

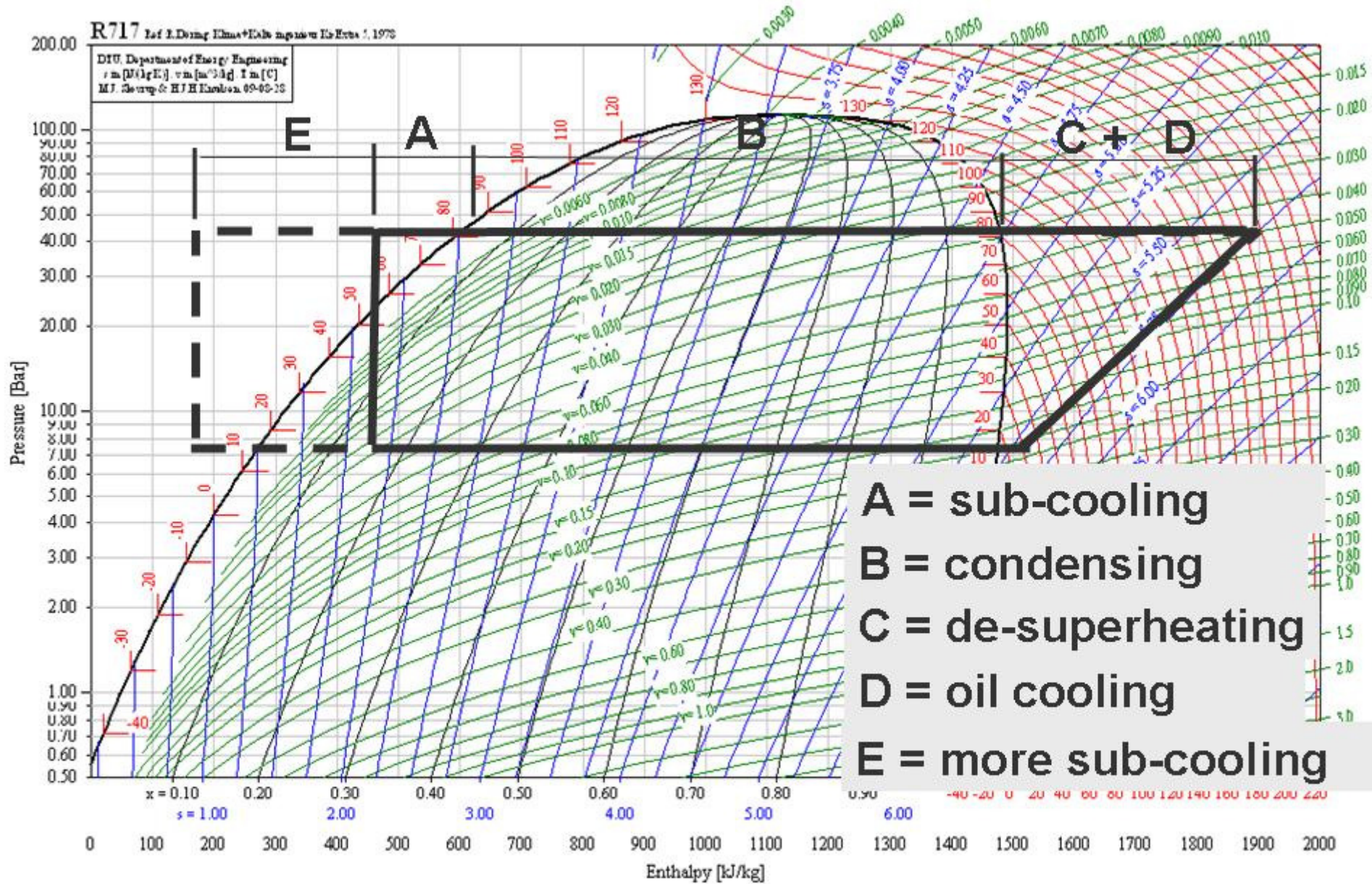
High temperature heat pump



by
Kenneth Hoffmann
Sales Manager - Heating

R717 Taf. 1. Dampf-Kälte- und Mischungs-Kälte-Karte 1. 1978

DTU, Department of Energy Engineering
 ρ in $[kg/m^3]$, v in $[m^3/kg]$, T in $[^\circ C]$
M.J. Geary & H.J.H. Eindhoven, 09-05-15

