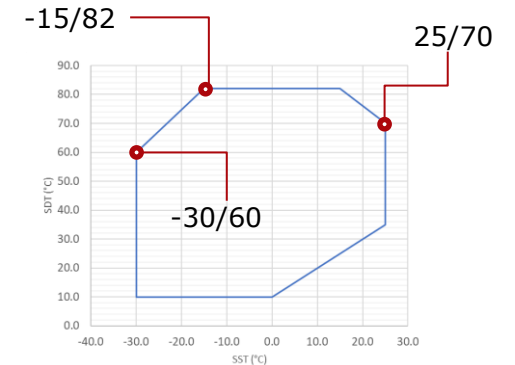
VZN /DSN R290 Scrolls ID Card

Medium pressure & low GWP compressors



Features & Benefits

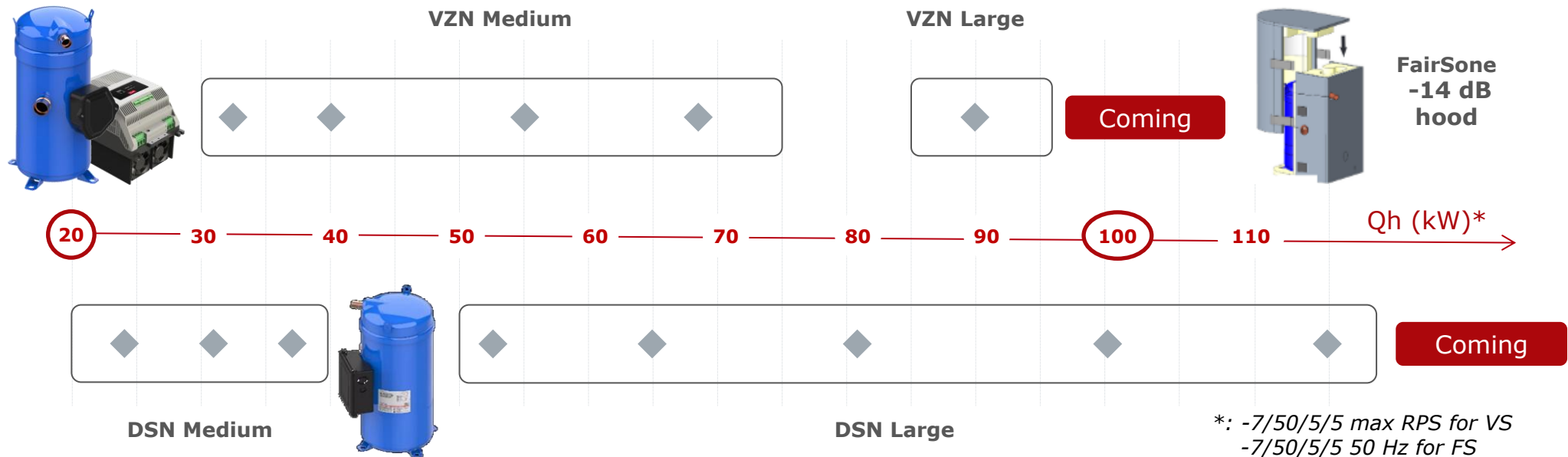
- Up to **80°C water supply**
- 20% -100% continuous speed modulation: **improved sCOP**
- **R290 optimized** and qualified for alternative HFO
- Low vibration & Noise, and improved by **14dB attenuation acoustic hood**
- **Paired and supported** with best-in-class inverter



