

Nürnberg, Germany
9.–10.9.2009

EUROPEAN

HEAT PUMP

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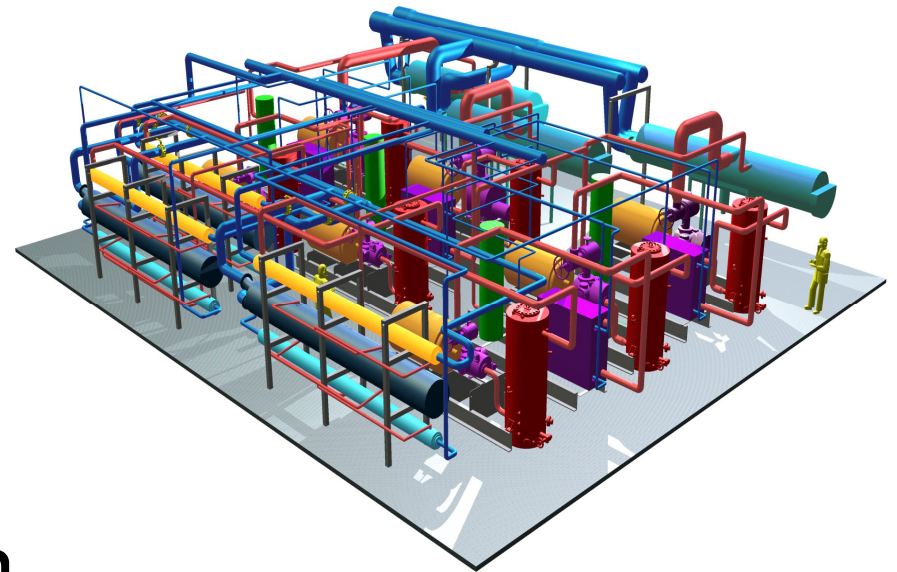
SUMMIT

2009

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Industrial • Commercial • Residential
Heating & Cooling • Components & Equipment

90°C R717 Heat Pumps for district heating systems and factory process applications



Dr Andy Pearson
Star Refrigeration

90°C R717 Heat Pumps

- The three “whys”
 - Why Ammonia?
 - Why not before?
 - Why now?
- Case Study – District Heating
- Case Study – Food Factory
- Conclusions



Ammonia? – Why try?

■ The “Fashionable” reasons -

Ammonia? – why try?

■ The “Business” reasons -

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Ammonia? - Why not before?

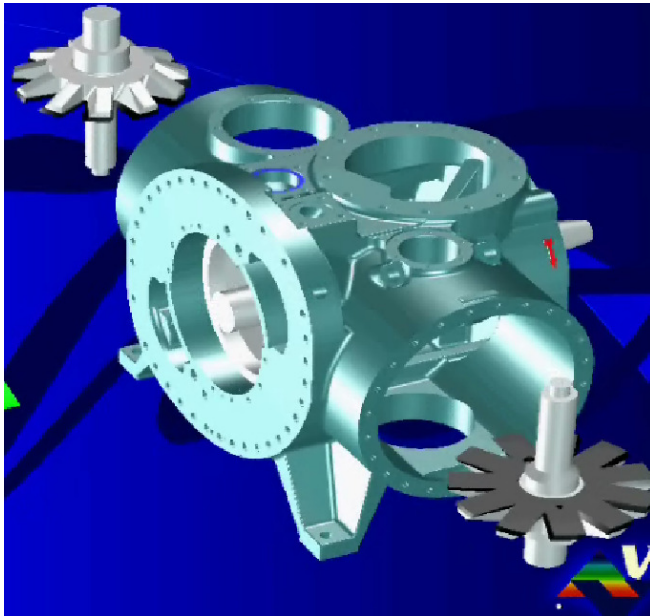
■ The “Fashionable” reasons -

Ammonia? - Why not before?

■ The “Business” reasons -

Ammonia? - Why now?

