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An international view of progress in CO_2 cooling

Nytænkning gennem 100 år

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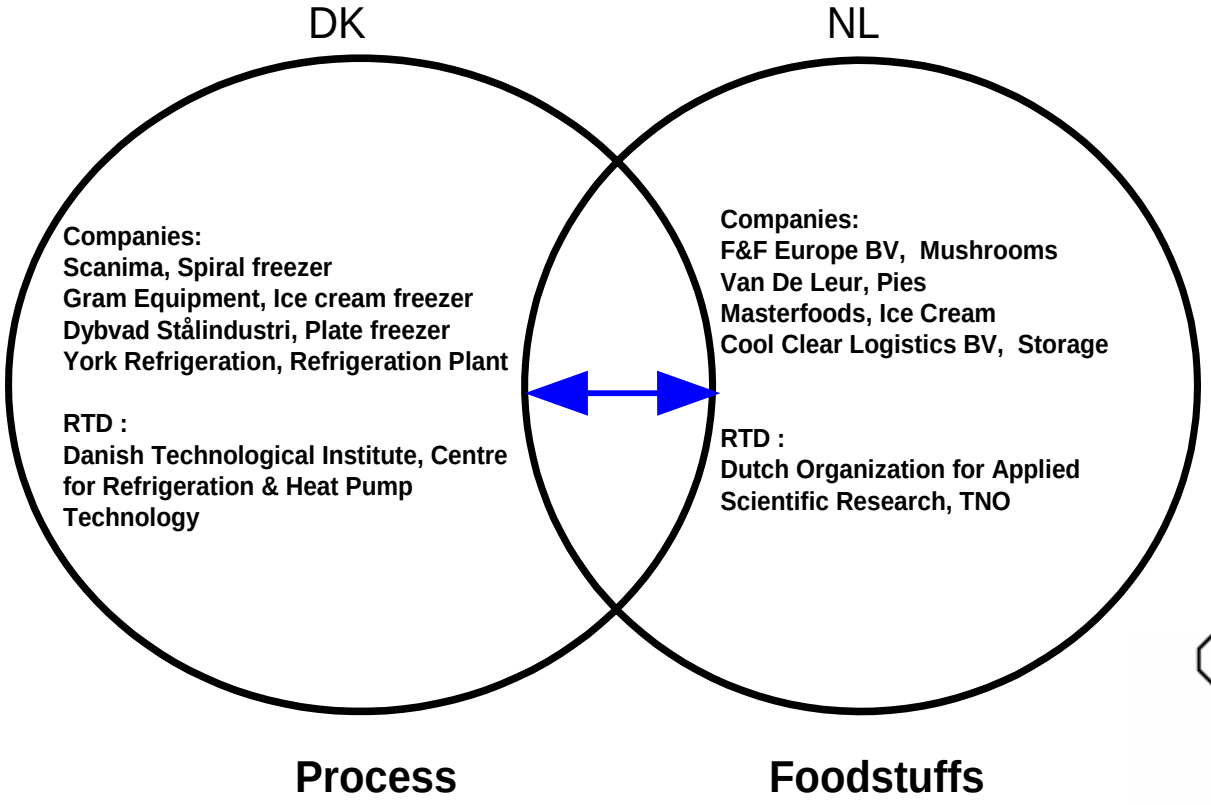
Project ”COMPFREEZE”

Grant from 6th EU framework programme CRAFT agreement

”Better quality of frozen food products (utilizing CO_2)”



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Test Plant

- CO_2/R717 cascade system: Reciprocating compressors
- Pump circulated (25 bar design pressure)
- 15-80 kW at -55 °C evaporation (max. 110 kW at higher Te)
- Hot gas defrost: Up to 250 kW at +10 °C (50 bar compressor)

Used for testing of:

- Plate freezers
- Spiral freezers
- Ice cream freezers

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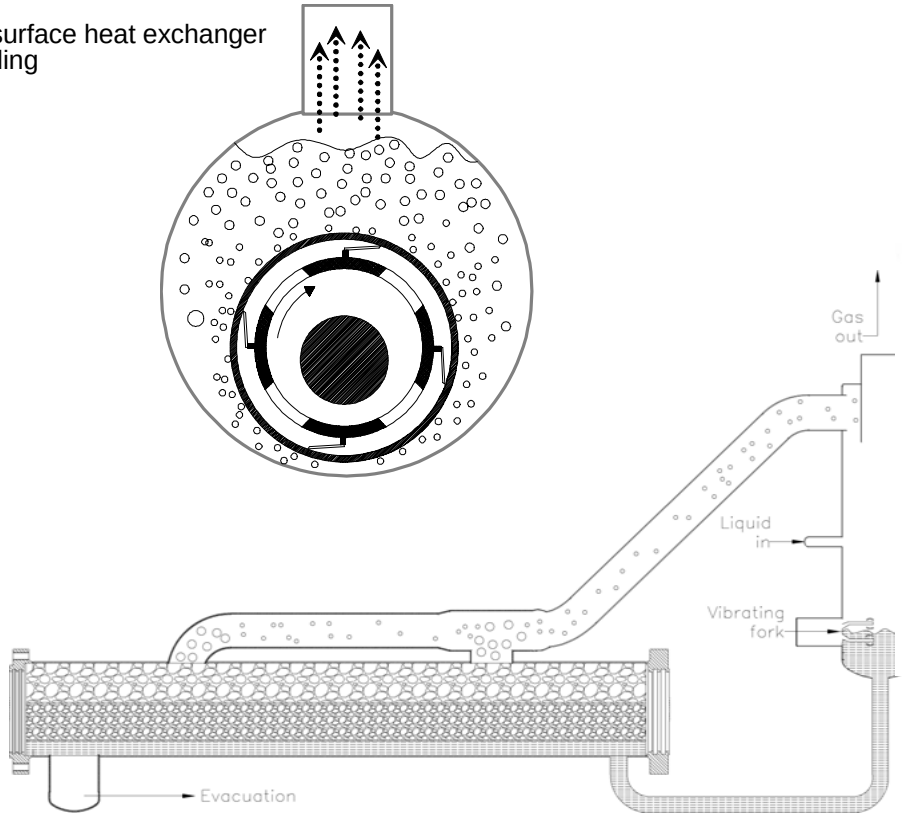
Ice Cream Freezer

Scraped surface heat exchanger
* Pool boiling



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Capacity Test

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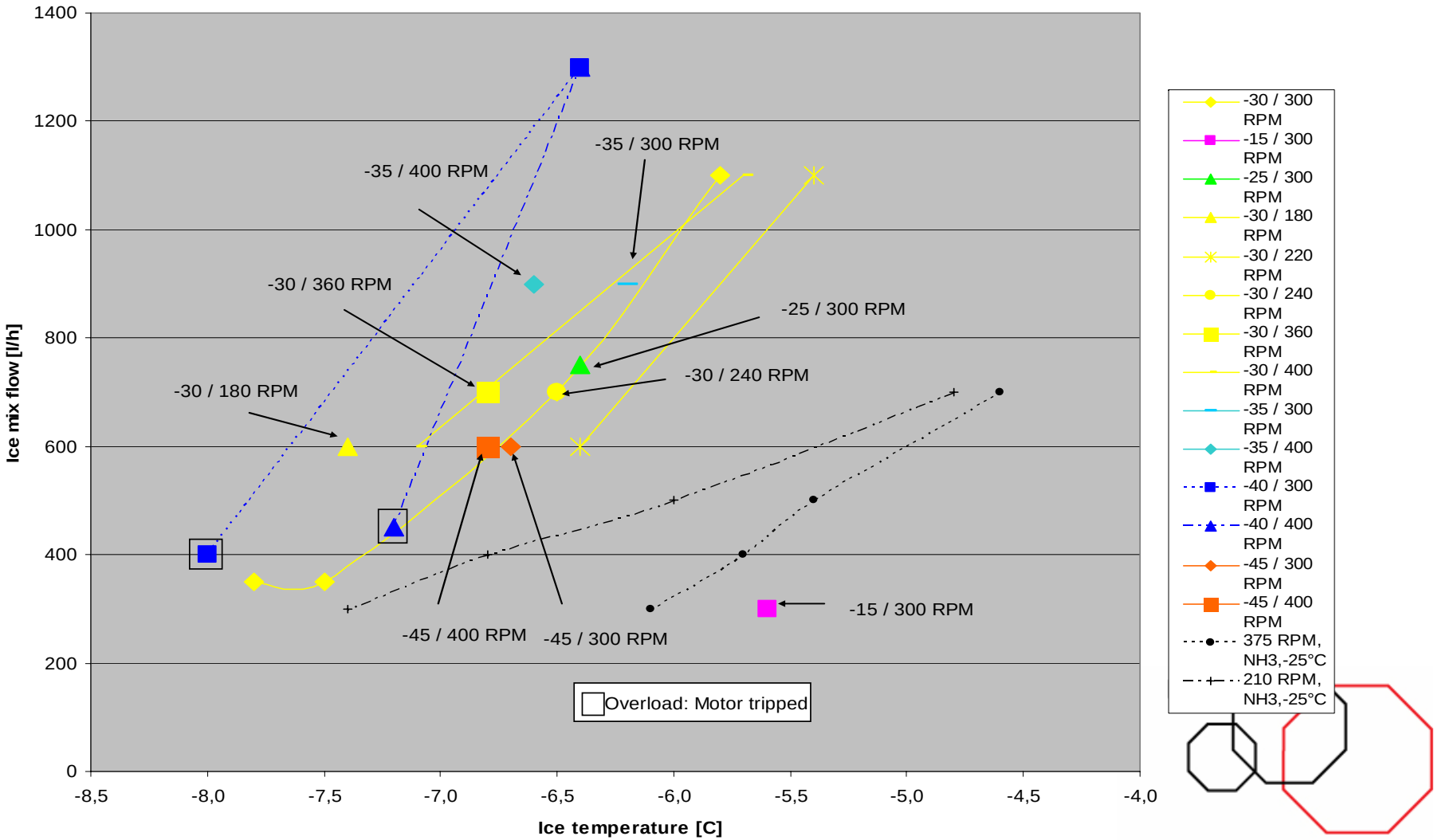
2. Test: High pressure liquid supply
* Upgraded freezer: Bigger motor + gear and higher pump capacity