Variable Speed



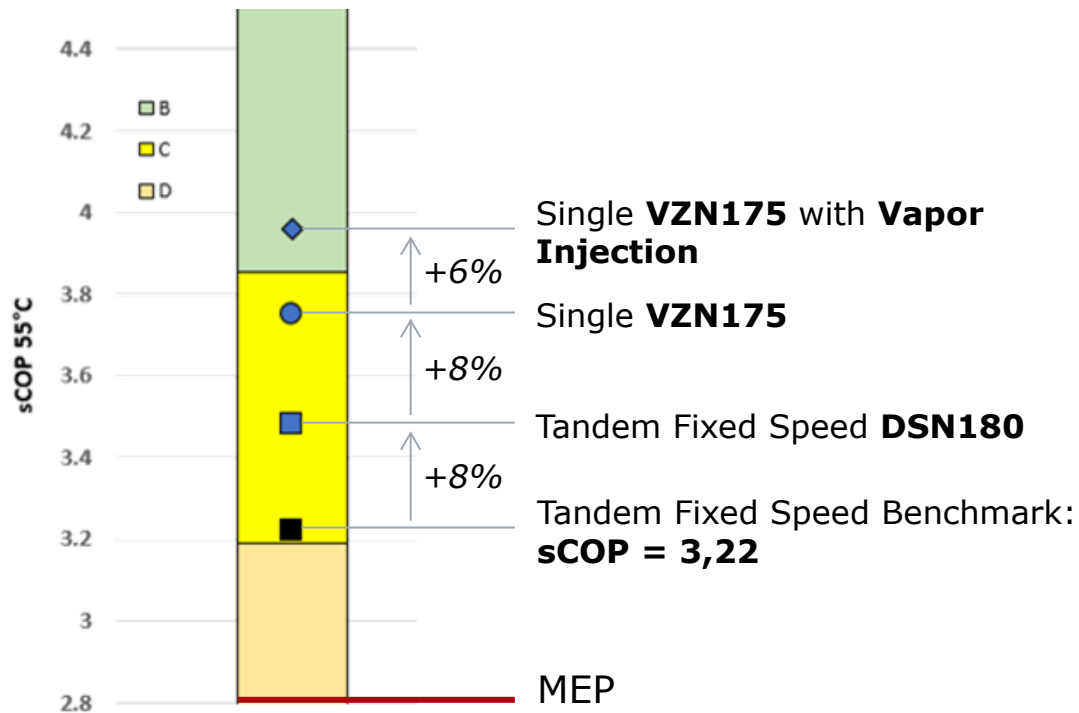
Fixed Speed



VZN R290 Scrolls

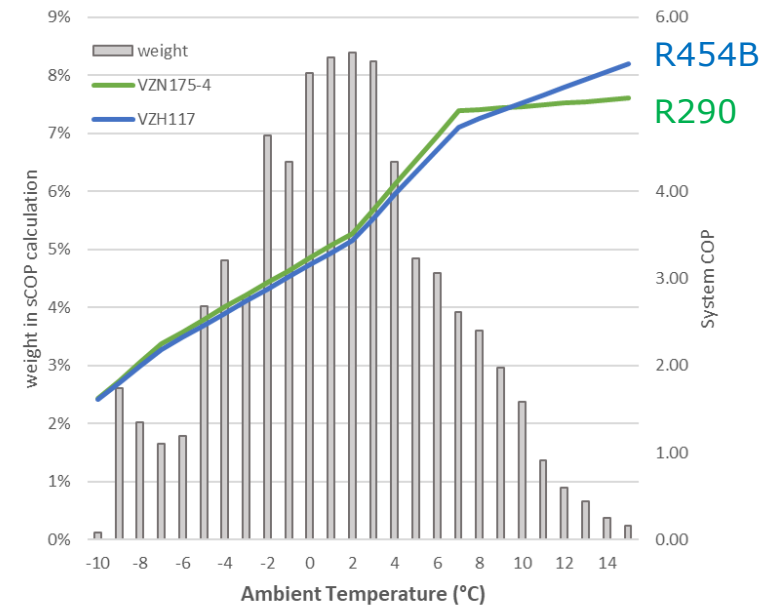
Performance status: sCOP and noise level

sCOP (AWHP) simulation and ENER lot 1 positioning



* Energy labelling according to draft ENER lot 1 2025

- ✓ **sCOP R290 & high density R454B are equivalent**
- ✓ **Going NatRef brings no efficiency penalty on the system level**



sCOP calculation according to EN14825
R290 vs R454B solutions on standard average climate (EUR)



VZN175 based Air to Water HP

Why HPs are so relevant for the decarbonization?



