Energy Saving & CO$_2$ Emissions

Porcelain Glost Kiln
One of the most important issues these days consists in an increased efficiency of the heat treatment plants used in the industry today in terms of energy consumption.
Riedhammer continuously improves the efficiency of the different kiln plants to be always one step ahead.

Our solutions can be splitted into:

- **Direct solutions** the waste energy from the kiln is used directly in the kiln i.e. for pre-dryers or as preheated combustion air
- **Indirect solutions** the waste energy from the kiln is recuperated and can be used elsewhere in the plant.
Energy Balance

- Implemented energy: 2330 kW
- Flue gas losses: 796 kW
- Wall losses: 202 kW
- Indirect cooling: 120 kW
- Waste air for recuperation: 1070 kW
- Heating up of kiln car: 365 kW
- Energy into product: 968 kW
Combustion Air Preheating

• **Principle:** SiSiC tubes installed directly inside the kiln at the beginning of the cooling zone work as heat exchangers. Ambient air flowing through these pipes is heated up and sent to the burners as combustion air.

• **Air temperature:** Approx. 400 °C at the burner

• **Result:** 6 - 10 % lower specific energy consumption
Combustion Air Preheating

Principle
Combustion Air Preheating
## Comparison: Results of Combustion Air Preheating

<table>
<thead>
<tr>
<th></th>
<th>Fast firing kilns built end of the 90s</th>
<th>Fast firing kilns built today</th>
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</thead>
<tbody>
<tr>
<td>Assumed daily production</td>
<td>14,000 kg of product / 24 h Porcelain</td>
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<tr>
<td>Specific energy consumption</td>
<td>4,000 kcal/kg product</td>
<td>3,300 kcal/kg product</td>
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<tr>
<td>Implemented energy per day</td>
<td>6,511 m³ nat. gas / 24 h</td>
<td>5,370 m³ nat. gas / 24 h</td>
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<td>65,656 kWh nat. gas / 24 h</td>
<td>54,150 kWh nat. gas / 24 h</td>
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<td>Energy per year</td>
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<td></td>
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<tr>
<td>Basis: 330 working days</td>
<td>2,148,630 m³ nat. gas</td>
<td>1,772,100 m³ nat. gas</td>
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<tr>
<td>CO₂ emission</td>
<td></td>
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<tr>
<td>Basis: 0.2 kg/kWh nat. gas</td>
<td>13,130 kg / 24 h</td>
<td>10,830 kg / 24 h</td>
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<td>4,333 t / year</td>
<td>3,574 t / year</td>
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<td>Saving per year</td>
<td></td>
<td>376,530 m³ nat. gas</td>
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<td>760 t/year</td>
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Recuperation

Energy is available as hot air in two kiln areas:

Flue gas exhaust
- approx. 15 000 m³/h
- approx. 150 °C

Waste air cooling zone
- approx. 20 000 m³/h
- approx. 220 °C

- Flue gas with SOx and F
- Use must be checked

- Use of recuperator for air/air or air/water recommended which can be supplied by Riedhammer