STRATEGY AND TECHNOLOGIES FOR TRANSITION TO LOW-TEMPERATURE DISTRICT HEATING

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EASY COMFORTABLE LOW COST
AGENDA

• Viborg District Heating in figures
• Low temperature in Viborg
• 4 generation district heating
• Examples of optimized network
VIBORG DISTRICT HEATING

Consumer owned

8,900 delivery points

260,000 MWh

320 km DH pipe

Heatloss 21%

2,15 mill. heated m²
VIBORG DISTRICT HEATING
PURPOSE

• The company’s main goal is to give our customers more value for less money.
• And the strategy consists of four main areas.
  • Competitiveness of product to gain more customers.
  • Customer support to reduce customers consumption of energy.
  • More efficient low temperature district heating system to reduce heat loss.
  • A more efficient administration to be able to include more customers.
• Total revenues 163 mill. DKK (21.5 mill. Euro)
• 66 % resale
• 20 % heat loss
• 5 % depreciation
• 9 % salary, energy savings, maintenance of network
• House 130 m² 18.100 kWh
• Energy 11.055 kr.
• Standing charges 1.855 kr.
• Meeter 532 kr.
• Tax 3.368 kr.
• Total 16.841 kr.
  \( \text{(2.228 €)} \)
TEMPERATURE FOCUS
SINCE MID 1990

- Smart meters 1999
- Motivation tariff 2002
- Temperature strategy 2011

Developement in supply temperature

Developement in return temperature
BENEFIT IN LOW TEMPERATURE

• Less loss in distribution network
  • Viborg district heating saves 650 MWh every time the temperature is lowered 1 degree in the network

• Possibility to use and optimize new heat production
  • Solar heating delivers more energy pr. m² solar panel
  • The COP value of heatpumps benefits from the low temperature
  • More possibilities for surplus energy
EXAMPLES OF SAVINGS HEATPUMP

- From 70 to 60 °C supply temperature saves 30 kr./MWh
- From 40 to 30 °C return temperature saves 33 kr./MWh
- Savings 16,3 Mill. kr. (2,2 Mill. €) per year
- Less heatloss 15000 MWh ~ 3 mill kr. (0,8 mill €) per year (production price 200 kr/MWh)
- Total savings 19,3 mill. kr. (3 mill. €) per year
EXAMPLES OF SAVINGS SOLAR

100,000 m² solar panels
Baseline 70/40 °C
20 % solar production of total

- From 70 to 60 °C supply temperature saves 15,2 kr./m² solar panel
- From 40 to 30 °C return temperature saves 15,6 kr./m² solar panel
- Savings 3,1 Mill. kr. (0,4 Mill. €) per year
- Less heatloss 15000 MWh ~ 6 mill kr. (0,8 mill €) per year (400 kr./MWh)
- Total savings 9 mill. kr. (1,2 mill. €) per year
- 23,4 % solar production of total
HOW WE ANALYSE

• Temperature optimizing program
  • Use it to see how temperature develops
  • Can test how a change in network will impact on the flow and temperature in network

• Sectioning the network
  • Heatloss and demand
  • Type of buildings and age
  • Geography
TEMPERATURE DEMAND

Supply Temp.

70 degree

55 degree

Reduction of temperature through investments

Small amount that needs a boost

Low supply temp. → higher efficiency → cheap heat

Large amount of cheap low temperature Heat

10-20%

80-90%

amount/MWh
PRINCIPLE OF THOUGHTS OF MORE EFFICIENT SURPLUS HEAT

- Supply temperature in current delivery points
  - The return temperature is low both because of the heat pumps, but also because new units are more efficient
  - Larger old residential buildings have a demand for supply temperature above 50 °C

- Lokal surplus heat from industry and cooling
  - In areas with only a few large residential buildings, the temperature boost can be done in the building
  - Some areas are placed far from the delivery points, here the temperature needs a boost in summertime when the flow is little.

- Heat pump in network or at consumer
IF TEMPERATURE IS TOO LOW

• The hot water at residential houses is heated by a heat exchanger, and is designed for 55 °C supply temperature.

• Some areas have a temperature that is lower than we promise at approx. 50-52 degree in summer.

• This can be solved if we install a booster pump, that raise the pressure when they need hot water.

• In the future we use a heat exchanger that’s designed for 50 °C supply temperature.
IF TEMPERATURE IS TOO LOW

- If temperature is even lower, the kitchen sink can have problems. Here we can boost the temperature by an electrical boost.
HOW DO WE INVEST

• We have a list of all our possibilities to make our network more efficient
• The investments has to have a reasonable payback time
• We prioritize the list and makes the best projekts first

• Secures the price will be reduced to our customers
EXAMPLE OF ENERGY SAVINGS

• Amtmandshøjen approx. 500 consumers
  • Problem with keeping supply temperature and high return temperature.
  • Solution, got rid of the Heat exchanger and mixed the temperature
  • Savings 440 MWh eq 250,000 kr. (33,000 EURO) per year
  • Cost 850,000 kr. (112,000 EURO)
  • Pay back 4 years
• Insulation before meeter at customer
  • Many consumer installations is without insulation from main valves to meeter (2x1 m).
  • Insulation of 8000 consumer installations will result in 6500 MWh saving per year eq. 3 mio kr. (397.000 €)
    • Cost around 8 mill. kr. (1.050.000 €)
  • Payback 3 years
EXAMPLE OF ENERGY SAVINGS

Renovation of pipes
Reduced pipe dimension
Twin pipe
Savings 120 MWh ~ 54,000 kr. (7150 €)
Investments 850,000 kr. (112,000 €)
Payback 15 years
EXAMPLE OF ENERGY SAVINGS

• Pump in network, closed networkloop
  60,000 kWh/y elec. 90,000 kWh/y heat.
  Total savings 95,000 kr. (12,600 €) per year
• Investment 750,000 kr. (99,200 €)
• Payback 8 years