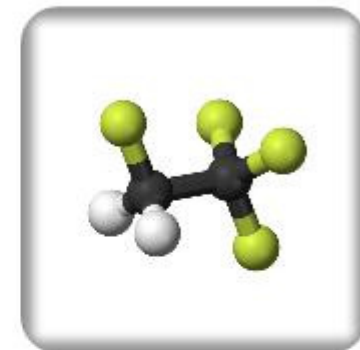
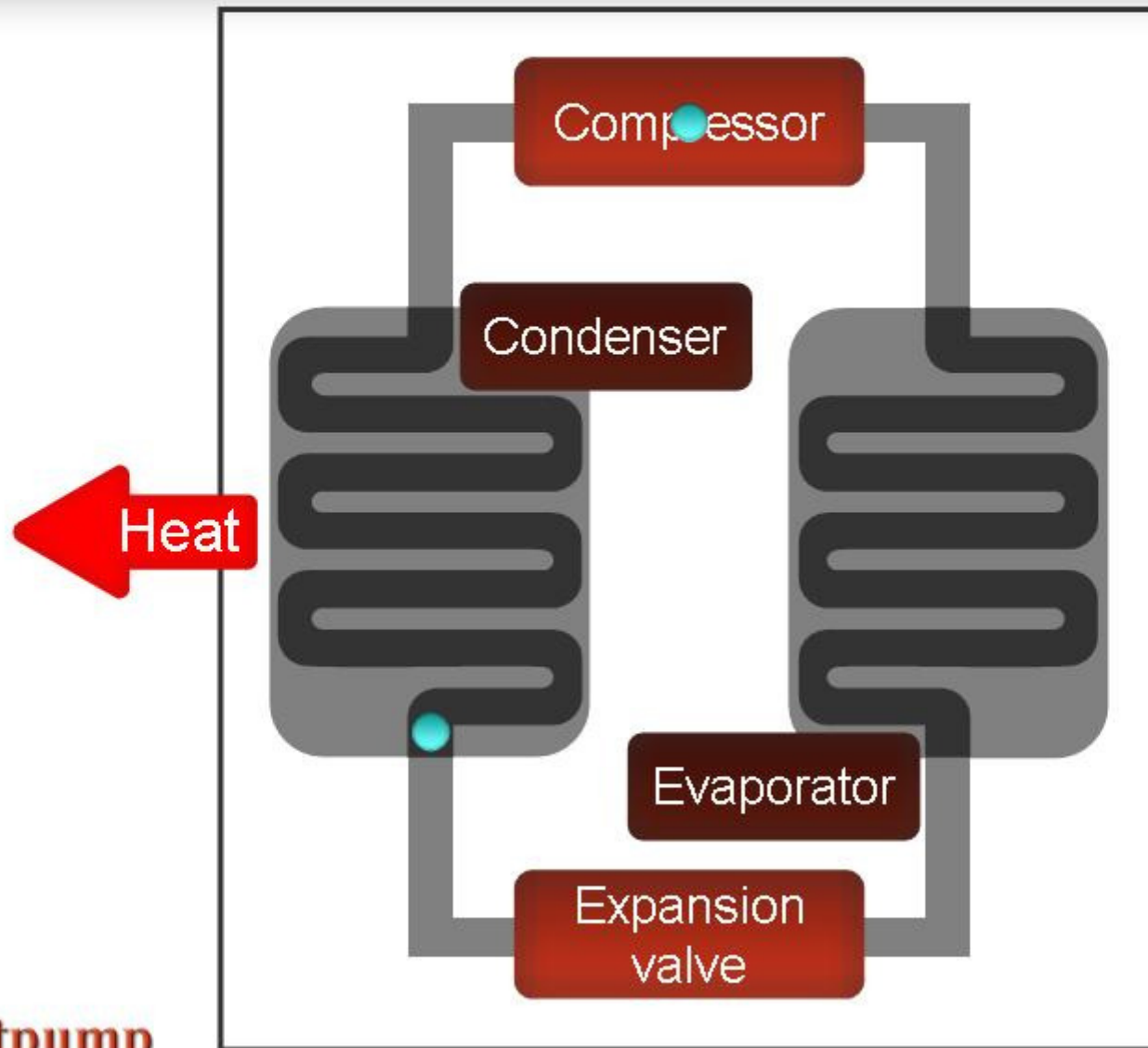


