

Integrally Geared Compressors for Supercritical CO₂



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Integrally Geared Compressors for Supercritical CO₂



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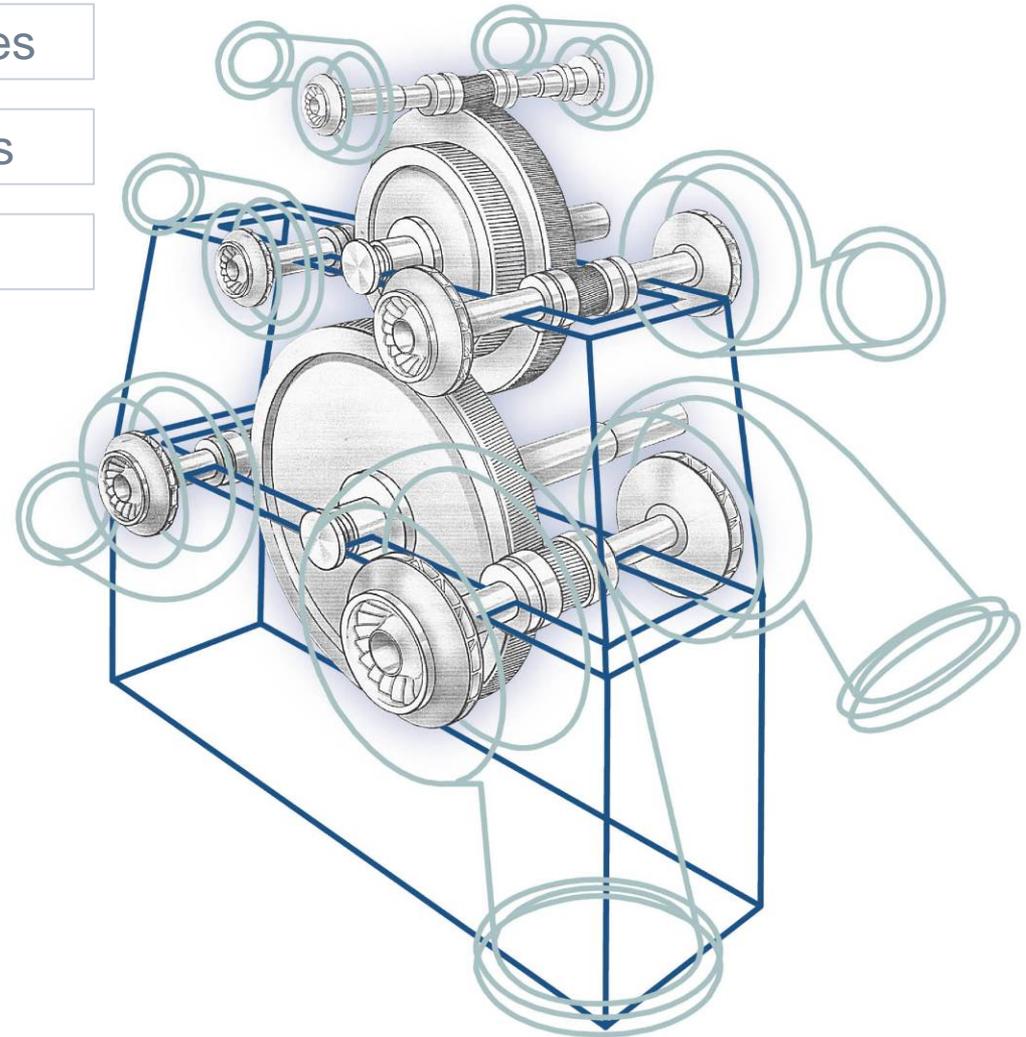
Integrally Geared Compressors for Supercritical CO₂



1 CO₂ Sources and Properties

2 CO₂ Compression Systems

3 Product Development

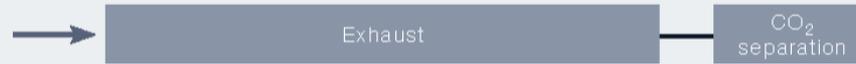


Integrally Geared Compressors for Supercritical CO₂



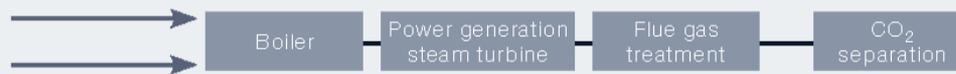
Industrial Application

Cement and steel industry, petrochemicals



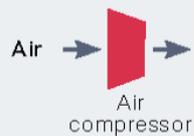
Conventional Power Plant

Coal

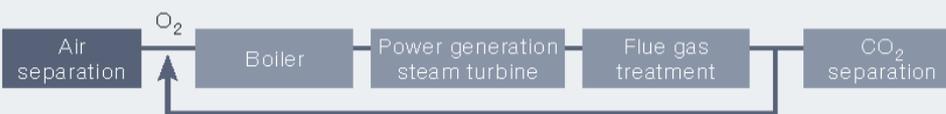
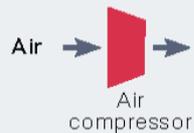


Air

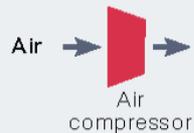
Integrated Gasification Steam Cycle (IGSC)



