Intelligent utilization of pumps in low temperature district heating
INTERESTED IN A SUSTAINABLE FUTURE?

Both can be achieved

WANT TO INCREASE SYSTEM EFFICIENCY?
Political support to lower carbon emissions with district heating as a key element

12% market share

Figure 2-6: Development GHG emission per sector (in Mt) in the European Union until 2050. [6]
Clean energy calls for intelligent heat grids

**UTILIZATION OF VARIOUS ENERGY SOURCES**
- Coal
- Oil
- Gas
- Electricity
- Biomass
- Geothermal
- Waste
- Solar energy
- Wind

**PRODUCTION AND DISTRIBUTION OF ENERGY**
- Heat plant
  - Combined Heat and Power plant
  - Transmission and distribution network
- Commercial
- Industry
- Residential
- Distributor station

**RENEWABLES**

**SURPLUS HEATING**
- Industry
- Commercial
- Thermal storage

**END USER PEACE-OF-MIND**

**THE SOLUTION**
Lower supply temperature in district heating
The challenge of low temperature heating

PRESSURE LOSS

The traditional district heating system

DE production or sub-station
Residential
Commercial
Industry
Residential

Total ∆P

Needed differential pressure

Needed differential pressure
Residual pressure
The challenge of low temperature heating

PRESSURE LOSS

A lower forward temperature requires more flow (and pressure) to deliver the same energy in the system: $\Phi = Q \times \Delta t$
The challenge of low temperature heating

PRESSURE LOSS

Solve the challenge of high pressure and loss by distributing pumps and adding the pressure when needed:

\[ \Phi = Q \times \Delta t \]
The challenge of low temperature heating

PRESSURE LOSS

Solve the challenge of high pressure and loss by distributing pumps and adding the pressure when needed:

$$\Phi = Q \times \Delta t$$
Savings when changing to low temperature district heating

**SAVINGS**

- **Long ROI**
- **Longer ROI**
- **Short ROI**
- **Super short ROI**

**Temperatures:**
- 110°C
- 100°C
- 90°C
- 80°C
- 70°C
- 60°C
- 50°C

**Typical installation characteristics:**
- 20% over-sized (at least)
- Designed for peak loads (few hours/year)
- Energy renovation reducing heat demand (insulation, windows etc.)

**Savings when changing to low temperature district heating:**

- **Redoing most consumer installations**
  - Many new building installations
  - Few new building installations
  - Consumer re-commissioning
  - New consumer contracts
  - Few distribution investments
Energy losses in traditional District Heating

- **30% efficiency loss**
- **30% heat loss**

Source: Anders Nielsen & Carsten Pedersen, BS Segment
Energy losses in Low Temperature District Heating

- 13% efficiency loss
- 30% efficiency loss
- 20%

1.736 MWh heat loss reduction leading to 2.551 MWh savings on primary energy!!

Source: Anders Nielsen & Carsten Pedersen, BS Segment
**CASE: Savings in an extension area with mixing loop (highly insulated piping)**

<table>
<thead>
<tr>
<th></th>
<th>Usual Design</th>
<th>New Temperature Design</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperatures (flow/return)</td>
<td>90°C - 58°C</td>
<td>69°C - 37°C</td>
<td>22%</td>
</tr>
<tr>
<td>Heat loss pipes/year MWh</td>
<td>2.573 MWh</td>
<td>2.021 MWh</td>
<td>552 MWh</td>
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<tr>
<td>Primary energy MWh/year</td>
<td>16.533 MWh</td>
<td>15.744 MWh</td>
<td>789 MWh</td>
</tr>
<tr>
<td>Pump energy MWh/year</td>
<td>0 MWh</td>
<td>14 MWh</td>
<td>14 MWh</td>
</tr>
</tbody>
</table>
THANK YOU FOR LISTENING!

- Pressure Holding Systems
- Distribution Pumps
- Sub Station
- Direct Connection
- Plate Heat Exchange
- Mixing Loops
- Consumer Connections
- Booster Pumps
- Temperature Zoning
- Distribution Line
- Water Treatment Pumps
- Flow Filter Pumps
- Main Pumps
- Boiler House
- Boiler Shunt Pumps
- Lull Heat Pumps
- Flue Gas Economiser
- CHP Power Plant
- Boilers
- Shunt Pumps
- Boilers