Neatpump

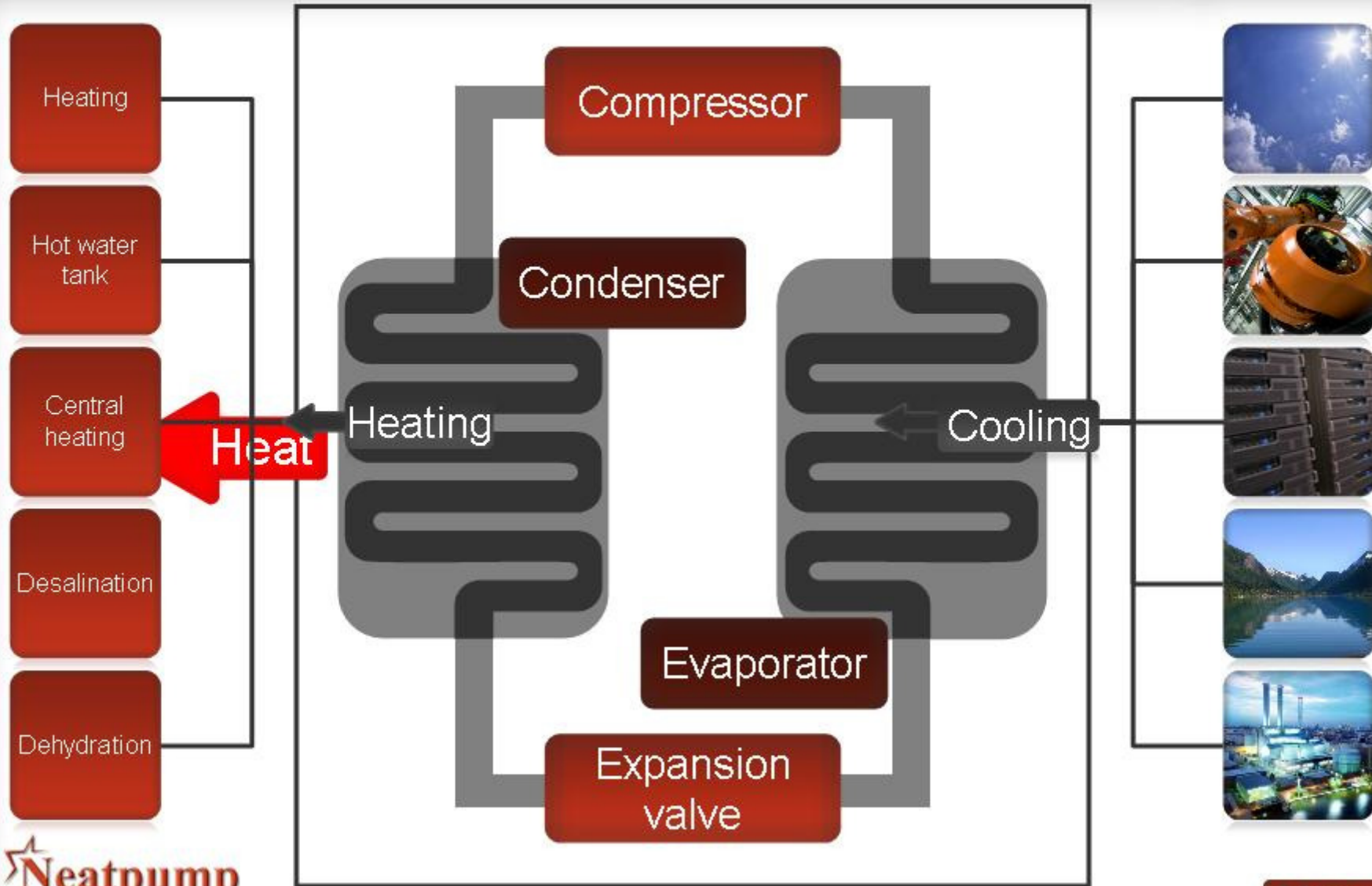
LOW CARBON HEATING...NATURALLY

Menu

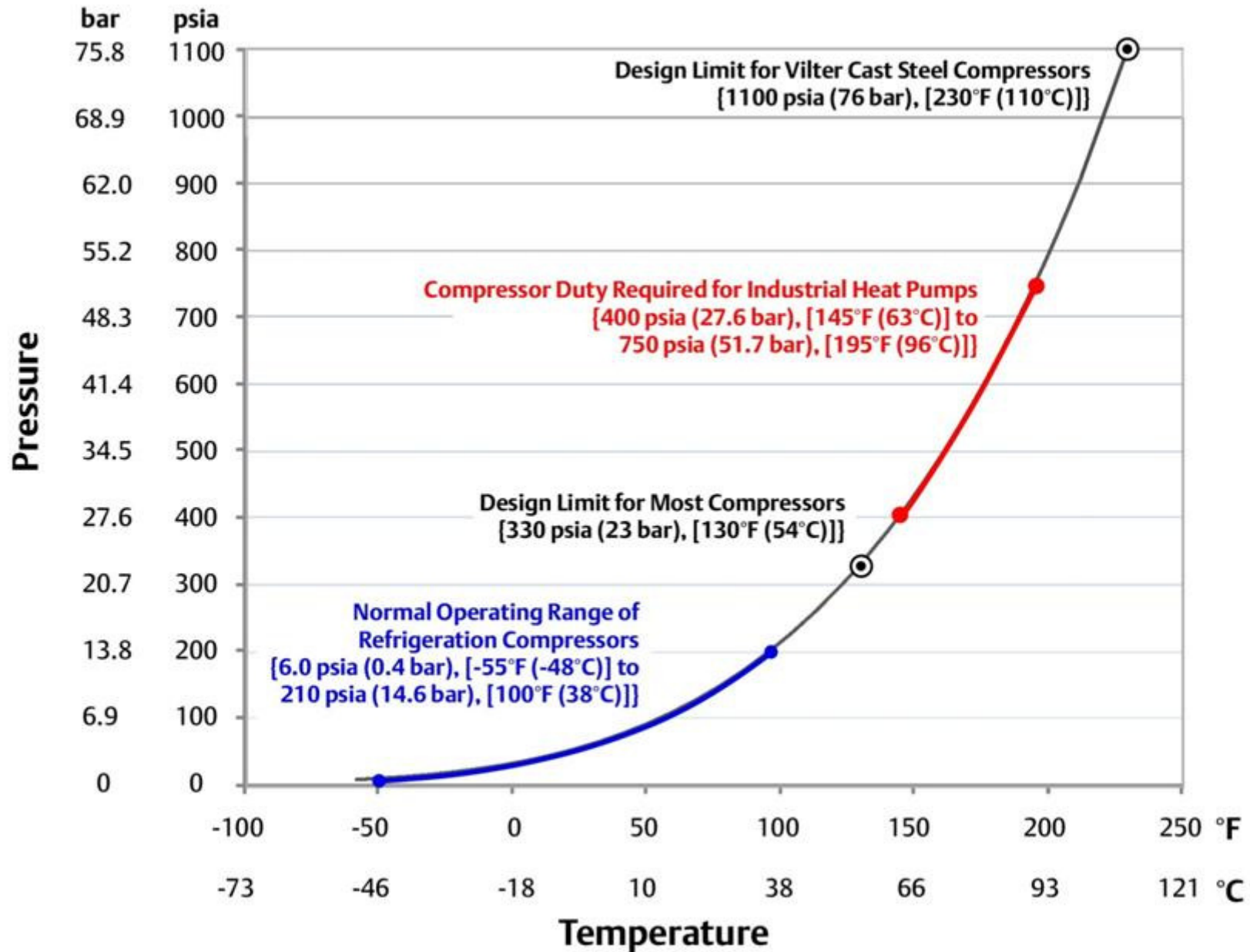
Heat Pumps



Heat Pumps



Ammonia (NH₃, R-717) Pressure-Temperature Relationship



Capacities



1-stage

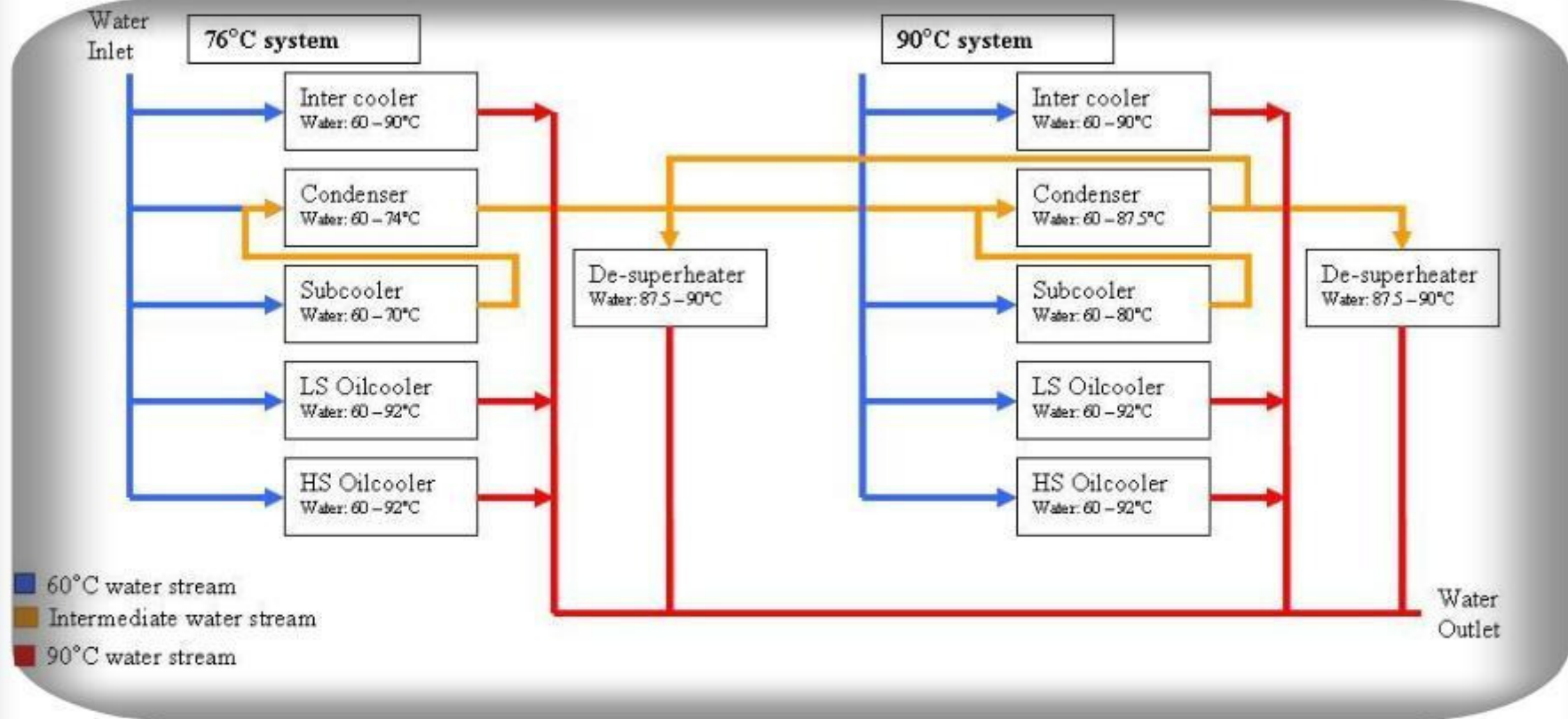
450 kW