VS



Avoided Emissions
(validated by Force Technology)



01.

Scope 1 and Scope 2 Emission from benchmarking on declared EPD:
Boiler wins, largely



02.

Scope 3 based on grid emission factor calculation (IEA) and sCOP values:
HP compensates scope 1 & 2 in 3 months



03.

A VZN175 based AWHP allows **477tCO₂eq** of avoided emissions*

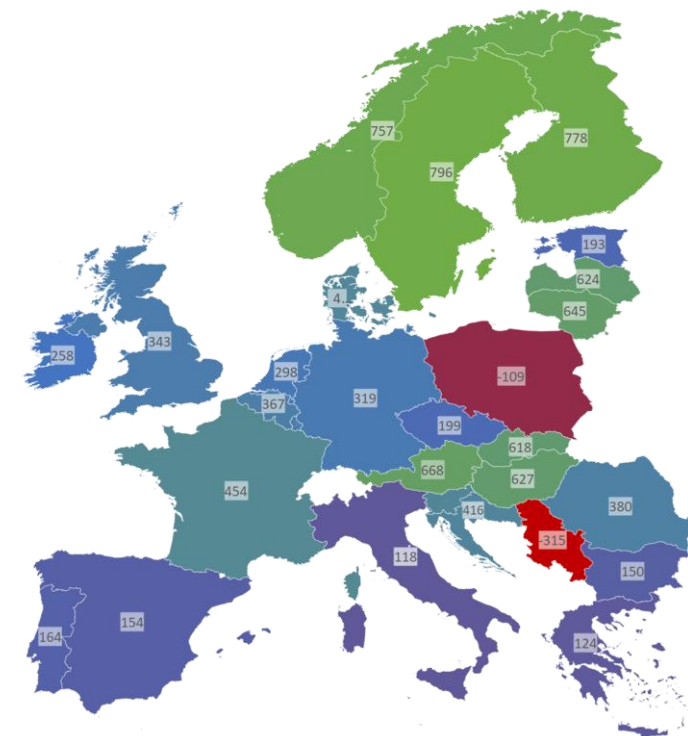


04.

This is **~15 electrical vehicle**** over 200 000km, or almost **50 years of emissions for a single individual** in Europe

*weighted over annual heating requirement in each country, for 15 years duration, compared to a conventional gas boiler

** source Carbone 4, assuming 32,4tCO₂ saving over 200 000km from thermal to electrical in a Tesla3 type car



Avoided emissions impact
per country in Europe

■ >700kgCO₂/kW/year
■ >300kgCO₂/kW/year
■ Negative impact

PSG ID Card

High Temperature HPs

Release March-25

R600a



Features & Benefits

- Up to **100°C water supply**
- High PR optimized design
- **R600a & HFO** qualified (R1234ZE/R515B)
- Low vibration (50% less) & noise design
- Oil Level Switch for improved reliability
- **Manifold** up to trios, more with active oil management

