INTRODUCTION TO DANFOSS TURBOCOR COMPRESSORS

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David Williamson
Sales Manager – Europe & Middle East region

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Danfoss Turbocor Compressors

- Agenda
  - Introduction
  - The Turbocor portfolio
  - Chiller design considerations
  - Typical chiller EER/ESEER
  - Danfoss Turbocor with HFO refrigerants
  - Summary
  - Question and answer session

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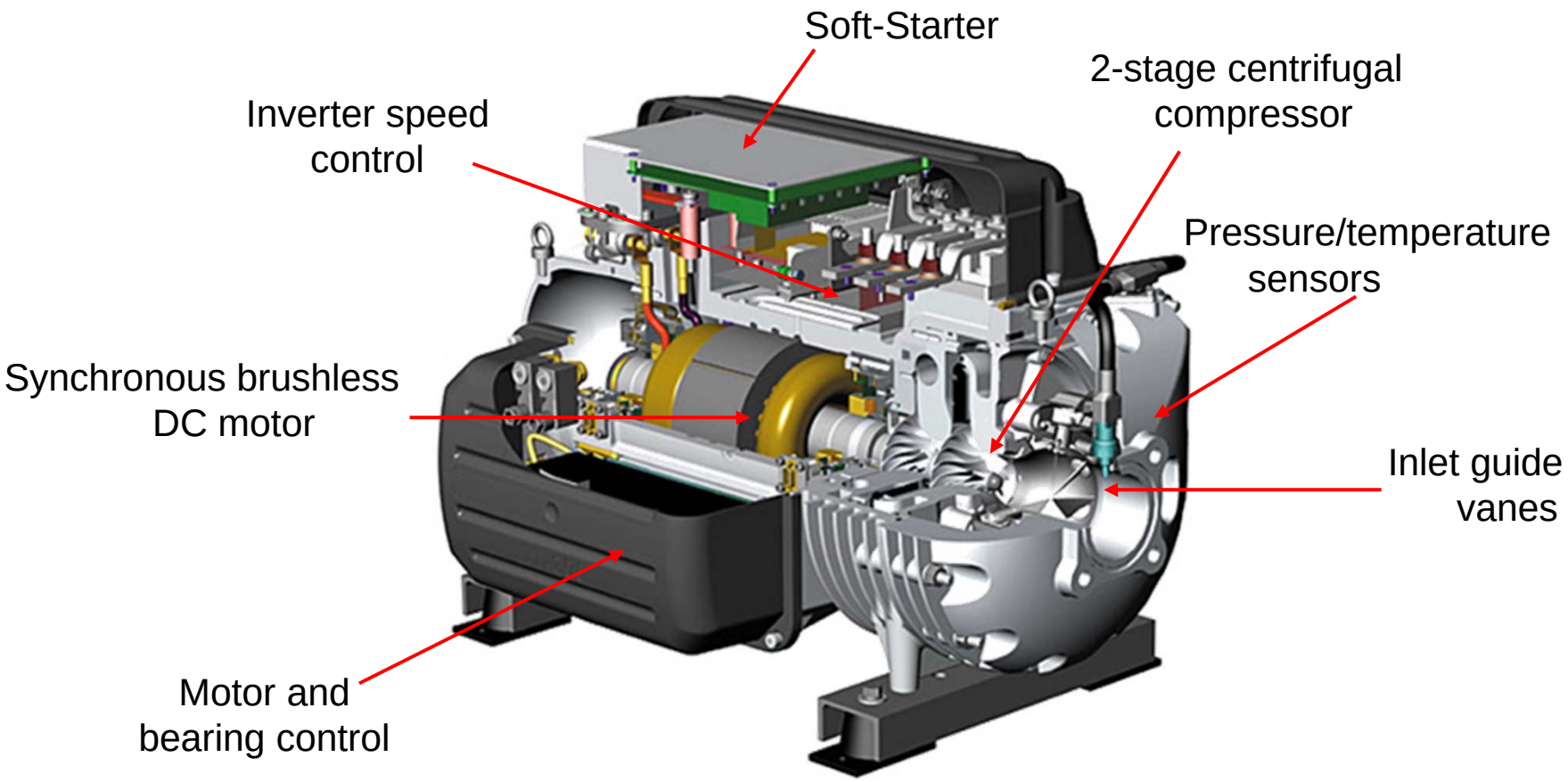
Introduction to Danfoss Turbocor