to
5000 kW



2-stage

1000 kW
to
8000 kW

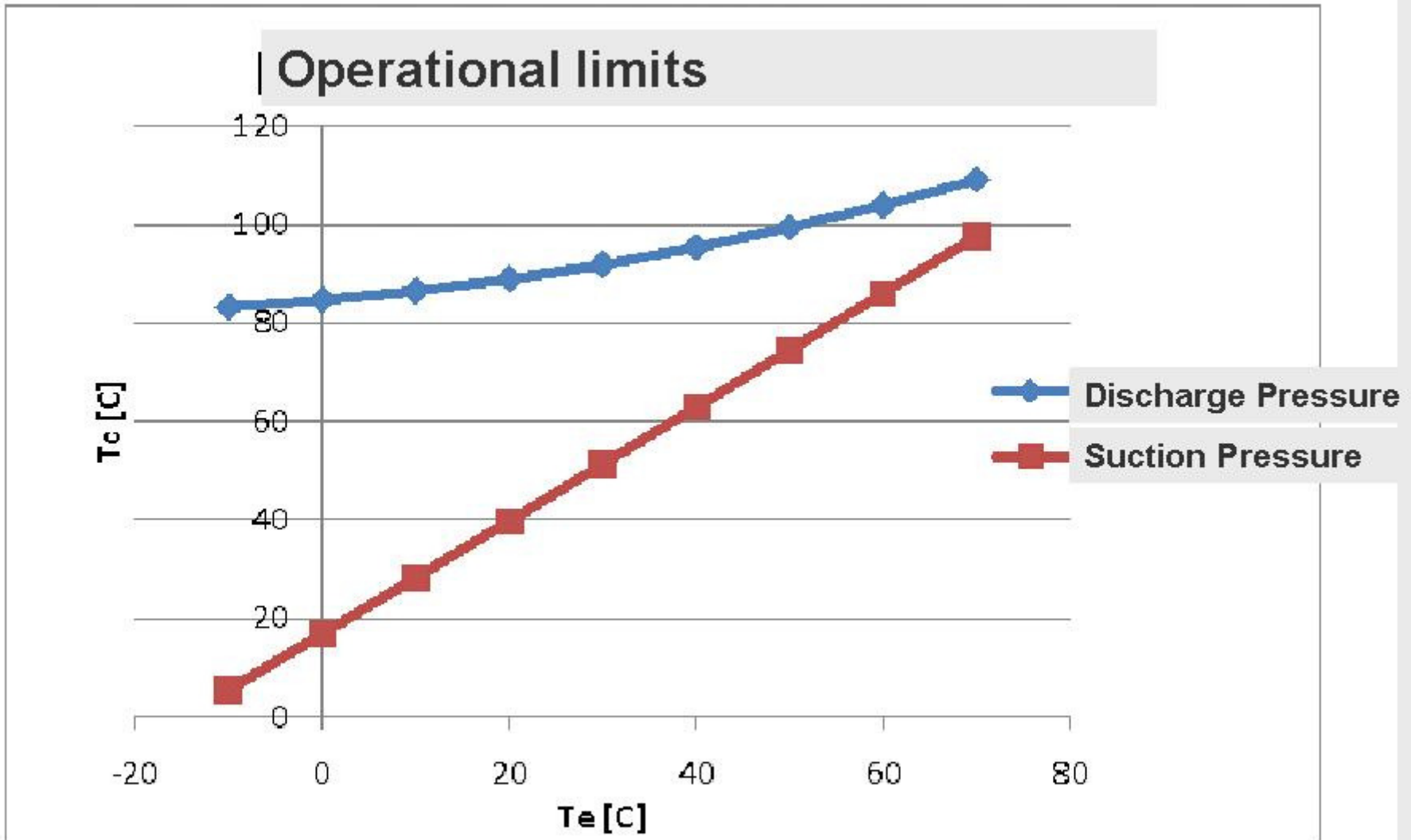
2 stage Heat Pump – Water circuit



Compressor

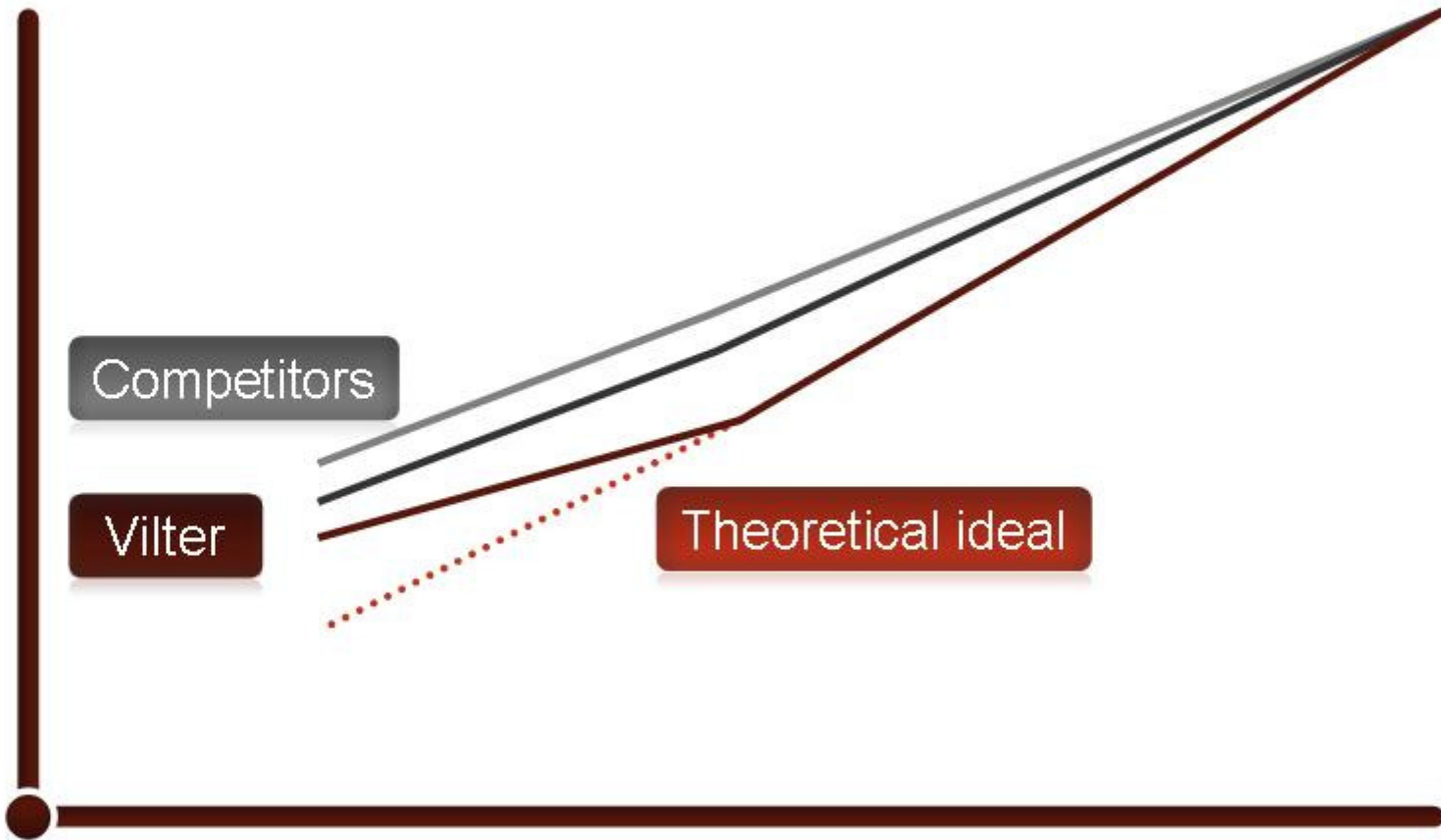


Suction and discharge pressure limits



Compressor Efficiency

% full load power

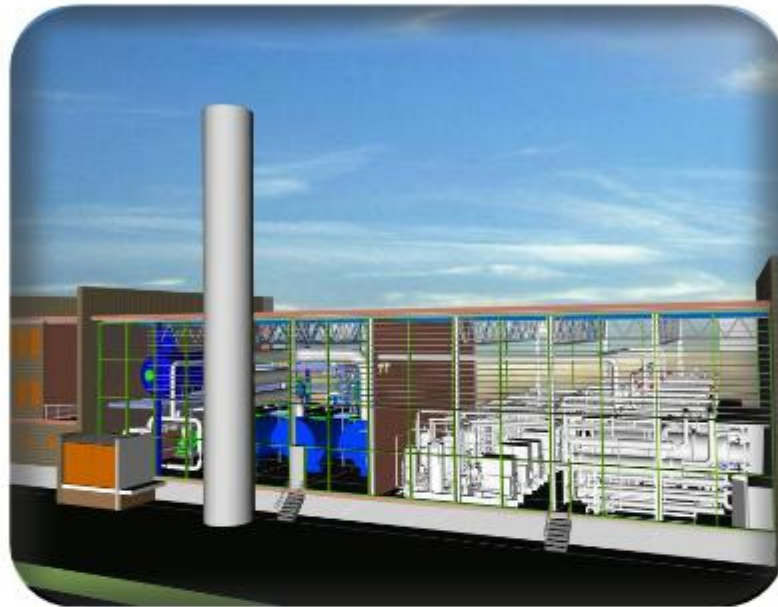