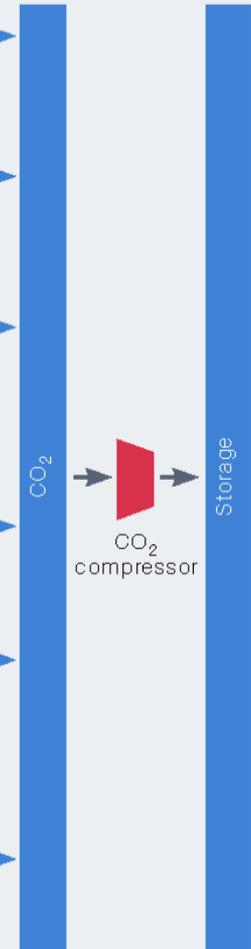
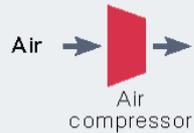
Oxyfuel



Integrated Gasification Combined Cycle (IGCC)



XTL, Coal Gasification

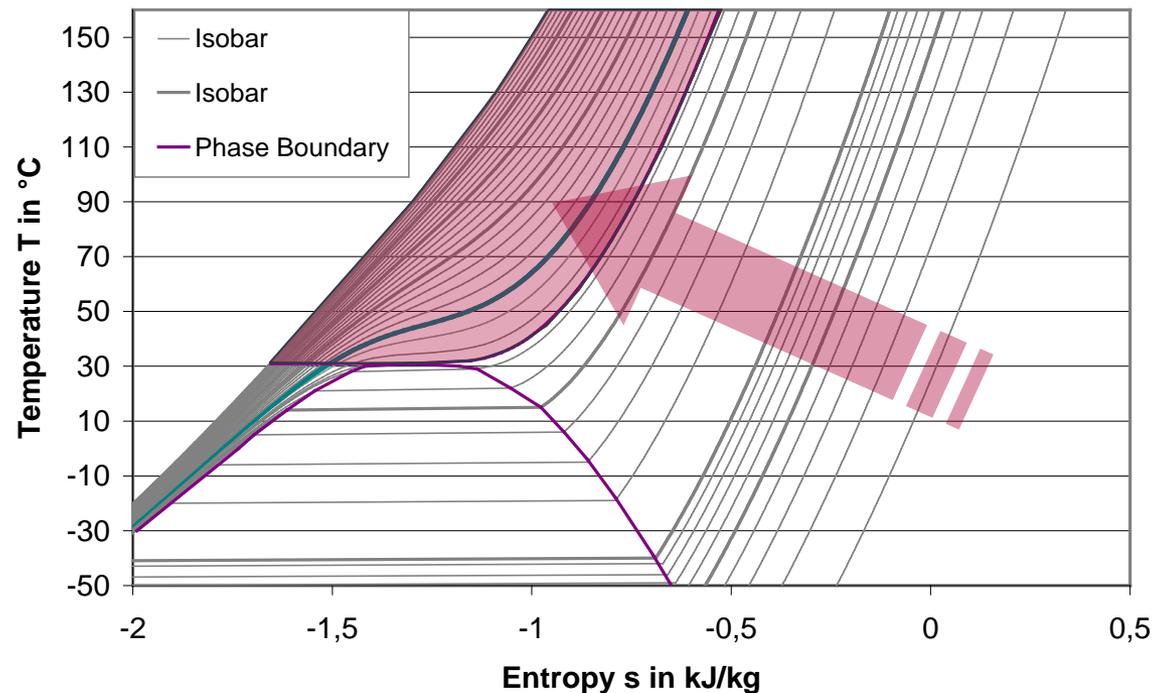


Integrally Geared Compressors for Supercritical CO₂



High-Pressure CO₂ means:

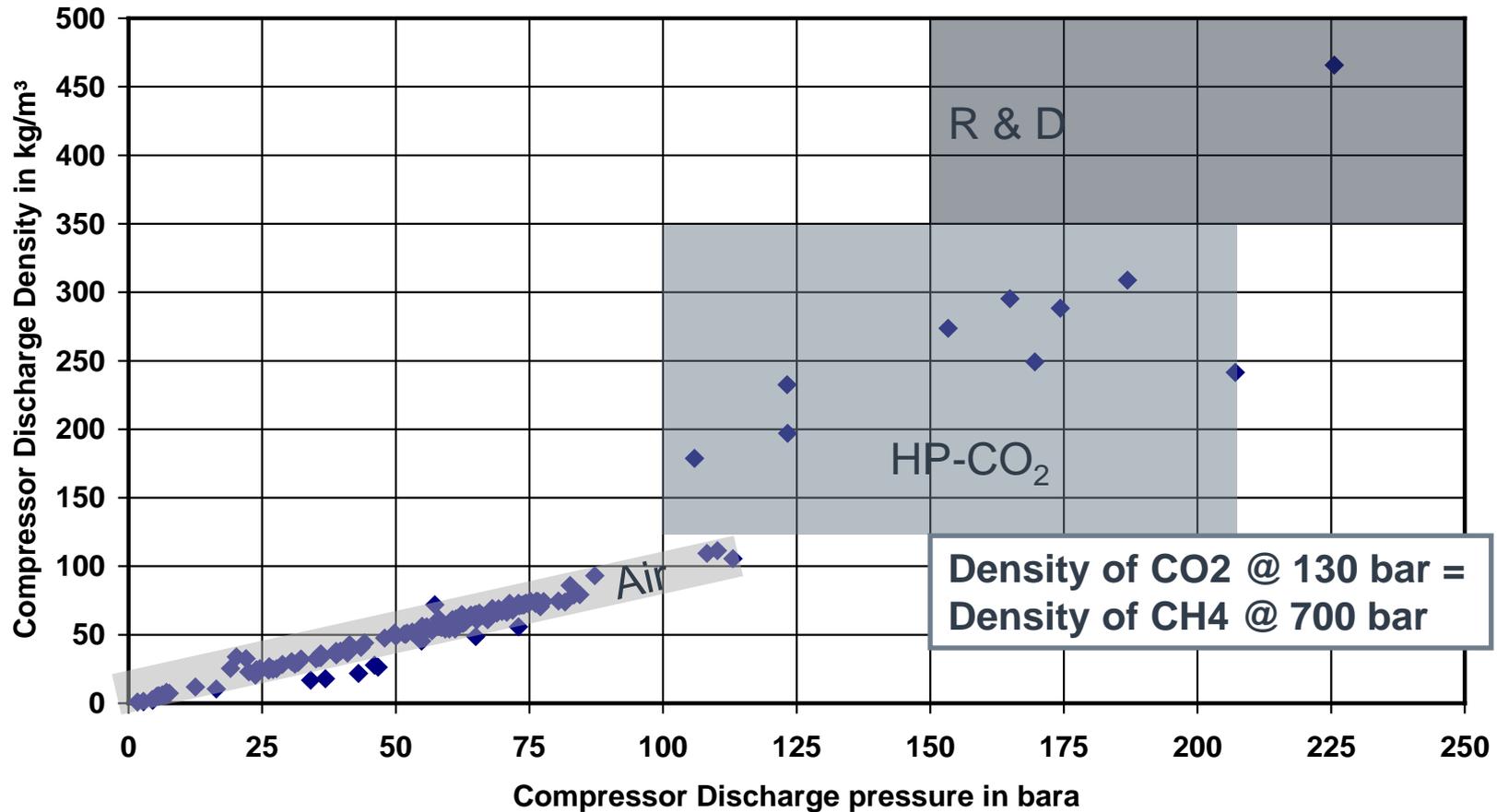
- Discharge pressure > 100 bara
- Very low compressibility factors at moderate pressures
- Compression from gas-phase to supercritical phase
- Very high density
- Applications:
EOR / CCS / UREA