■ It is possible

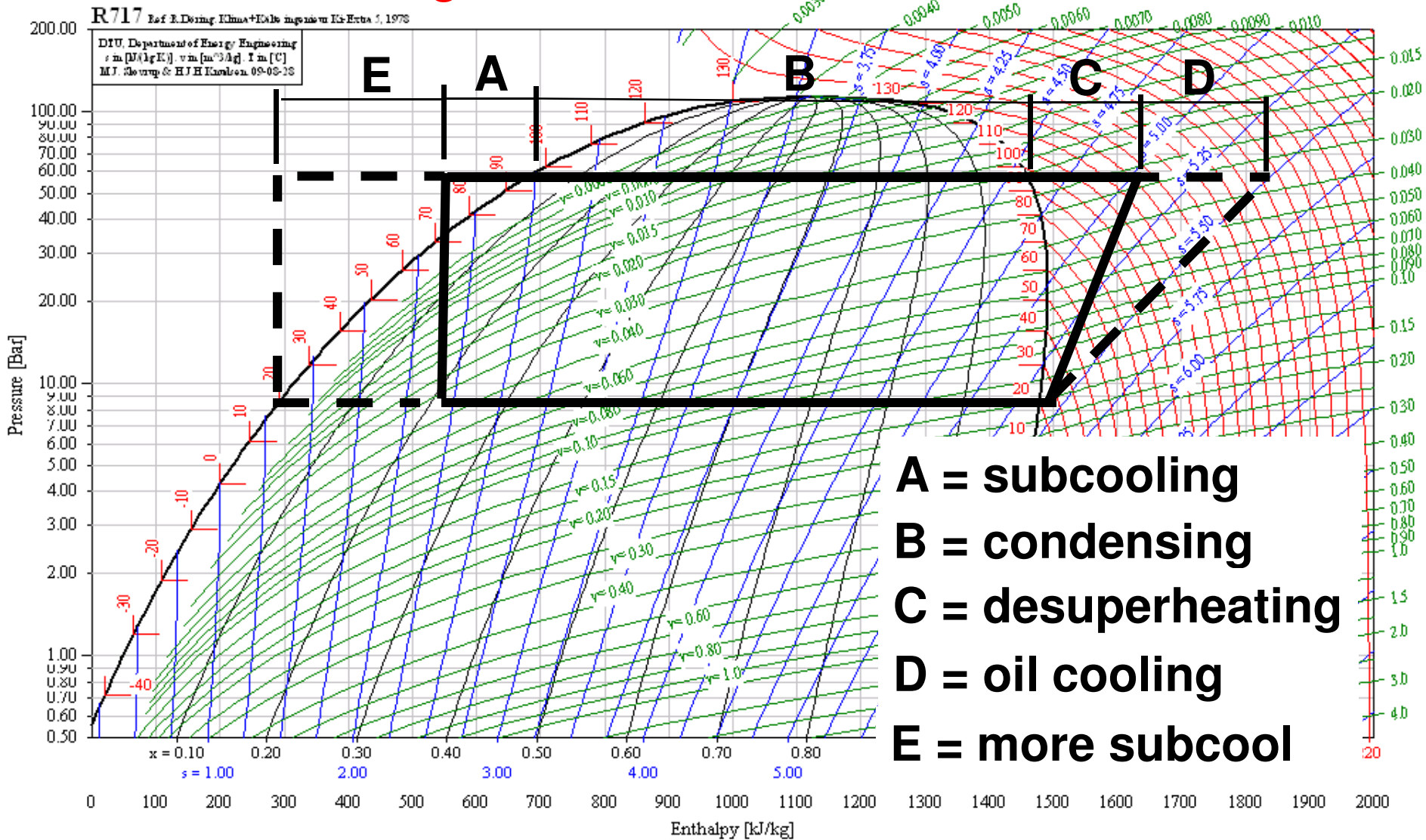


Recent Compressor development offers high pressure compressors with balanced radial and axial forces suitable for condensing ammonia at 95°C