3x PSG800 = 440 kW*



→ 90°C water
← 40°C water



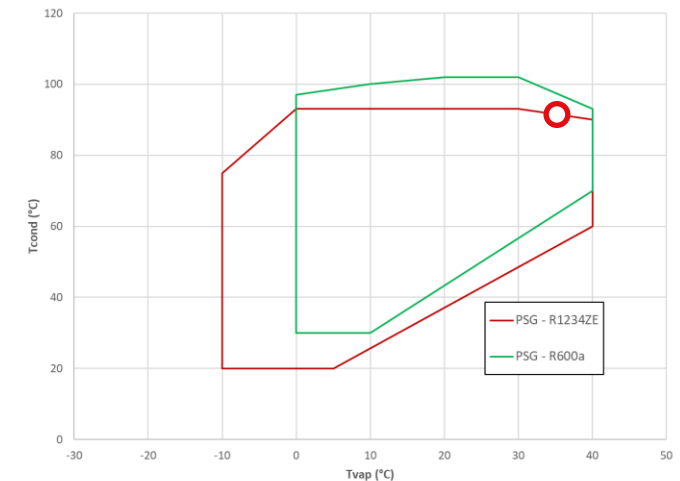
PSG605

PSG800

100

150

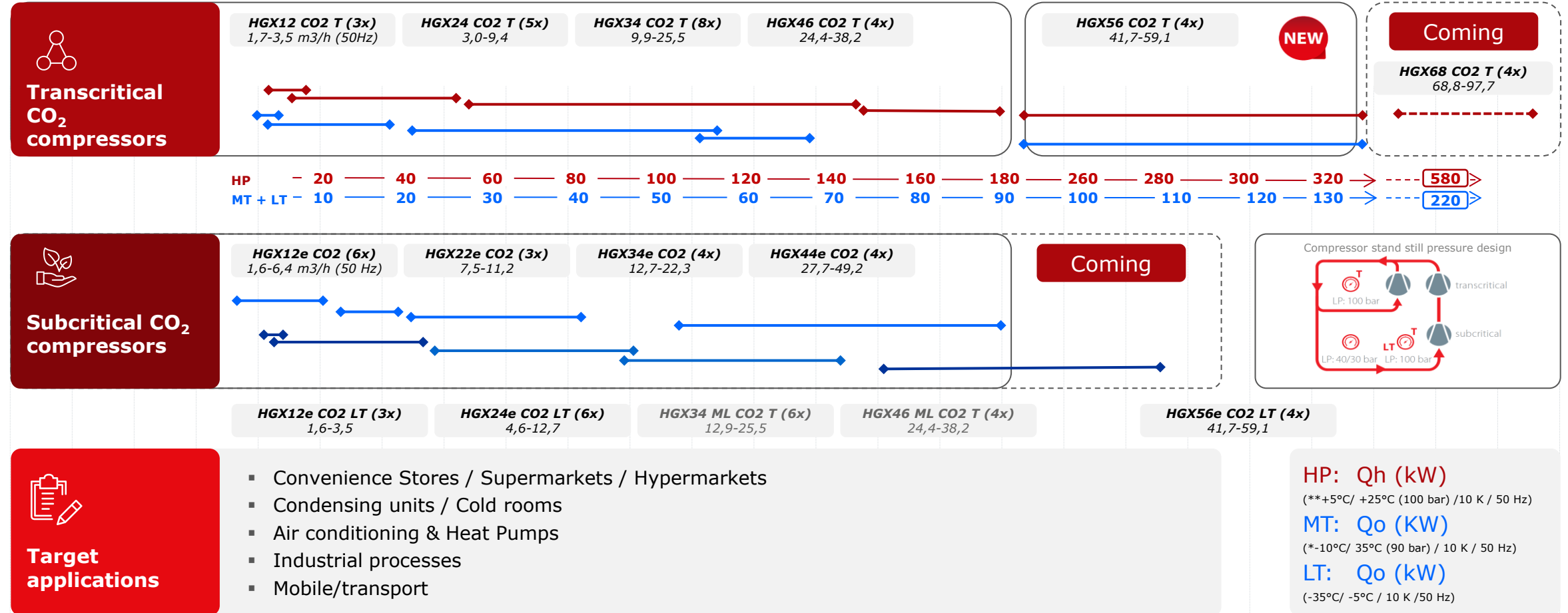
Displacement
(m³/h)



*using R1234ZE, 330kW with R600a

CO₂ BOCK® Compressors Ranges

Transcritical & Subcritical



Main Benefits

BOCK® CO₂ compressors



Lowest energy and operating costs

1. **3-6% higher efficiency** to market standard*
2. **+5%** increase with **LSPM motor** technology*
3. **ASERCOM certification** for different compressor types*
4. **Advanced** holistic compressor design



Wide range of applications

1. **Increase operating limits** (lower pressure ratio, higher suction pressure...)
2. **Wide capacity control** – for flexible part & full load
3. **Optimized for heat pump applications** - higher source and sink temperature (>90°C).