Integrally Geared Compressors for Supercritical CO₂



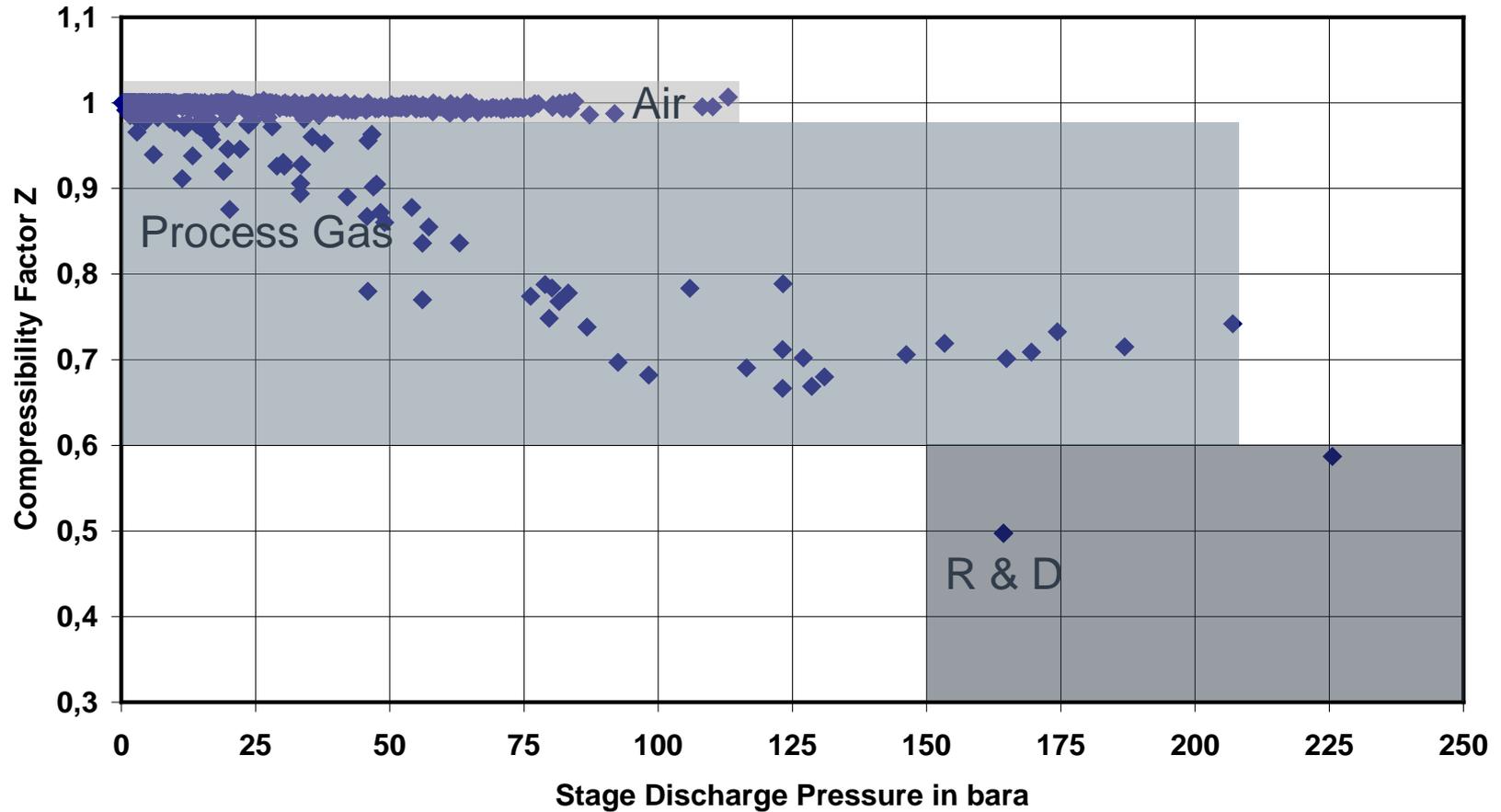
Pressure-Density-Chart



Integrally Geared Compressors for Supercritical CO₂