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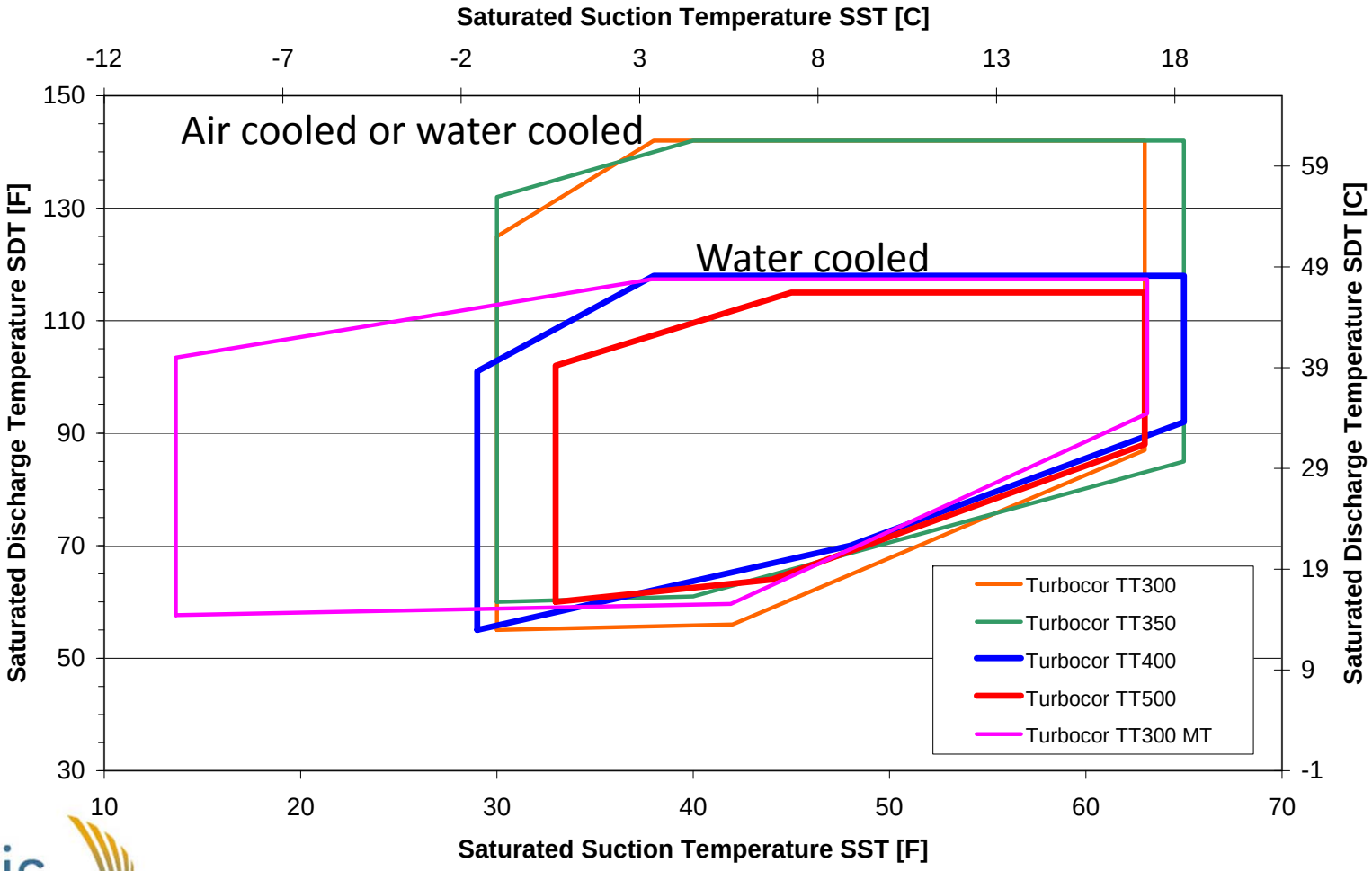
Typical compressor maps