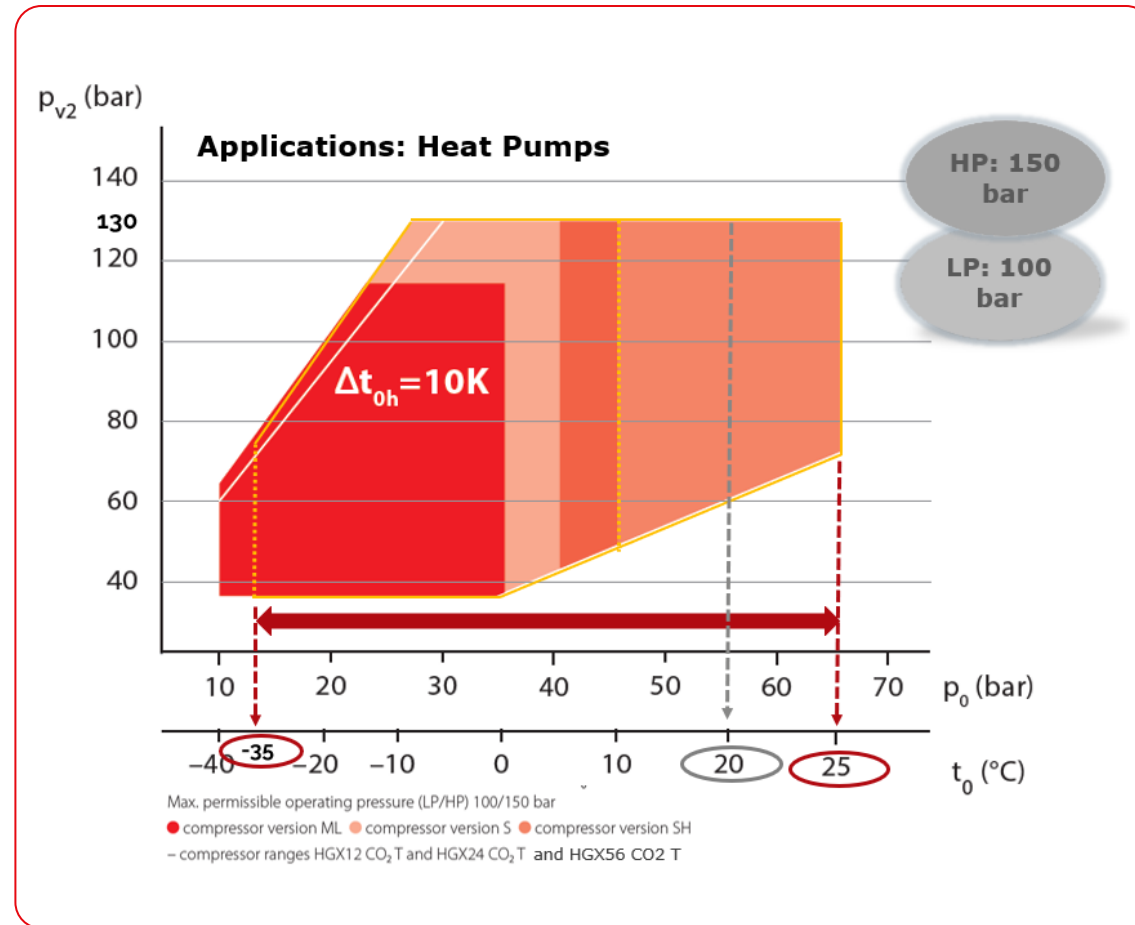


Outstanding running comfort

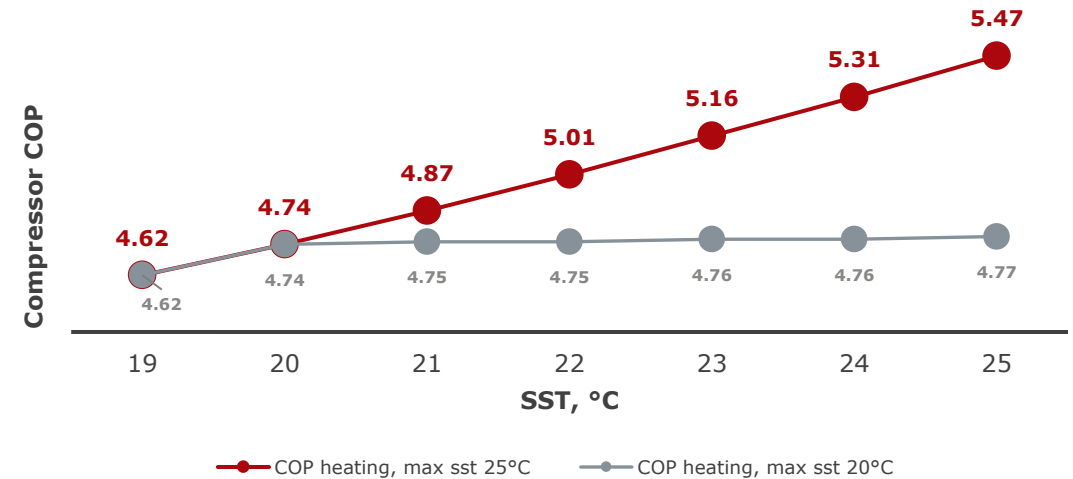
1. **Lowest pulsation and vibration**
2. **Lowest oil carry over**
<0,2 % @ 50 Hz
3. **Serviceable compressors**

**Depend on size and operating point*

Lowest energy and operating costs



max. SST 25°C vs. 20°C



Danfoss BOCK® / HGX46 / 345-4 SH CO₂ T