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Development of bottle cooler

- Project partners: Vestfrost, DTI, Knudsen Køling and Frigor
- Project finished 2006
- Basis is a M200 bottle cooler from Vestfrost converted from R134a to transcritical CO_2
- Uses MPE type gas cooler, Danfoss compressor and capillary tube as expansion device
- Passed Coca-Cola C test (energy and pull down) app. the same energy consumption as the standard R134a system

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Transcritical Supermarket

- Total budget app. 200.000 £
- Subsidised by EU life program (100.000 £)
- Main objective is to develop a transcritical supermarket system for a REMA1000 discount store

Life

BOCK COMPRESSORS

TEKNOLOGISK INSTITUT

Danfoss

REMA 1000 - discount uden alt det sure

KNUDSEN KØLING

Alu Heat Exchanger

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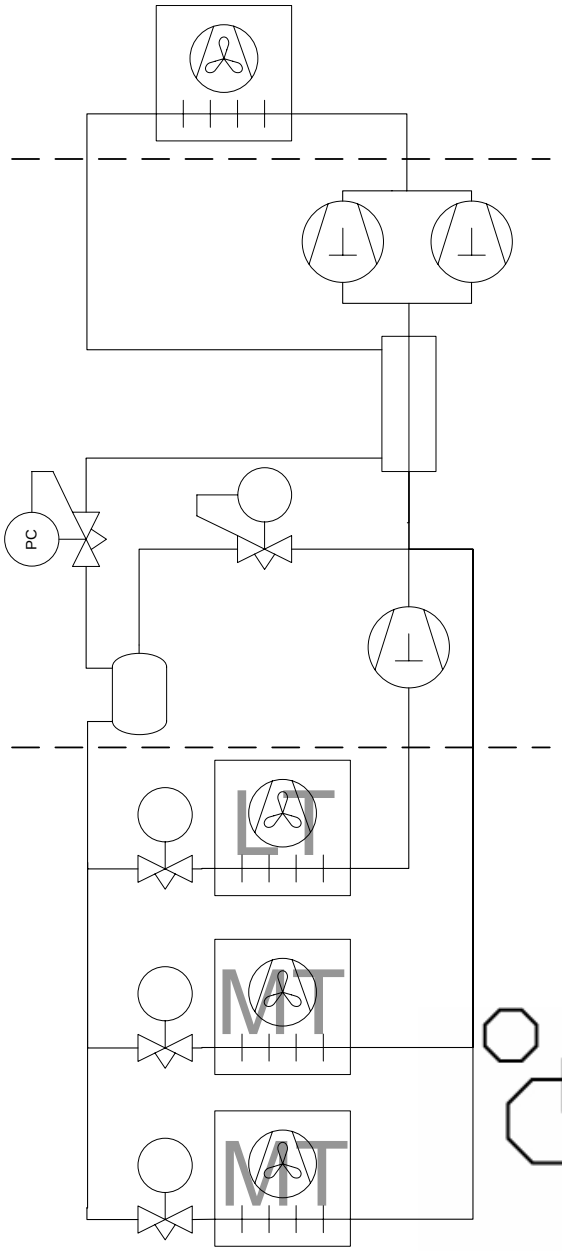
Specifications