Picture courtesy of Vilter Mfg Corp

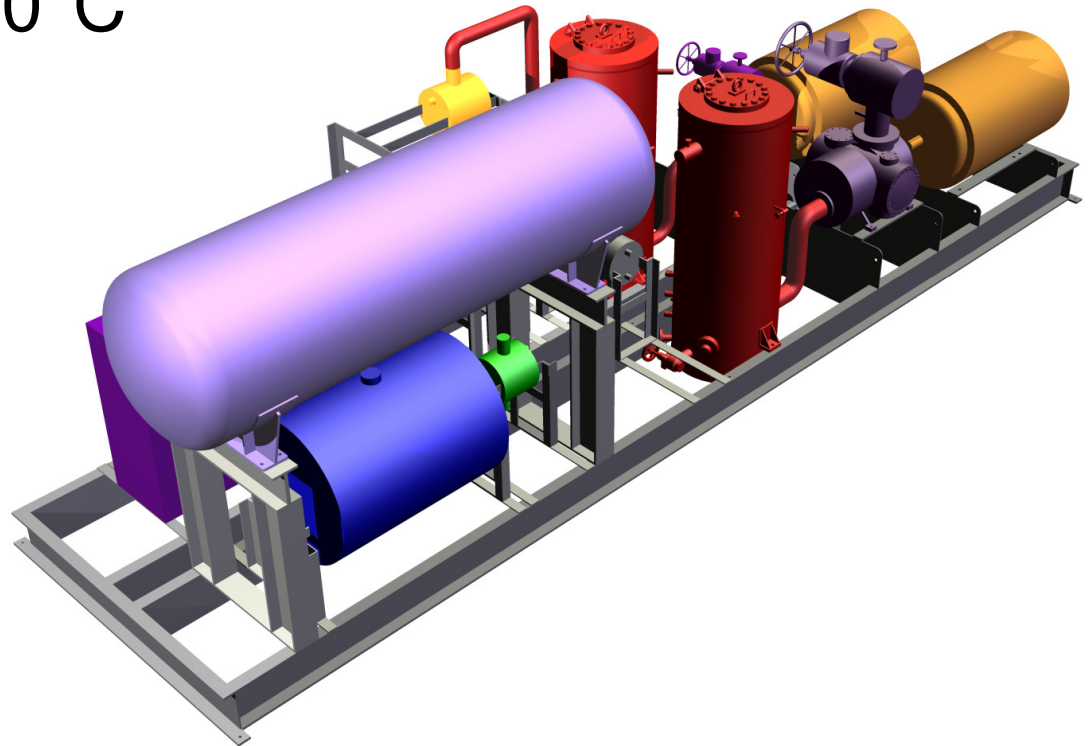
Ammonia? - Why now?

■ Excellent refrigerant!



The Limits?

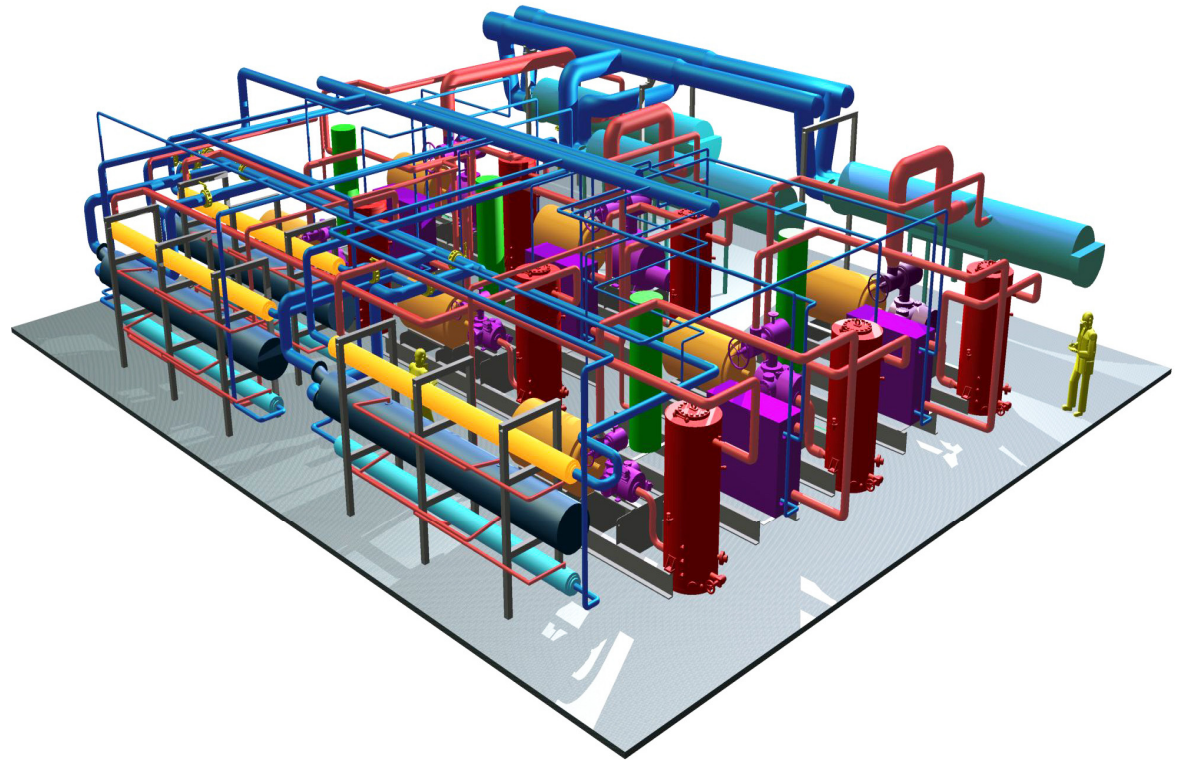
- Process Heating + 90°C
- Process Cooling - 40°C
- 5MW Packs
- Turndown to 10%
- Renewable Heat