Operating conditions: Gas cooler out=40°C, Discharge Pressure=90 bars, SSH=10K

COP improvement of up to 15% for higher SST with 25°C (77°F)



Danfoss BOCK® CO₂ compressors - What else do you get?



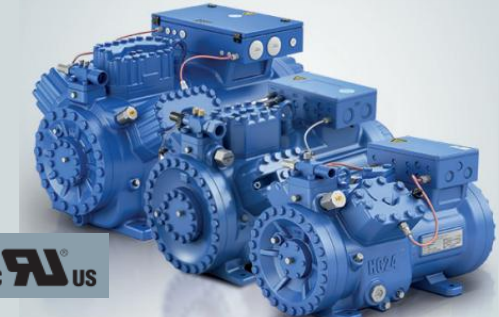
Pre-mounted Danfoss COM oil level regulator



flexxCO₂NTROL – the capacity regulator for CO₂ compressors



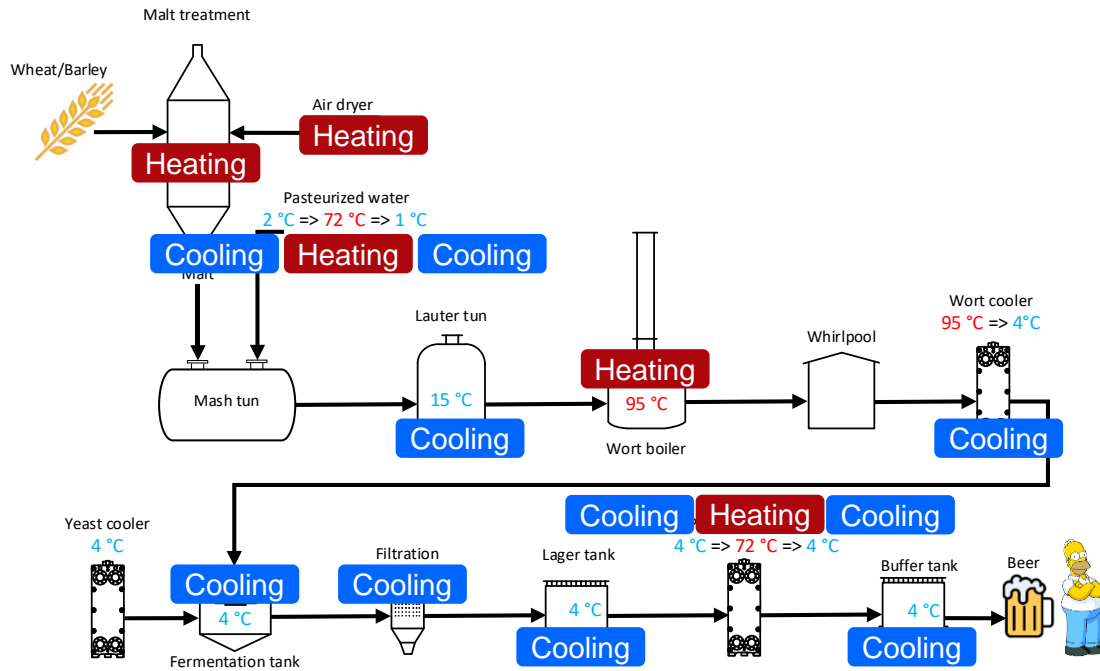
Compressors with LSPM motors for highest efficiency



