Rethink Energy in Industrial Heat Pumps NOW!

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A message to the politicians

This is NOT a heat pump
Production of heat
EU 28 Energy source

- 48% Conventional thermal
- 26% Nuclear
- 12% Hydro
- 10% Wind
- 4% Others
Energy source (Eurostat 2015)
How do we use it in industrial applications?

- Wind and Solar energy is volatile
- How do we store energy for use out of production hours?
  - Battery
  - Hot and cold storage
- Heat Pumps come in to the picture for simultaneous production of heat and cold during production of energy
- Flexibility is of major concern to ensure best use of the resources
- What temperature levels will be relevant?
- What technologies will we use?
- How do we ensure the highest possible efficiency?
Heat Pumps in Industrial systems

Heat sink:
- Melting
- Cleaning
- Disinfection
- Heating
- Homogenisation

Heat source:
- Low value heat
- Melting
- Cooling plant
- Fermentation
- Exhaust
Heat Pumps Function

Renewable heat source

Low value heat

Heat Pump

High value heat

Energy
Heat Pump and the Process

- Heat Pump
- Process
- Heat Pump
- Condenser
- Evaporator
- Compressor
An example

- Raw milk in
- Raw milk storage
- Holding tube
- Hot water preparation
- Steam
- Heat treatment
- Ice water
- Clarification
- Intermediate storage
Mapping a seafood processing factory

<table>
<thead>
<tr>
<th>Source</th>
<th>Temperature</th>
<th>Capacity</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigeration</td>
<td>30</td>
<td>3000</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>AC chiller</td>
<td>30</td>
<td>1000</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>Compressed air</td>
<td>50</td>
<td>1000</td>
<td>Cooling tower</td>
</tr>
<tr>
<td>Waste water</td>
<td>40</td>
<td>5000</td>
<td>Sewer</td>
</tr>
<tr>
<td>Exhaust air</td>
<td>35</td>
<td>2000</td>
<td>Out in the blue</td>
</tr>
<tr>
<td><strong>Total heat source capacity</strong></td>
<td></td>
<td><strong>12000</strong></td>
<td></td>
</tr>
</tbody>
</table>

Boilers at site: 4 boilers each with a capacity of 1600 kW. Total 6.400 kW

Required temperature levels: 90°C
Mapping a brewery
Mapping a brewery
Mapping a brewery
Why is the market not growing faster?

— Lack of knowledge
— Reservation to new technology
— Price compared to alternatives
— Communication optimisation
— Clear and understandable to layman
— Market rivalry

Produkt specification

Do I need it?

Is it reliable?

Is it good business?

Buy

No Buy
Porters five forces

Competitive Rivalry

- Threat of Substitute Products
- Threat of New Entrants
- Bargaining power of customers
- Bargaining power of suppliers
Porters five forces

- Threat of Substitute Products
- Threat of New Entrants
- Bargaining power of suppliers
- Bargaining power of customers
- Technological factors
- Social factors
- Economic factors
- Political factors
Conclusions

- Industrial applications offer a unique possibility of recovering low value heat for production of high value heat
- The economics are different in a process heat pump
- You can optimise your production by thinking smart and different
- You can become more efficient than your competitor

\[-Factory\,efficiency = \frac{Bottom\,line}{Invested\,capital} \ast patience\]
Thank you for your kind attention