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Trend for heat exchangers used in District Heating

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Future “energy” situation for DH:

Today	2020:	2040:
Coal/Gas CHP	Coal/Gas CHP	
Solar thermal	Solar thermal	Solar thermal
Waste incineration	Waste incineration (?)	Waste incineration ?
Biogas CHP	Biogas CHP	Biogas CHP ?
Biomass CHP	Biomass CHP	Biomass CHP ?
Geothermal	Geothermal	Geothermal
Surplus energy	Surplus energy	Surplus energy
Energy consumption in buildings, 100%	80% ?	60% ?
Net Energy Use, 100%	85% ?	70% ?
DH temp. 80-100°C	65°C	55°C

Blue: temperature dependent source

Low Temperature District Heating

Benefits:
Higher usage of renewables/waste energy
Lower distribution losses
Higher efficiencies on plant
Lower ”technical” specifications regarding temperature

Challenges:
Demands to distribution network
Demands to heat exchanger in buildings
Demands to Building insulation
Demands to radiators in existing buildings

> Focus on Heat Exchangers !

Heat Exchanger Essentials

Heat transfer

$$P = UA\Delta T_{lm}$$

Impacts price (plate area)

Pressure drop

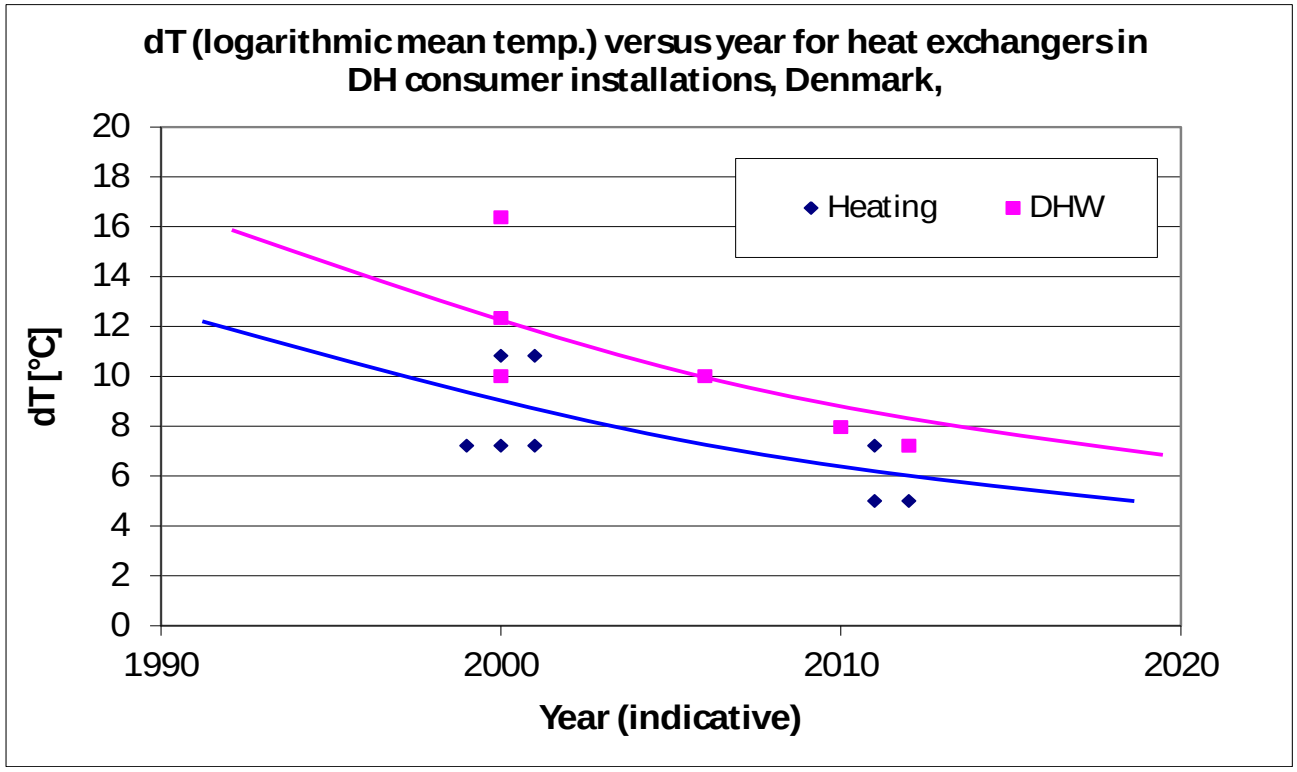
$$dp = C_D \frac{1}{2} \rho v^2$$

DH pump energy

Strength

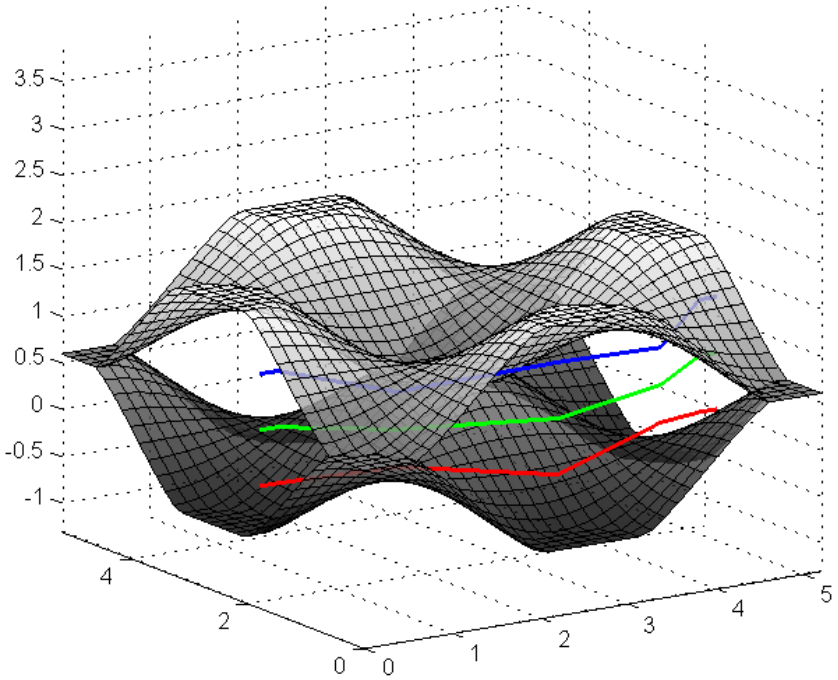
Impacts price (plate thickness)

Demands to dT(lm) over time

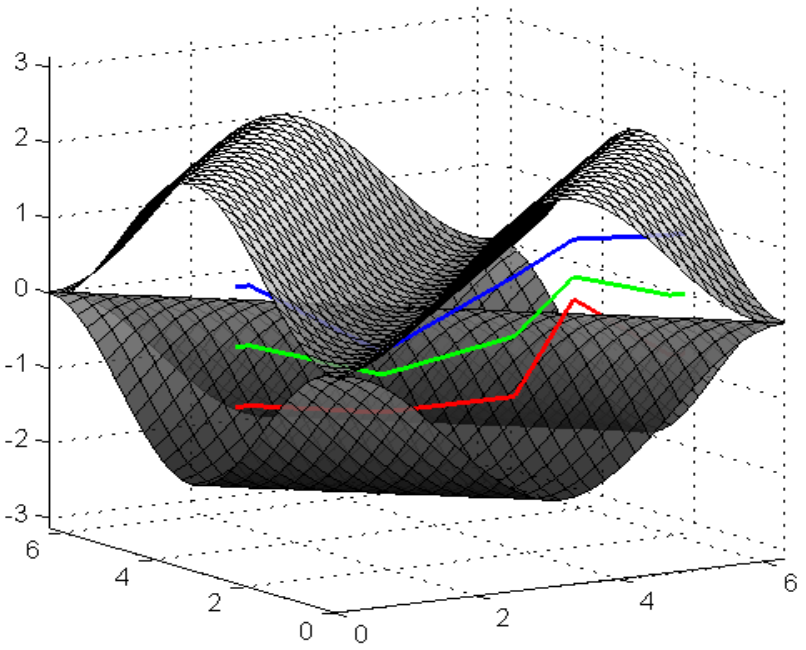


(DK: Randers, Skanderborg, Aarhus, Vejle, Lystrup and general)