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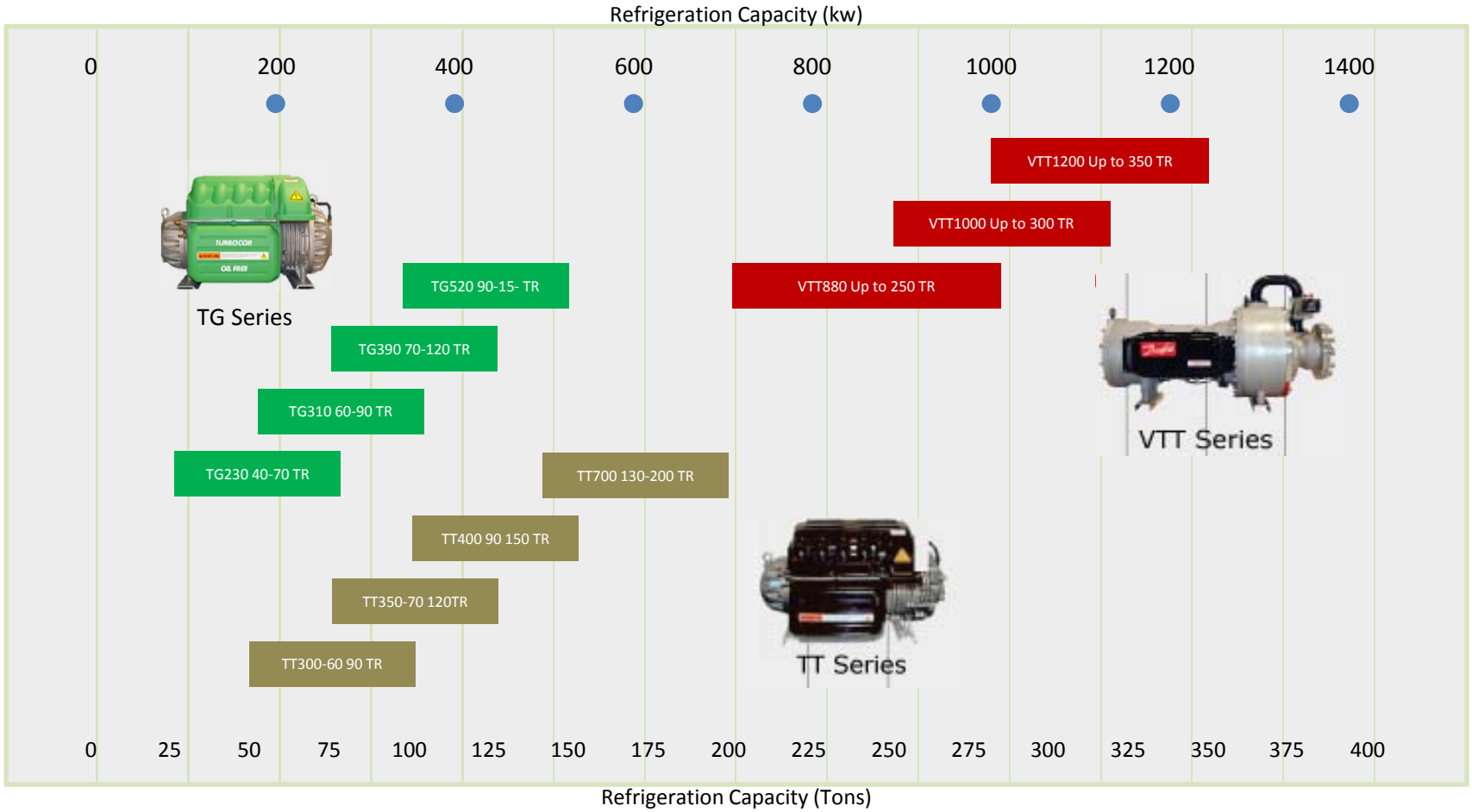
Danfoss Turbocor Compressor family