Pressure - Compressibility - Chart



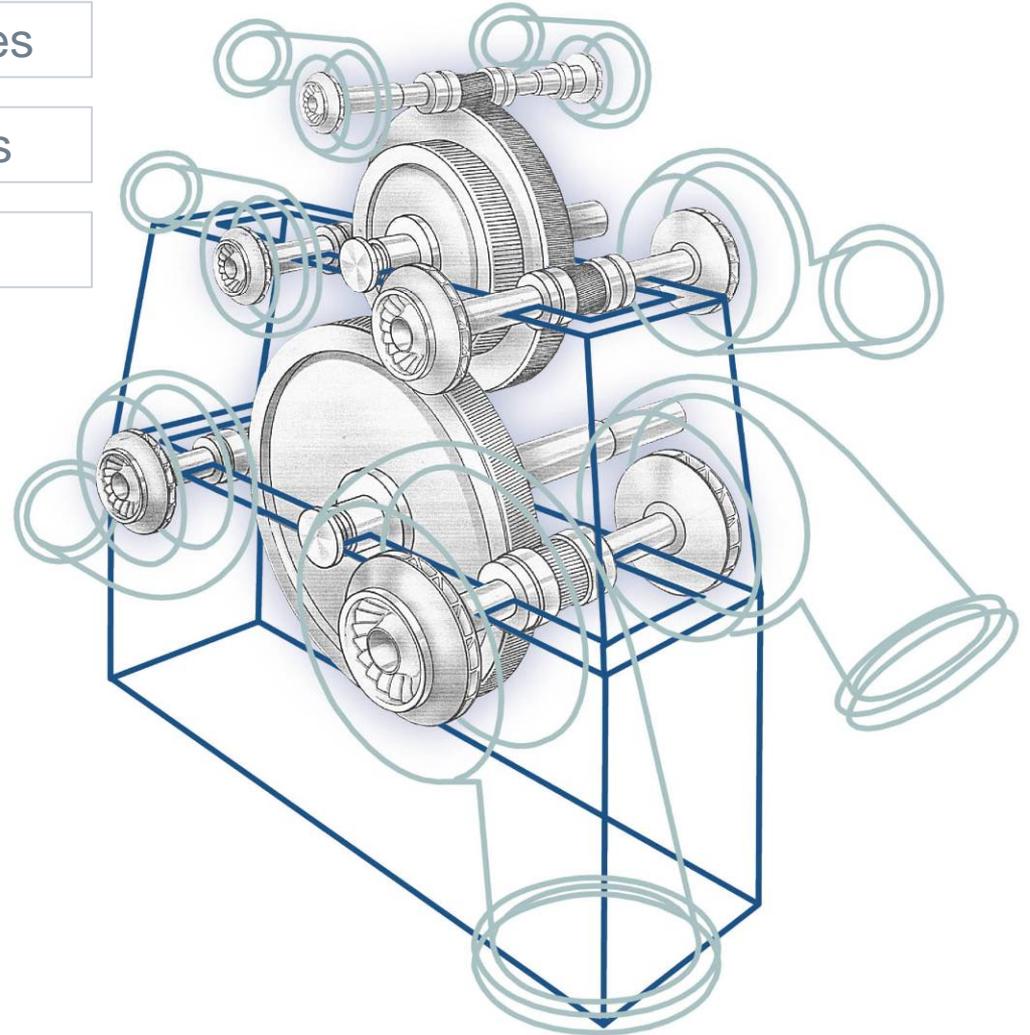
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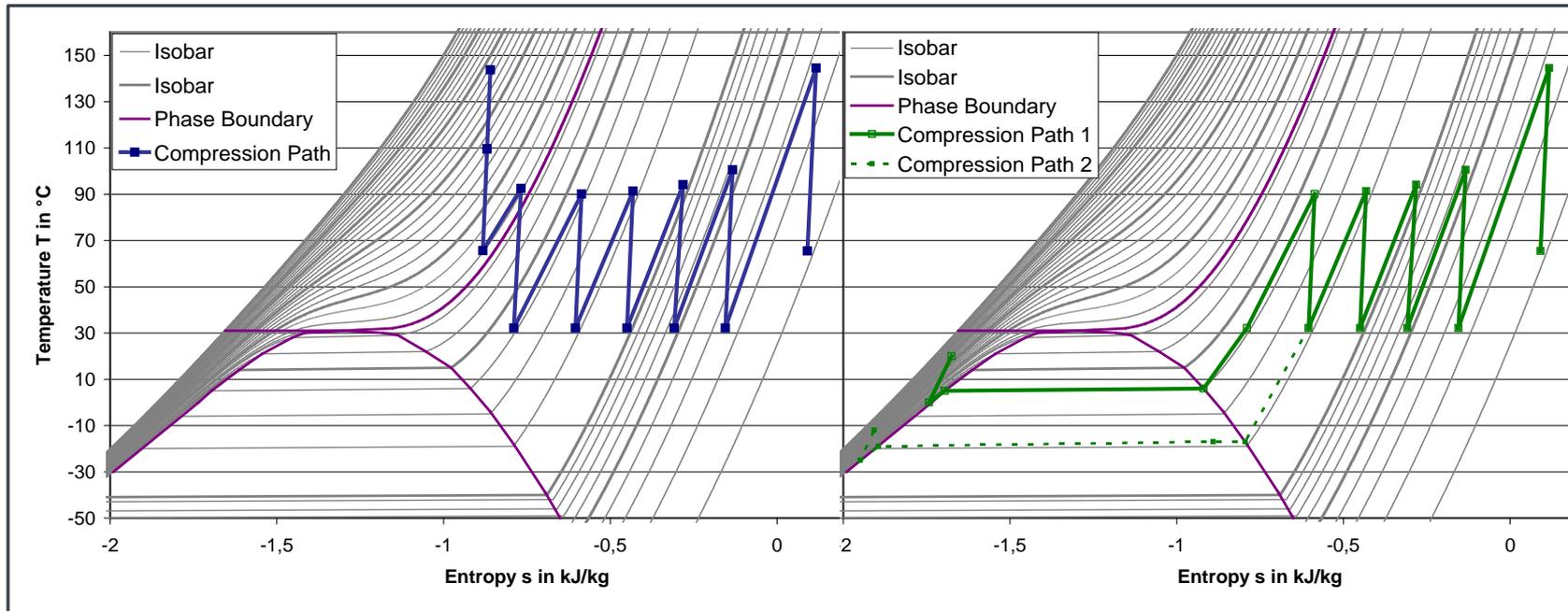