Competitors

Vilter

Theoretical ideal

% full load capacity



14 MW, 90°C, District heating
3 x 2 stage 4.6 MW Systems



$COP_{\text{heating}} = 3.0$

Evaporating temp. 2°C
Sea water 8 to 4°C

Condensing temp. 89°C
District heating water 60 – 90°C

TURN THE FRIGID WATERS OF THE NORTH SEA INTO HEAT FOR AN ENTIRE CITY
WITH ZERO GLOBAL-WARMING IMPACT.

IT'S NEVER BEEN DONE BEFORE



Get the full story at
Emerson.com/StarRefrigeration



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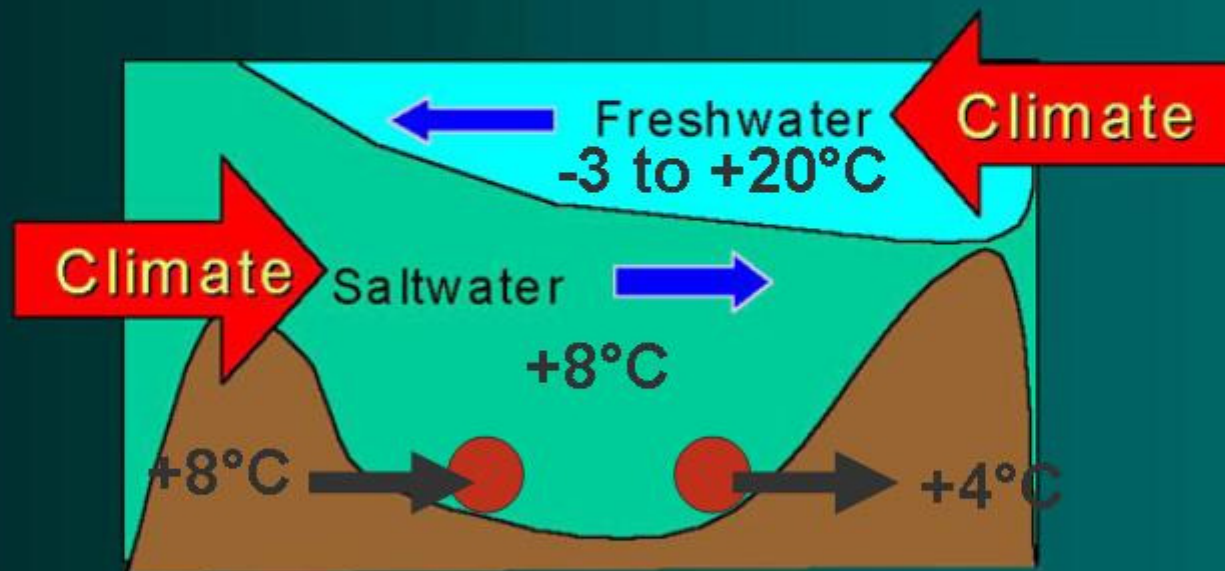
CONSIDER IT SOLVED