Danfoss Turbocor Compressor Portfolio



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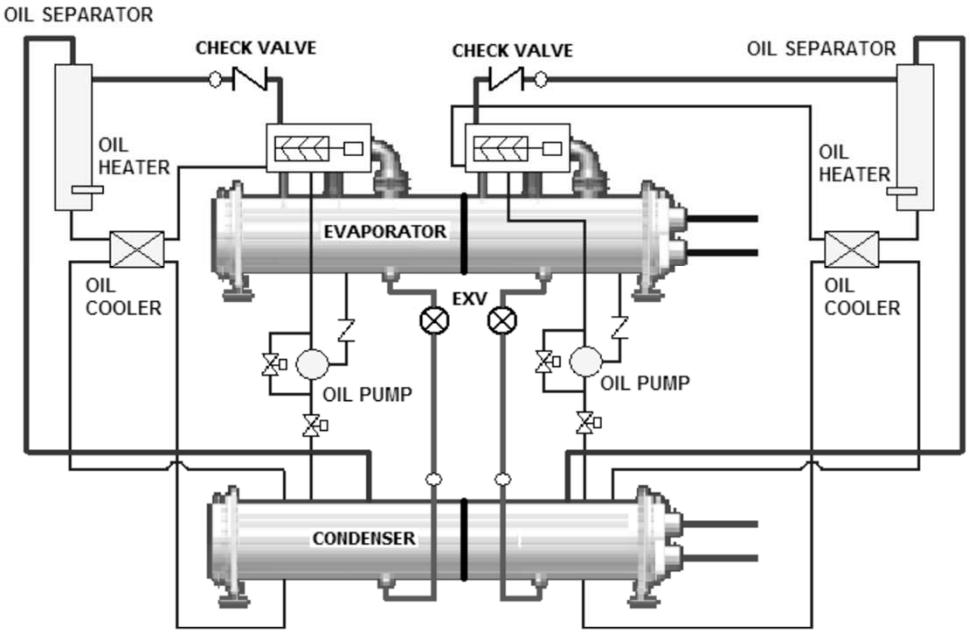
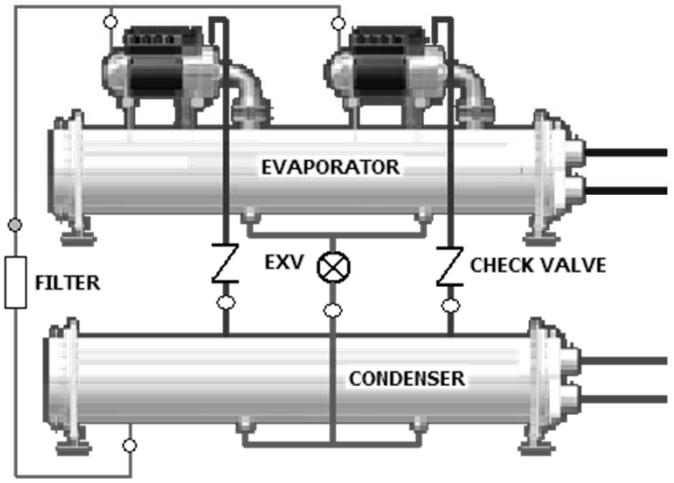
Oil free reduces complexity

Typical screw chiller



Typical oil-free chiller



- Simple
- Fewer connections
- Higher efficiency
- Less maintenance
- Higher reliability