Different compression concepts:

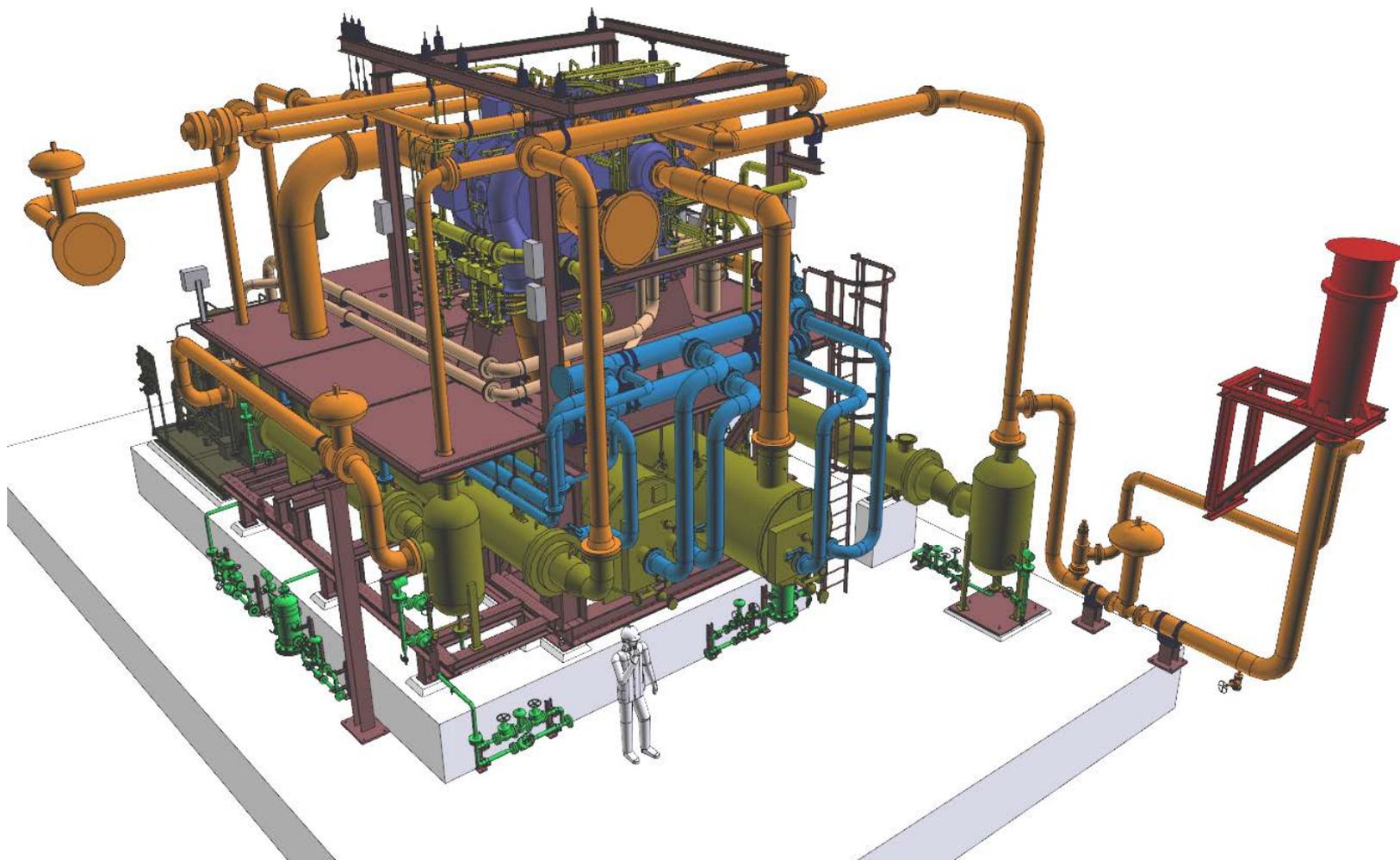
Compression from gas-phase to 200 bara (above critical point)

