Ultra-high temperature heat pump

OCHSNER Energie Technik

Summary of technology

Ultra-high temperature heat pumps can provide process heating at high temperature for industrial applications. The most relevant applications are: paper industry, food industry, chemical industry, waste heat utilization from process cooling and power plants, industrial processes, and district heating. The ultra-high temperature heat pump technology by Ochsner Energie Technik has been commercialized and is currently available in the market.

The heat pump is based on an electricity-driven hermetic single-stage refrigerant circuit. It equips a semi-hermetic rotary screw compressor. The lubrication system includes an internal oil circuit and an external oil circuit for additional cooling.

The evaporator and condenser heat exchanger have a shell & tube design and suitable transport media on the sink and source side are water or brine.

The design is application-specific. A buffer tank is required on the sink and on the source side to ensure minimum running time.

Ochsner technology solutions use heat extremely efficiently and with very low environmental impact. The COPs measured in the laboratory at different temperatures are shown in Table 1.
Figure 2: Ultra–high temperature heat pump

Table 1: Performance.

<table>
<thead>
<tr>
<th>T_{source,in}</th>
<th>T_{source,out}</th>
<th>T_{sink,in}</th>
<th>T_{sink,out}</th>
<th>COP_{heating}</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>45</td>
<td>130</td>
<td>125</td>
<td>1.6</td>
</tr>
<tr>
<td>55</td>
<td>60</td>
<td>125</td>
<td>130</td>
<td>2.3</td>
</tr>
<tr>
<td>50</td>
<td>55</td>
<td>100</td>
<td>110</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Figure 3 shows the temperature limits of the condenser outlet and evaporator inlet.

FACTS ABOUT THE TECHNOLOGY

Heat supply capacity: 500 kW
Temperature range: condenser +80/+130 °C, evaporator +35/+60 °C
Working fluid: R1233zd
Compressor technology: semi-hermetic screw
Specific investment cost for installed system without integration: 350 - 700 €/kW
TRL level: TRL9
Expected lifetime: 20 years.
Size: Weight 4000 kg, footprint 4 m²

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All information were provided by the supplier without third-party validation. The information was provided as an indicative basis and may be different in final installations depending on application specific parameters.