High Temperature Heat Pump in a Swiss Cheese Factory
From Waste Heat to Cheese

Application
The mountain cheese factory in Gais Appenzell transforms waste heat at 20 °C from the neighboring data center into process heat of up to 100 °C using a high temperature heat pump in order to heat and process the milk for cheese production. This saves the mountain cheese factory around 1.5 million kWh of natural gas per year.

Technical data of the HTHP

**Economizer cycle with vapor injection**
- The mildly flammable (A2L) HFO refrigerant R1234ze(E) demands special measures for fire protection (e.g. gas sensors, ventilation) and escape routes.

Performance data of the heat pump

<table>
<thead>
<tr>
<th>Part load (%)</th>
<th>COPH</th>
<th>Weight</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%**</td>
<td>100*</td>
<td>~4'000 kg</td>
<td>L x W x H</td>
</tr>
<tr>
<td>75%**</td>
<td>97</td>
<td></td>
<td></td>
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<tr>
<td>50%**</td>
<td>92</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(from data sheet of Ochsner Energie Technik GmbH, * experimentally tested data, ** extrapolated)

References
1. https://www.rechenzentrum-ostschweiz.ch
2. https://www.bergkaeserei.ch

Cheese factory in Gais Appenzell
- Energy demand approx. 1’800 MWh per year
- Approx. 10 mio. liters of milk per year (60 milk suppliers)
- Approx. 300 tons of cheese per year

Temperature levels:
- Waste heat recovery (washing, ventilation heating): <42 °C
- Space heating and hot water (cheese storage house): 65 °C
- Process heat 1 (cheese vats, cleaning water): 92 °C
- Process heat 2 (multi-purpose heater, pasteurisation): 105 °C

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[Image of cheese factory, data center, high temperature heat pump, and heat pump type with technical data]

Heat pump type: Industrial heat pump
- W: Water as heat source
- H: High temperature heat pump
- S: Screw compressor
- T5: Heating capacity range in kW
- E: Economizer cycle
- R: Shell and tube heat exchanger
- P: Refrigerant R1234ze(E)
- C: 2-stage compressor

- Part load (%): 100*, 75**, 50**
- Effective part load (%): 100, 81, 62
- Condenser capacity (kW): 520, 416, 321
- Condenser water flow rate (m³/h): 44.7, 36.0, 27.6
- Temperature difference condenser (K): 10.0, 10.0, 10.0
- Evaporator capacity (kW): 338, 264, 195
- Evaporator water flow rate (m³/h): 88.7, 72.7, 62.7
- Temperature difference evaporator (K): 3.5, 2.7, 2.0
- Compressor power (kW): 182, 155, 126
- COPH (-): 2.85, 2.70, 2.55

[Detailed table of performance data]