Gas phase only

Gas & liquid



Integrally Geared Compressors for Supercritical CO₂



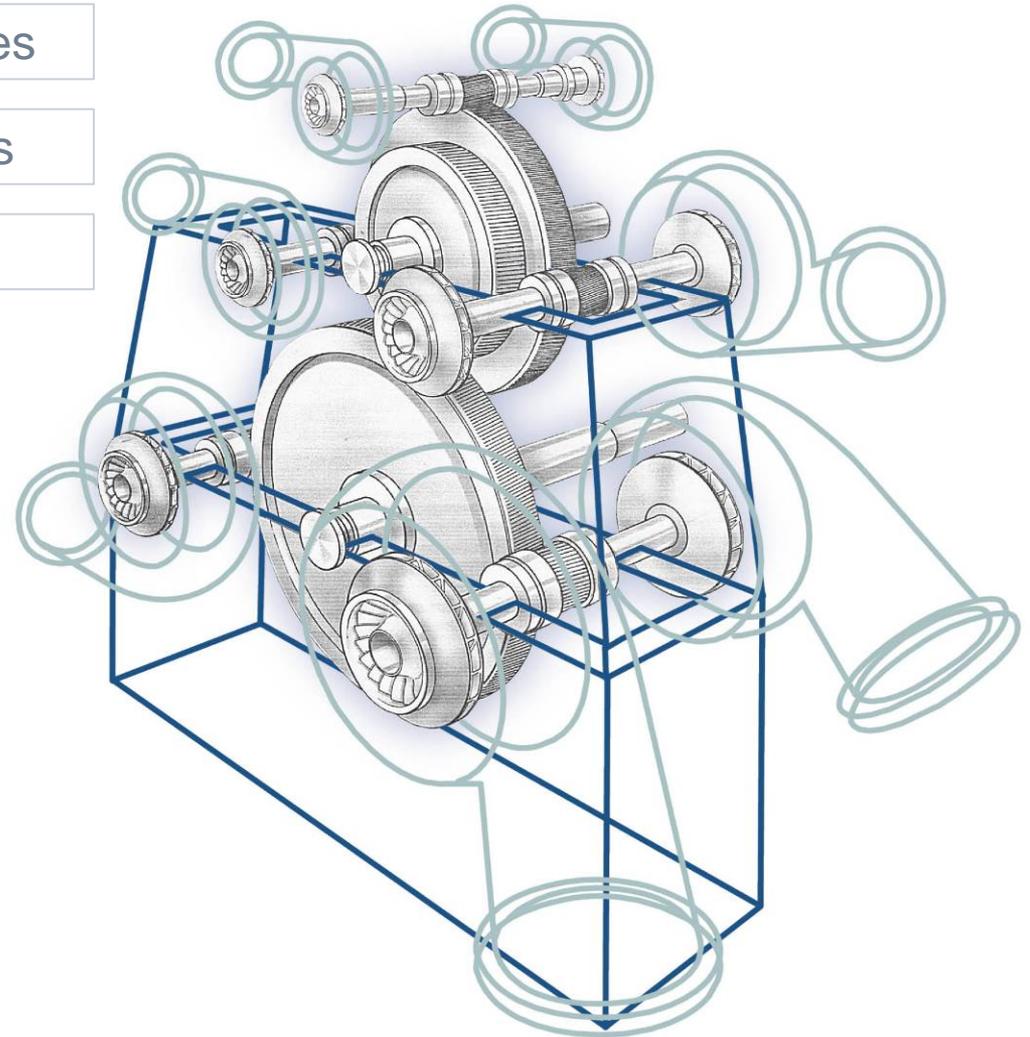
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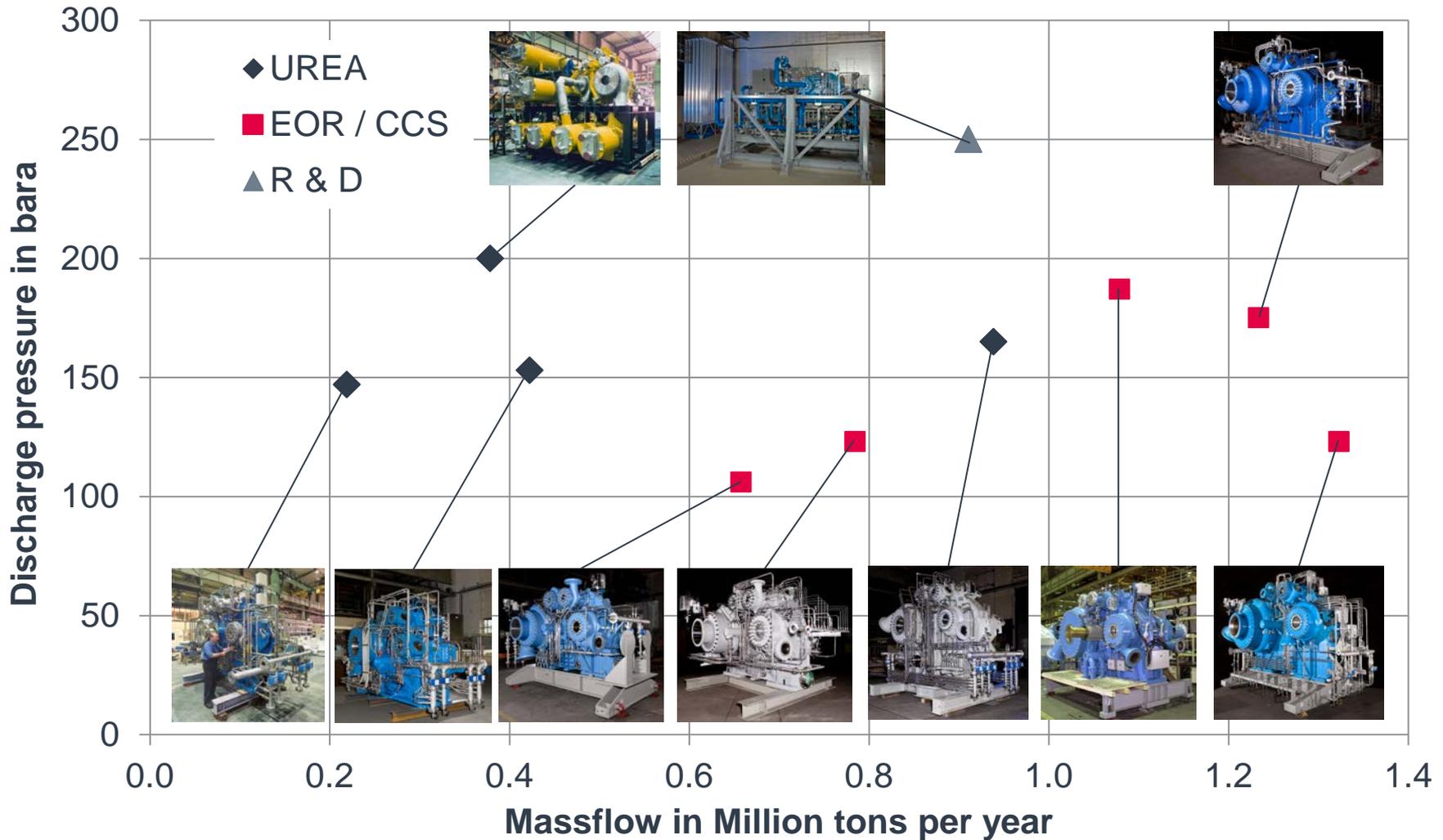