90°C 15 MW District Heating

■ CoP > 3.0

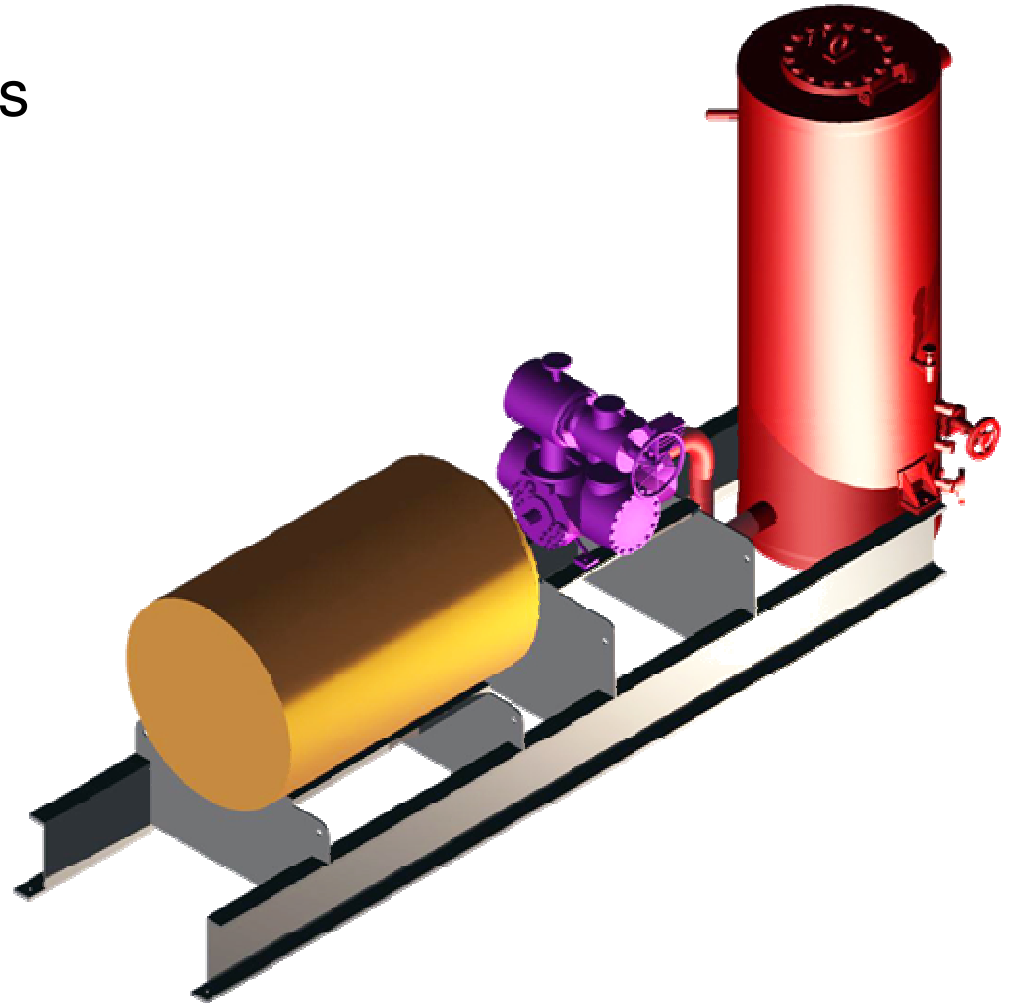
- Heating + 90°C
- Cooling +8/4°C
- 5MW Packs
- Turndown to 10%
- Future Proof
- Similar Capital Cost



60°C Food Factory

■ CoP > 4.5

- Renewable Heat Incentives
- Heating + 65°C
- Scavenge Rejected Heat
- Turndown to 10%
- 60% Cost of gas heating
- 0.5MW Packs to 1.5MW