- 26 kW MT and 10 kW LT
- Leak rate < 10 % a year
- Noise < 29 dB (10 m) and 25 dB indoor
- Must not require more service than a conventional HFC system
- Same or lower energy consumption than a HFC system

- Shop opened 1st of March 2007



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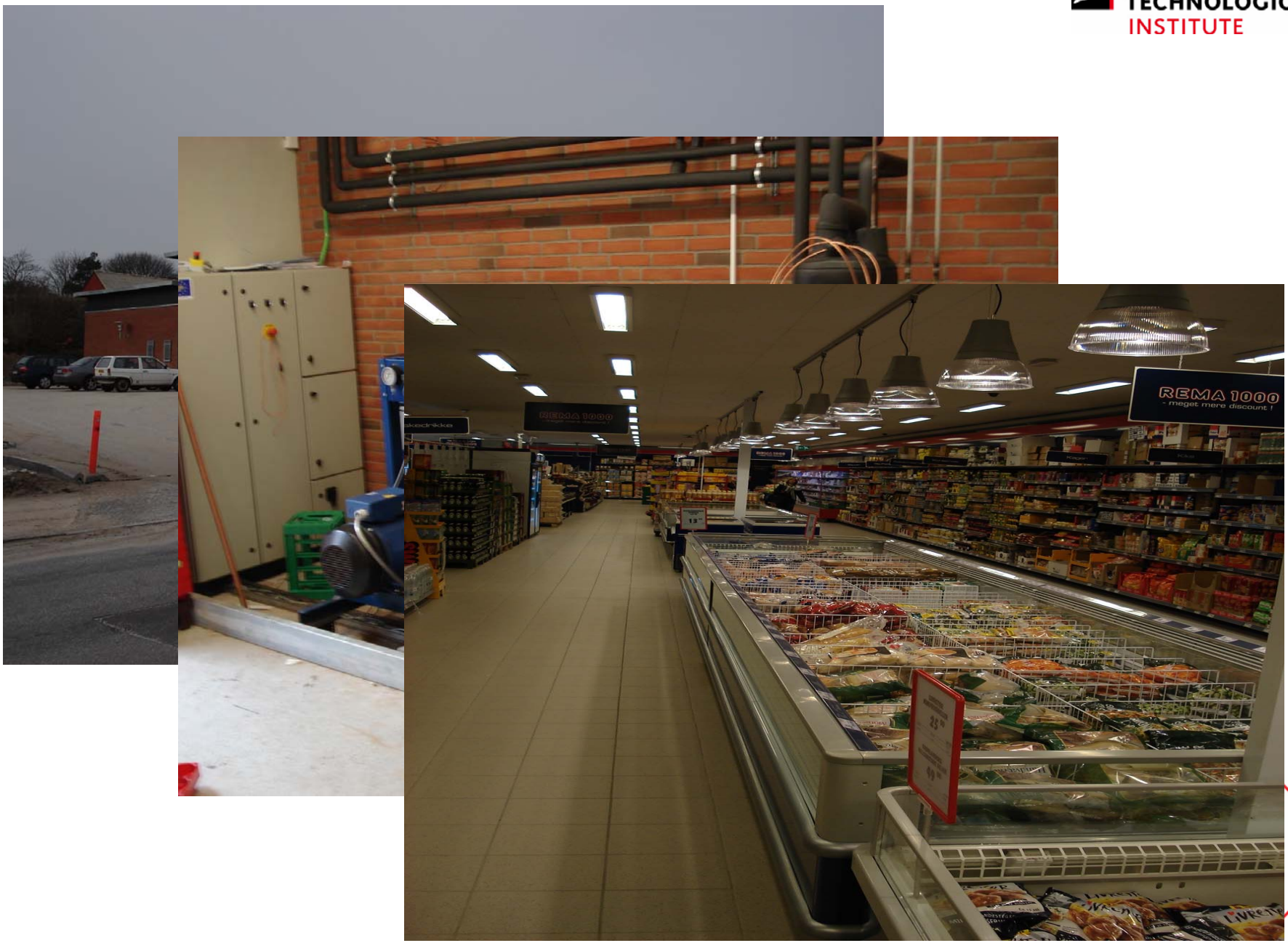