Heat Exchanger Pattern

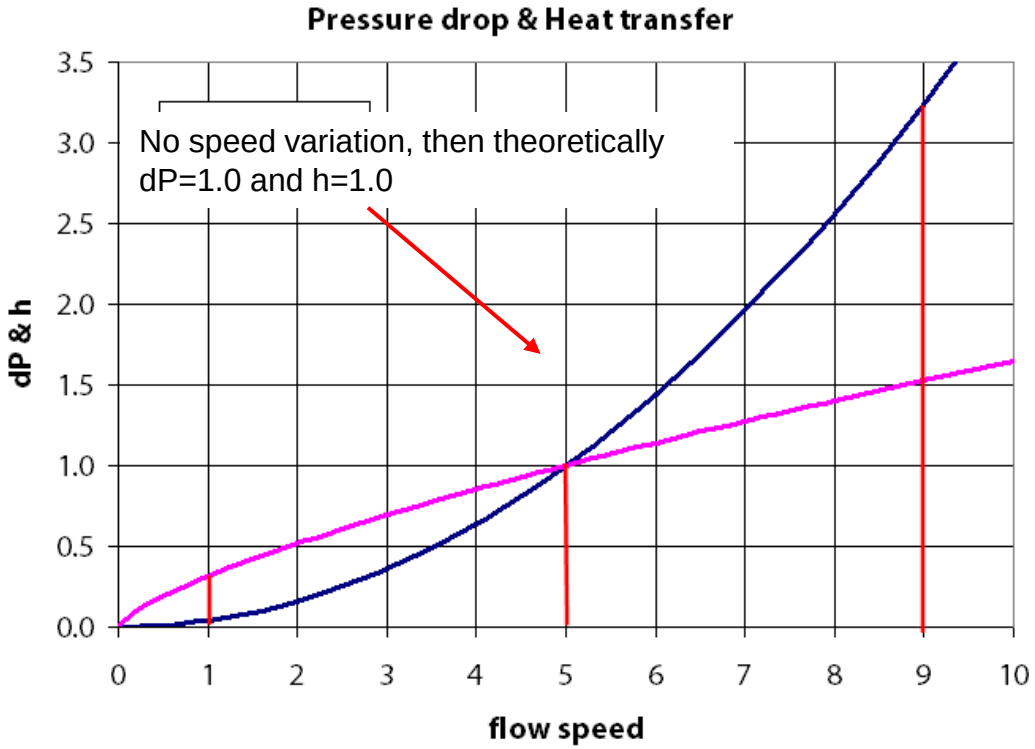


Danfoss Dimple Pattern



Traditional pattern

Heat transfer / pressure drop relation

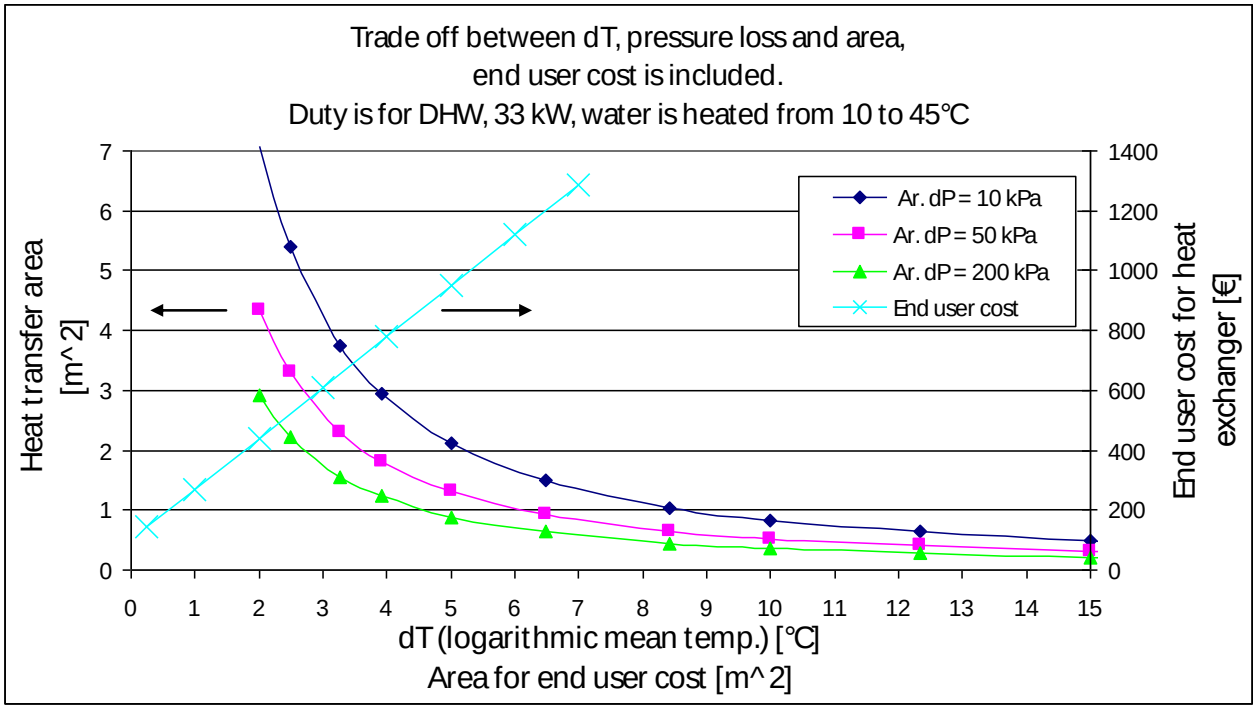


Speed variation

v=1, 2…,9 equally distributed, resulting in average dP=1.27, h=0.97 or transforming to dP = 1.0 gives dP=1.0 and h= 0.92

resulting in 8% less performance on h versus dP

Size of Heat exchanger / dT(lm) relation



10 > 50 kPa equals 37% area saved
10> 200 kPa equals 57% area saved
dTlm 15°C to 5°C equals price increase of 220% @ 10kPa

Recommendations for heat exchanger

Beneficial to specify heat exchanger with low dTlm

- for current situation
- for future situation

Today typically specified dTlm approx. 10-15°C !

This is recommended to be 5°C

- heat exchanger technology develops !
- fits to historical trend

Recommendations for DH in general

LTDH can be applied:

- for the whole DH net
- for sub nets
- for the DH net outer parts
- Connected to transmission return line

What DH temperature level is recommended:

- basically as low as set by the DHW temperature demands (max. utilization of renewable sources)

Thank You for the Attention

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