60°C Food Factory

VSC Heat Pumps

File Tools Help

System type: Parallel heating circuit with fixed suction

Project: []

Heating circuit

Media: Water

Free value: Flow

Flow: 80.00 m³/hr

Inlet temp: 10 °C

Outlet temp: 65 °C

Input

Saturation temp: 20 °C

Superheat: 70 K

Additional flow: 0.00 kg/s

Cooling circuit

Media: Water

Free value: Outlet temp

Flow: 200.00 m³/hr

Inlet temp: 40.0 °C

Outlet temp: 30.0 °C

Compressor

R717

VSS-601

50Hz

Subcooler
 Effectiveness: 50 %
 124.5 kW
 18.0 m³/hr

Condenser: Fixed CT
 CT: 70 °C
 1,083.9 kW
 18.1 m³/hr

Desuperheater
 Effectiveness: 70 %
 158.1 kW
 33.5 bara

Oil Cooler
 Oil temp: 80.0 °C
 241.5 kW
 3.8 m³/hr

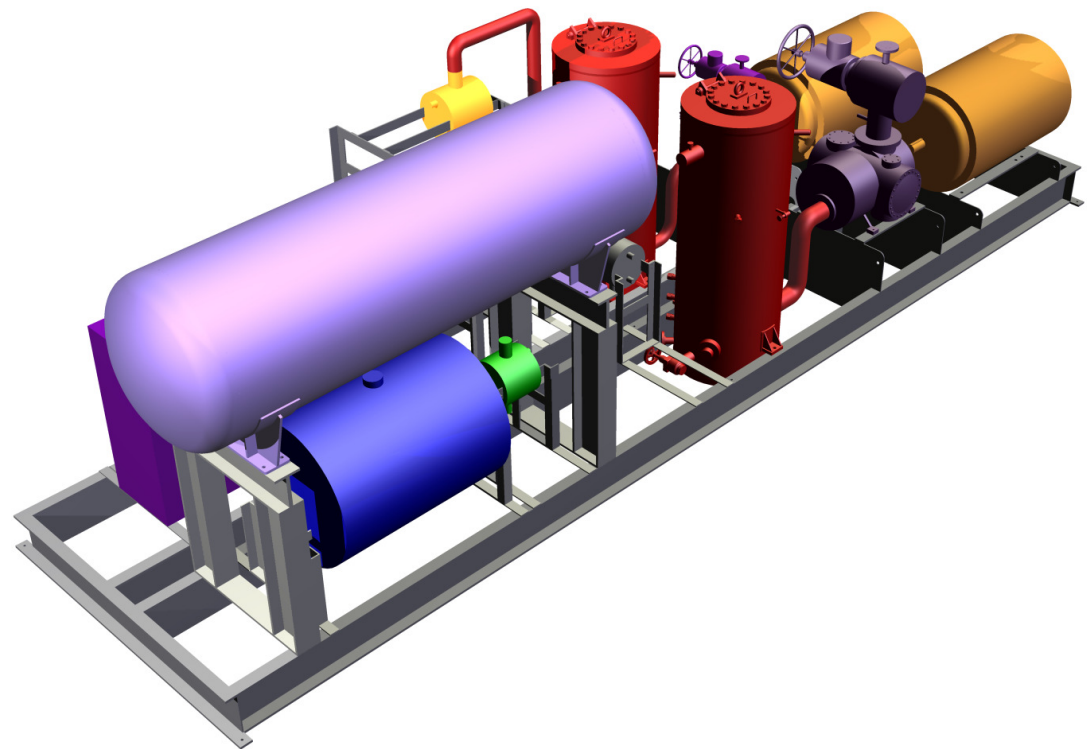
Mix

Discharge Line Loss: 0.50 K
 Suction Line Loss: 0.50 K

Total heating capacity 1,608.0 kW
 Coefficient of performance (heating) 4.41
 Warning: Very high differential pressure
 Stop: Too high discharge temperature, max 245 F / 118.3 C
 Warning: Very high suction temperature
 Stop: Too high suction superheat, max 54 F / 30 C
 Warning: Heavy duty shaft required

■ High Temperature Heat Pumps are

- Proven Technology
- Favourable Costs
- Future Proof
- Low Carbon
- Retrofit
- Expansion
- New build



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