INTEGRATED HEAT AND MASS RECOVERY FROM INDUSTRIAL EXHAUSTS
Most of heat exchangers are designed for transferring of sensible heat.
Objectives of HMX concept development:
- optimisation of the humid exhaust flow arrangement
- providing an efficient heat transfer element;
- fast removal of condensate

HMX designing solutions:
- streams splitting and merge devices
- staggered heat pipes
- a low hydraulic resistant spiral channel
HMX CONCEPT APPROACHES

heat transfer enhancement:
• staggered heat pipes
• spiral channels

Spiral Channels

Heat Pipes

Water Separator
## APPLICATION ASSESSMENT

### Bakery Waste Heat/Water Recovery System

**HMX**

- **Stack gas**, 25°C, 0.64 kg/s, 100%RH
- **Ambient Air (RH 60%)**, 20°C, 1.35 kg/s

### Water cooling condenser

- **Stack gas**, 25°C, 0.64 kg/s, 100%RH

### Heat-Mass Exchanger

- **Recovered heat**: 471 kW
- **Condensate flow rate**: 0.208 kg/s
- **Proofer air (50°C, 100%RH)**: 2.28 m³/s
- **Heating flow: water 40°C**: 0 kg/s
- **Heat transfer surface area**: 183 m²

### Table

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>Concept Heat-Mass Exchanger</th>
<th>Water cooling condenser</th>
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<tr>
<td>Recovered heat</td>
<td>kW</td>
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<td>436</td>
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<tr>
<td>Condensate flow</td>
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<tr>
<td>Proofer air</td>
<td>m³/s</td>
<td>2.28</td>
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<tr>
<td>Heating flow</td>
<td>kg/s</td>
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<td>4.35</td>
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<tr>
<td>Heat transfer</td>
<td>m²</td>
<td>183</td>
<td>412</td>
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</tbody>
</table>

### Diagram

- **Oven**
- **Proofer**
- **Gas-air HX**
- **Baking exhaust**
- **Stack gas**
- **Ambient Air**
- **Water cooling condenser**

**SMART HEAT Inc.**