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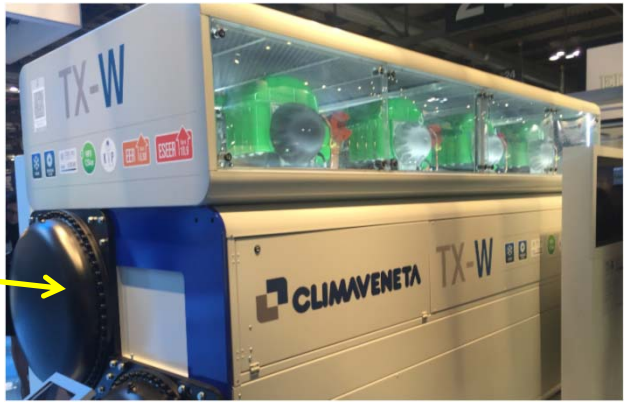
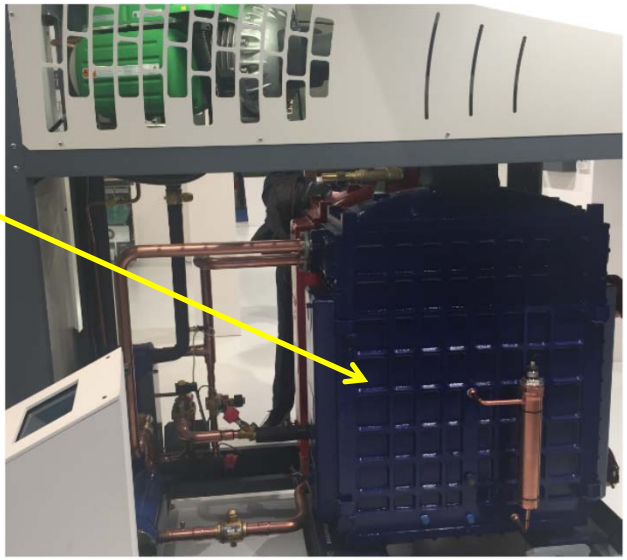
Heat exchanger technology

- Evaporator
  - Shell and tube flooded – low approach temperature. Multiple compressors. Up to 2 circuits.
  - Falling film – reduced refrigerant charge
  - New technology spray plate exchanger. Very low refrigerant charge. Single compressor application suitable for modular design.





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Heat exchanger technology

- Condenser
  - Shell and tube (water cooled). Multi compressors. Single or dual circuit.
  - Spray plate (water cooled). Single circuit, single compressor for modular chiller design
  - Fin and tube (air cooled)
  - Micro channel (air cooled)

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Economiser options

- Plate heat exchanger
- Open flash tank
  - Choice between increasing cooling capacity or increasing efficiency (or mixture of both)
  - Most OEMs offer chillers with or without economiser