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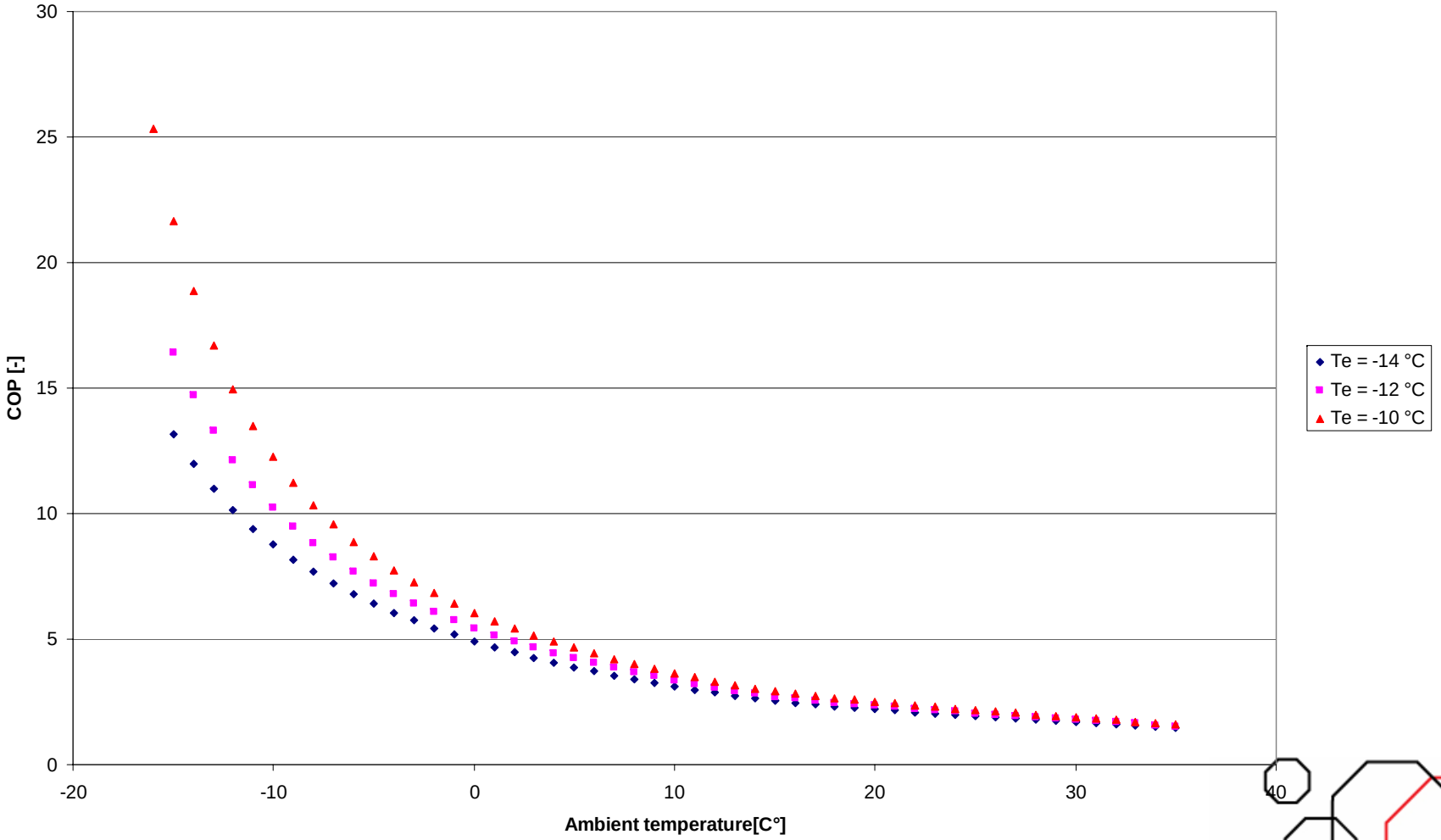
COP VS. Ambient temperature