UL-recognized CO₂ compressors series

Where can we start industrial decarbonization?

Food & Beverage: f.i. Brewery



Simplified process diagram in Brewery

Brewery processes



Consecutive **cooling and heating** processes



Heating processes can be covered **< 100°C**



Traditionally: cooling & process heating disconnected + **Fossils are burned** for process heat



Decarbonize: We can connect cooling and process heat, and disconnect from fossils!



Potential: how many micro and craft beer breweries (<1MW request) are out there?
EU: ~ 6,000 in 2022 (statista.com)
USA: ~ 10,000 in 2022 (brewersassociation.org)

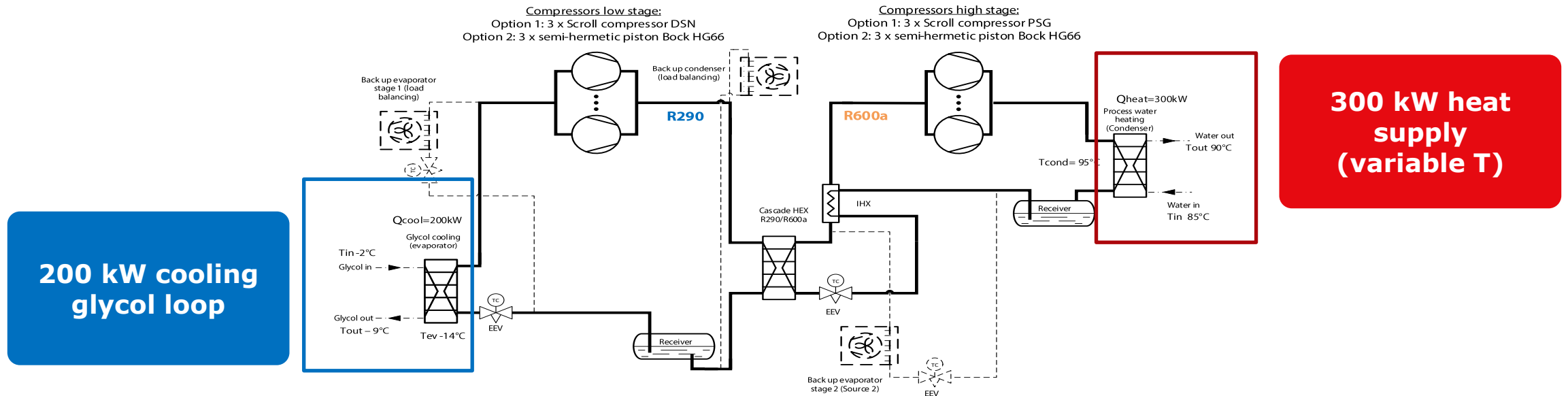
Layout example for cooling and process heating in Food & Beverage



OR



- ✓ **Both Scrolls and Pistons** are now applicable for process from Cooling to Heating below 100°C
- ✓ Choice of either one or the other **depends on end-customer or OEM preference** according to **expertise, ROI, service** activities...
- ✓ Now **we have options to accelerate Industrial processes decarbonization**





ENGINEERING **TOMORROW**

Thank you for your attention!
Let's meet at the **Danfoss Booth Hall 7, booth 251**

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