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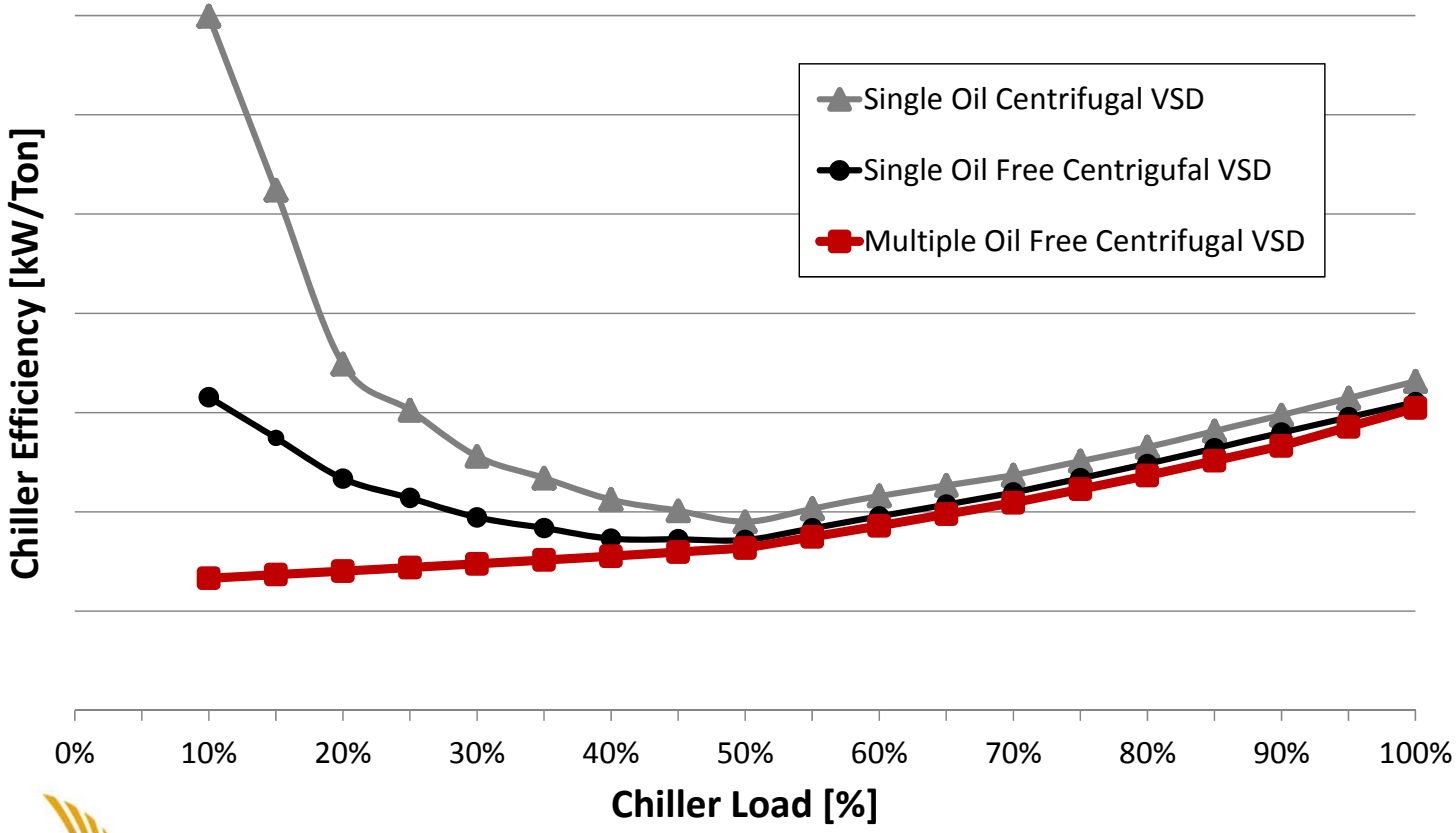
Oil free enables multiple compressor benefit

Multiple oil-free compressors improve energy efficiency at low load operation



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Typical chiller EER and ESEER

- Typical EER for air cooled chillers 3.45 to 3.84
- Typical ESEER 5.55 to 5.82
- Available with free cooling option
- Typical EER for water cooled 5.25 to 5.5
- Typical ESEER >8.0

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Danfoss Turbocor with HFO refrigerants

Phase down controlled by a quota allocation system

Declining supply of HFC

increasing refrigerant prices weighted on GWP value

2018 = a critical year

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Danfoss Turbocor with HFO refrigerants

- Extremely lightweight and compact
- Soft startup with low in-rush current
- Available for 380 – 460 Volt applications
- Nominal capacity: 230kW, 310 kW, 390kW, and 520 kW
- Fastest restart time in the industry of less than 30 seconds without the use of an external universal power supply.
- High efficiency at full load and extraordinarily high efficiency at part load conditions

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Summary

- Industry leading part load efficiency
- Low maintenance
- Overall life cycle cost savings compared to other compressor technologies
- Options for ultra low GWP refrigerants
- Suitable for data centre cooling, commercial building air conditioning and industrial applications.

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- Questions?

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