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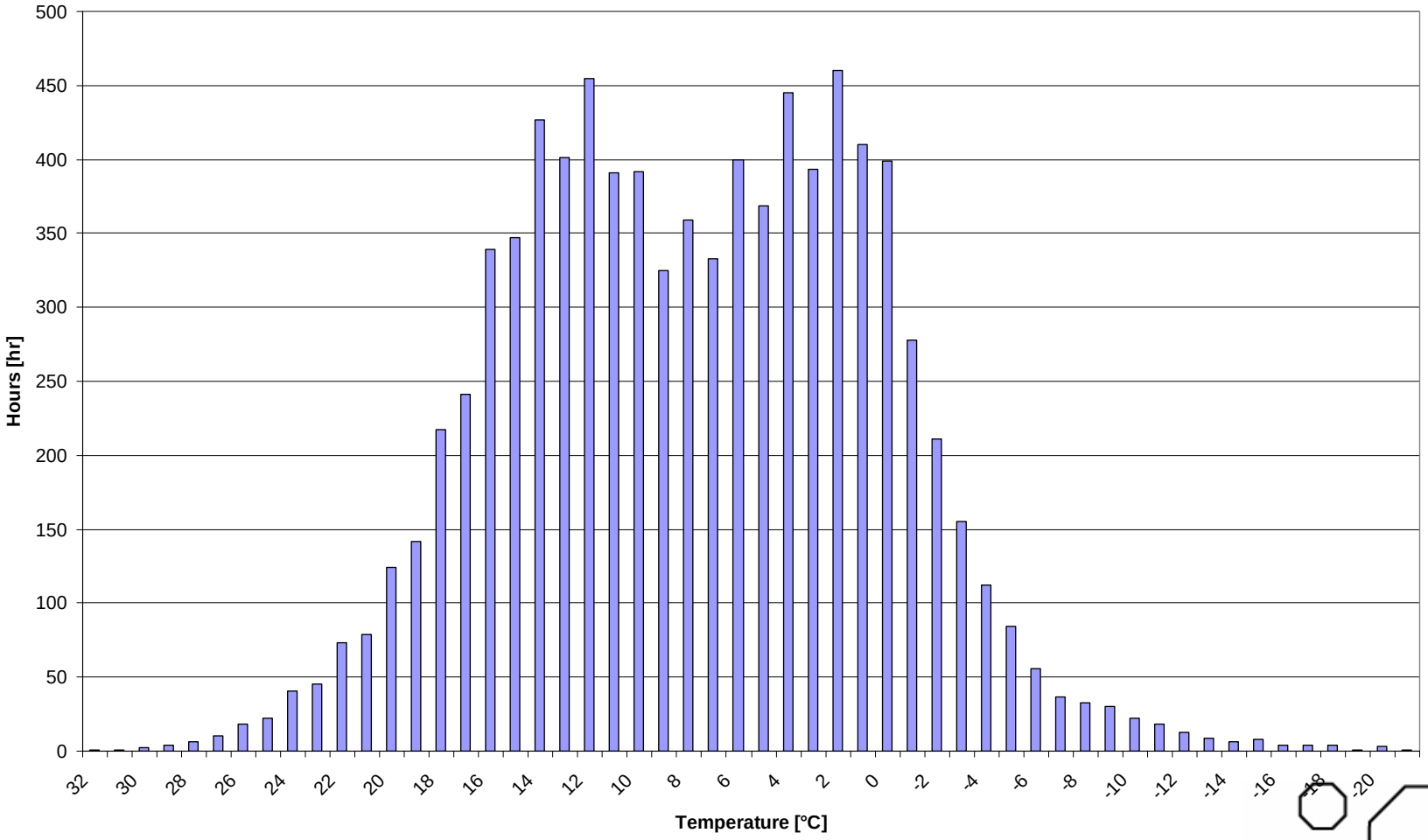
Temperature distribution Denmark



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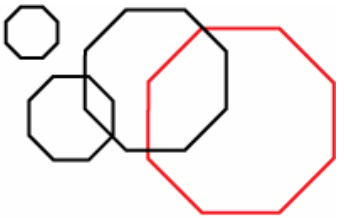
Average COP on yearly basis

t_e	CO_2	R404a*	R134a*
-14 °C	3.71	3.91	4.17
-12 °C	4.07	4.22	4.50
-10 °C	4.51	4.57	4.87

* t_{sh}=5K, t_c=21°C, t_{sc}=2K; η_{is}=65%



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