More than 20 years of experience, 450.000 operating hours

and dedicated research



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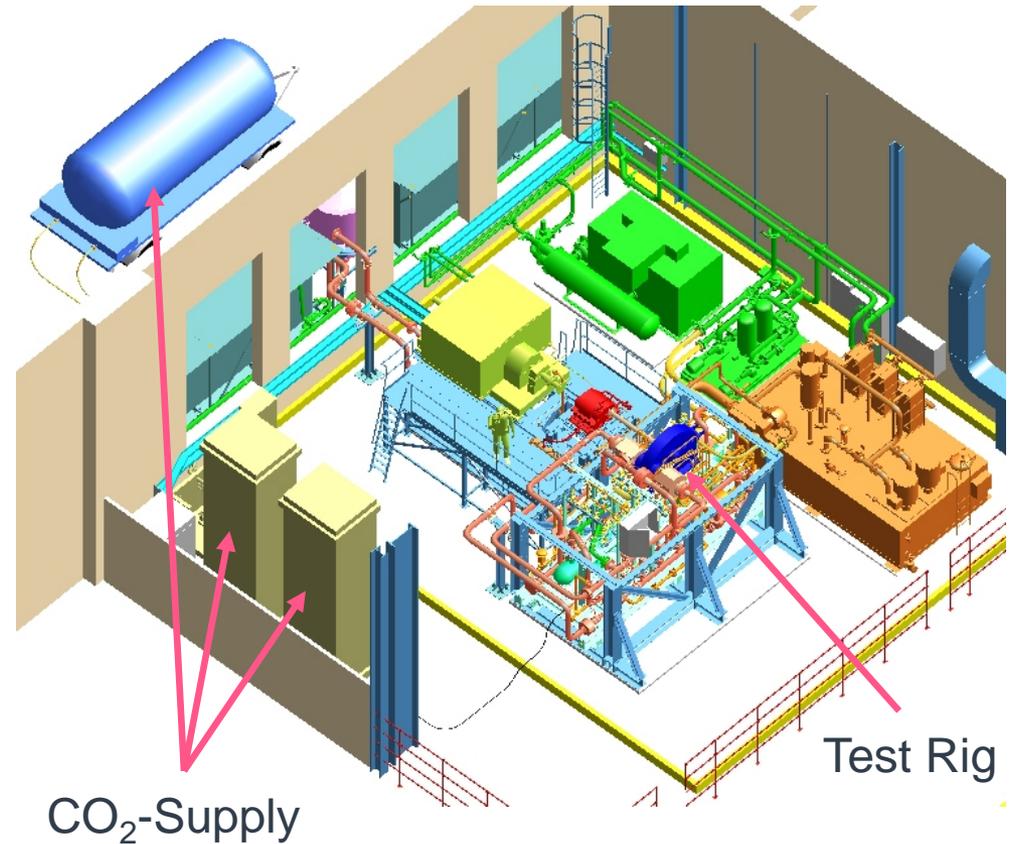


Integrally Geared Compressors for Supercritical CO₂



R&D project CORA (CO₂ Research Rig for Advanced Compressors)

- Liquid-CO₂ from tank
- High pressure closed loop
- Single lift unit
- 2 Stages
- MAWP: 250 bara
- 1 Cooler



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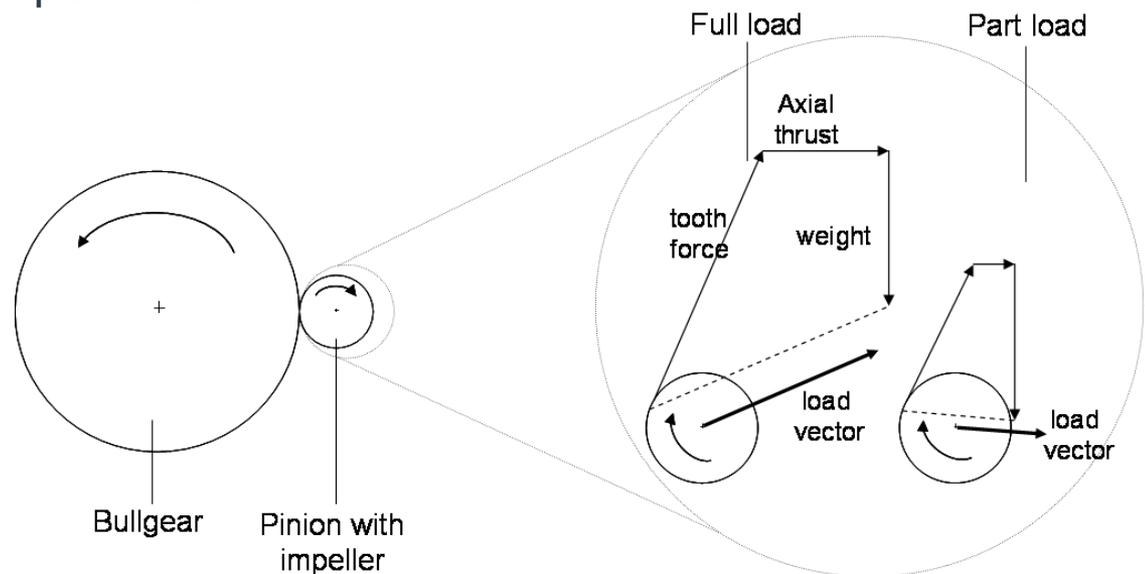
Integrally Geared Compressors for Supercritical CO₂



R&D project CORA (CO₂ Research Rig for Advanced Compressors)

- High-pressure tests for CO₂-compressor components
- Development of stages for CO₂-compressors
- Investigation of CO₂-compressor behaviour in the region of the critical point
- Development of inlet guide vanes for very high inlet pressures
- Full load testing of gear components
- Improving:

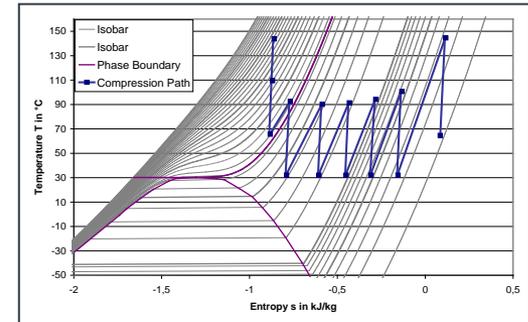
Bearing design
Static seals
Shaft seals
Maintainability



Integrally Geared Compressors for Supercritical CO₂



- HP-CO₂-compression is a complex task
- Integrally geared compressors (RG's) are very flexible, save investments and operating costs
- 450.000 operating hours with RG-type in HP-CO₂ compression
- A dedicated HP-CO₂ test rig for further design improvements



Questions please



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