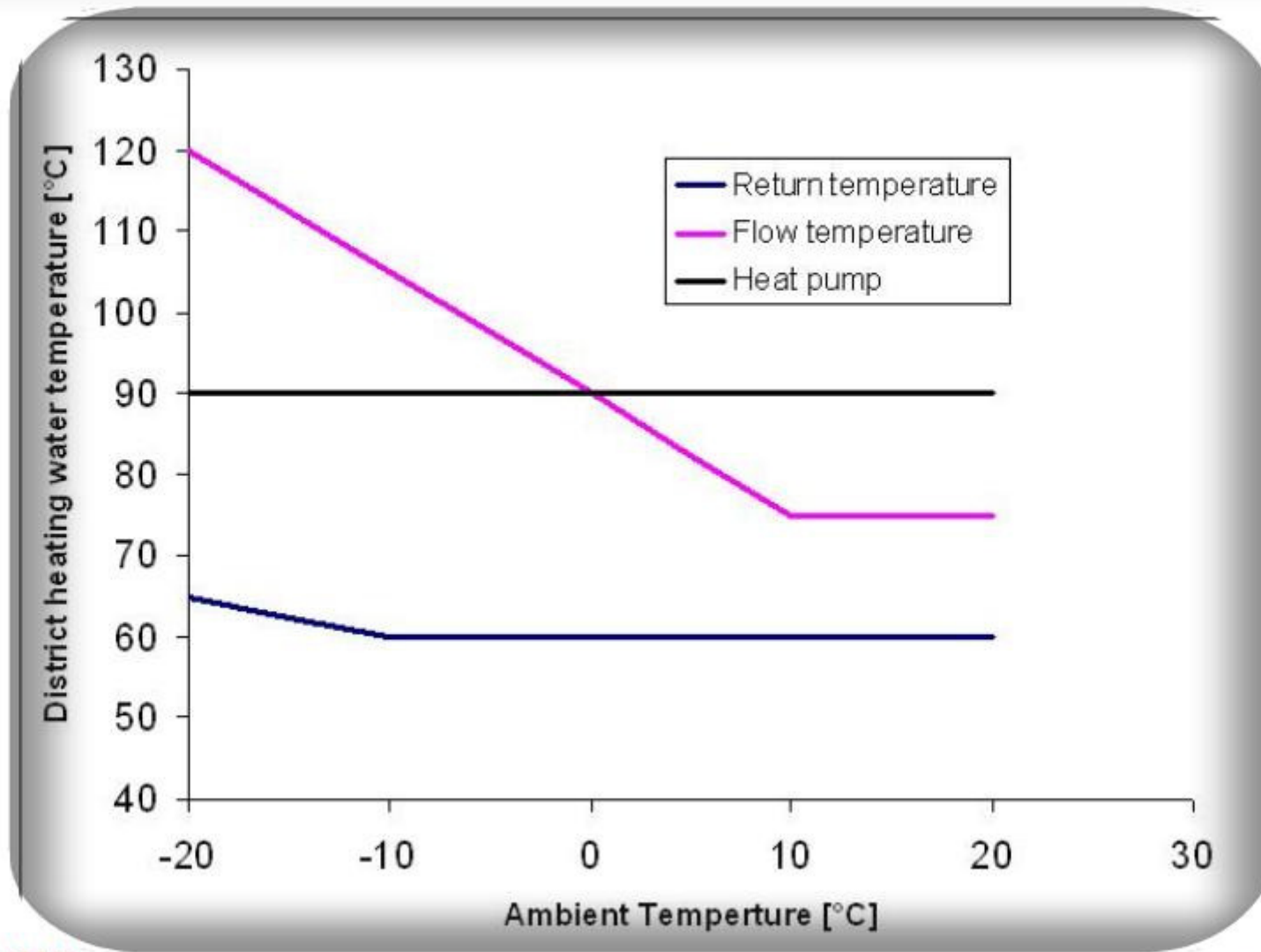
Water intake pipe

New District heating plant

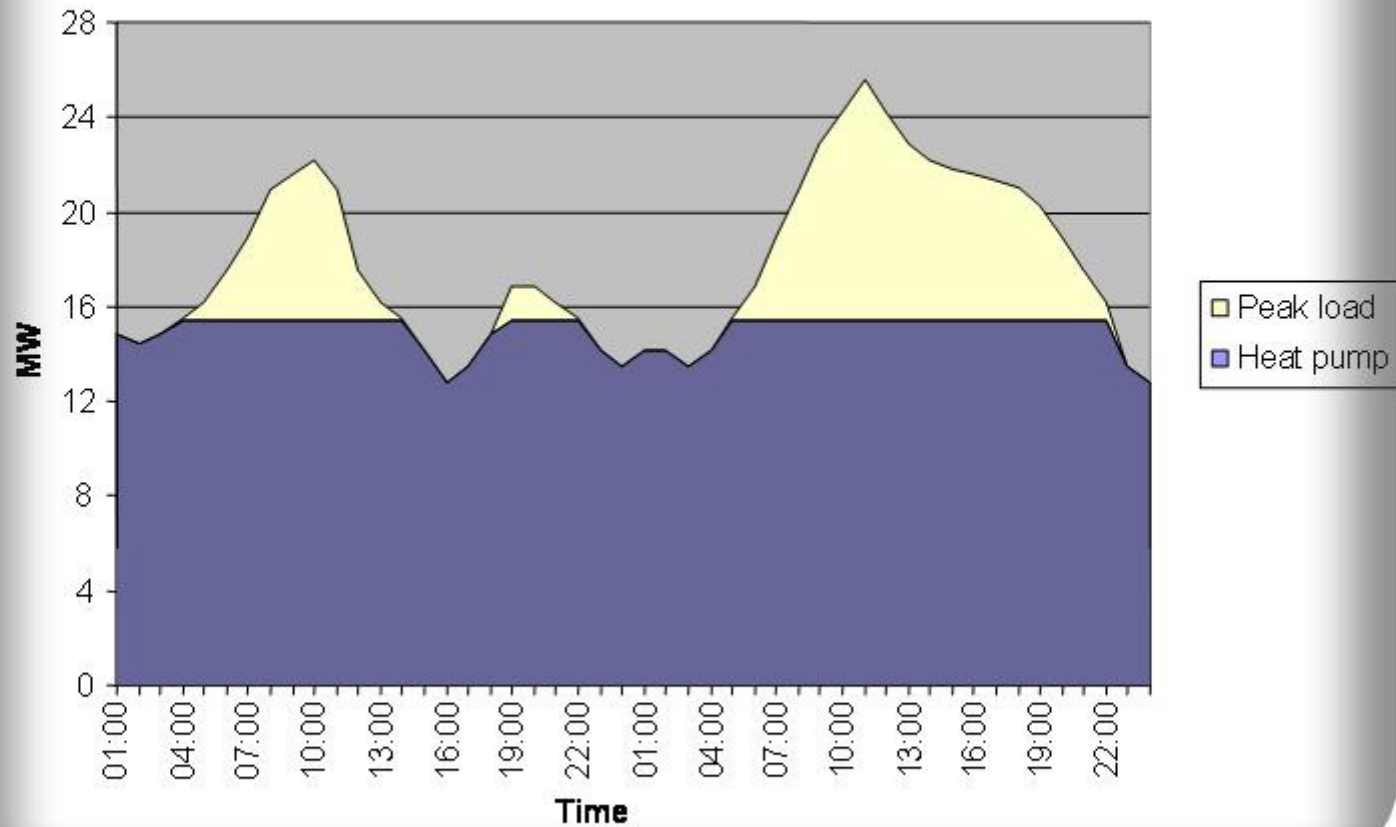
Puget Sound--A Fjord Estuary



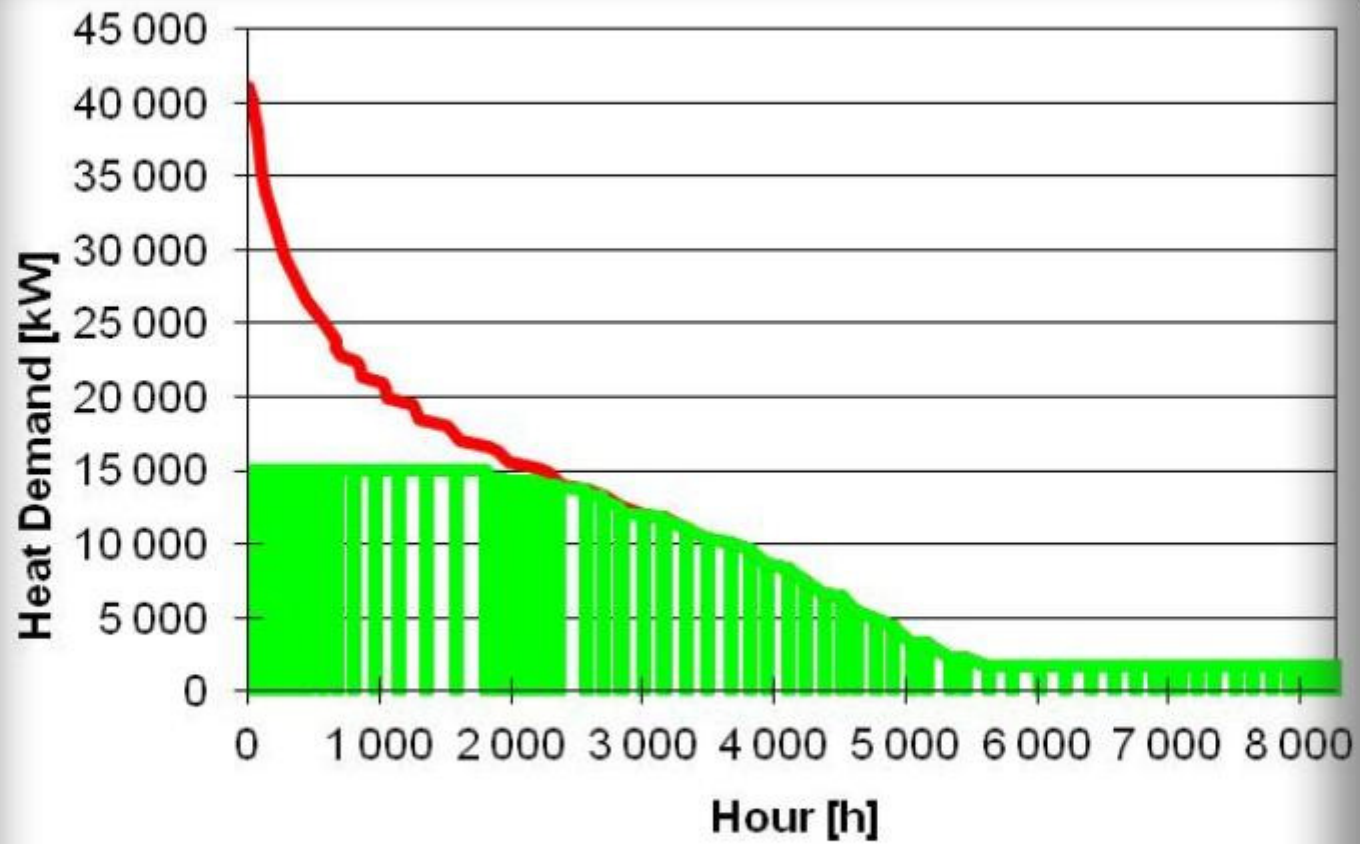
Heating system



Day variation of required heating duty



Heating system



Why did we win this order?

- **5% - 10% lower capital cost than R134a Heat pump**
- **15% Lower carbon footprint**
- **15% Better efficiency**
- **Turndown ratio to 25% of total duty compared to 40% for competitor**
- **Significant lower maintenance cost**
- **Future proof solution**