Fact sheet
Directly heated Rotary Kilns

Sixteen different rotary kilns are available for your project trials and production needs.
- 4 direct heated rotary kilns
- Temperature range: 100 – 1,550°C
- Residence time: 15 – 180 minutes
- Reaction modes: continuous, batch, co-current, counter-current
- Typical Processes: calcination, sintering, reduction, oxidation and drying

<table>
<thead>
<tr>
<th>Kiln name</th>
<th>Beheizte Ofenlänge [m]</th>
<th>Inner diameter [m]</th>
<th>Heating type</th>
<th>Temperature range [°C]</th>
<th>Raw material throughput [kg/h]</th>
<th>Mode of operation</th>
<th>Special features</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDO</td>
<td>12</td>
<td>1</td>
<td>natural gas</td>
<td>up to 1,500</td>
<td>150 – 1,500</td>
<td>counter-current</td>
<td>raw material silo, 10 m rotary cooler, cyclone preheater</td>
</tr>
<tr>
<td>MDO</td>
<td>4</td>
<td>0.6</td>
<td>natural gas</td>
<td>up to 1,400</td>
<td>50 – 500</td>
<td>counter-current</td>
<td>rotary cooler, cyclone preheater</td>
</tr>
<tr>
<td>KDO</td>
<td>7</td>
<td>0.3</td>
<td>natural gas</td>
<td>up to 1,550</td>
<td>10 – 100</td>
<td>counter-current or co-current</td>
<td>vibration cooler, rotary cooler, reducing gas atmosphere possible, afterburner</td>
</tr>
<tr>
<td>BDO</td>
<td>0.6</td>
<td>0.35</td>
<td>natural gas</td>
<td>up to 1,400</td>
<td>15 l per batch</td>
<td>batch operation only</td>
<td>batch kiln for small amounts</td>
</tr>
</tbody>
</table>

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## IBU-tec – Pre- & Post-Processing

### Conveying and Dosing Equipment
- Screw conveyors
- Conveyor belts
- Disc conveyors
- Pneumatic conveyors
- Gravimetric dosing unit with screw feed
- Volumetric dosing screws
- Vibration chutes (Vibration conveyors, Gravimetric feeders)
- Membrane pumps
- Spraying lances
- Rotary feeders
- Displacement and peristaltic pumps

### Exhaust Gas Treatment
- Thermal afterburners and exhaust gas cleaning
- DeNOx systems to denitrogenize the exhaust gas
- Filter systems to remove dust from the exhaust gas
- Gas scrubbers, venture-scrubbers (wet gas scrubbers) for the removal of particulates and absorbable gases [acidic and alkaline washes]
- Dust analysis in the treated gas, final police filter
- Use of adsorbents to remove acidic components

### Mixing and Granulation Units
<table>
<thead>
<tr>
<th>Type</th>
<th>Number on site</th>
<th>Typical size</th>
<th>Attainable throughput</th>
<th>Material type</th>
<th>Specifications / special characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIRICH Intensive mixer R2</td>
<td>1</td>
<td>Useable vol.: 3.5 l</td>
<td>N/A</td>
<td>Stainless steel</td>
<td>Laboratory mixer</td>
</tr>
<tr>
<td>EIRICH Intensive mixer R09</td>
<td>1</td>
<td>Useable vol.: 150 l</td>
<td>up to 300 kg/h</td>
<td>Stainless steel</td>
<td>Batch mixer, suitable for tests or production</td>
</tr>
<tr>
<td>EIRICH Intensive mixer R11</td>
<td>1</td>
<td>Useable vol.: 250 l</td>
<td>up to 1,000 kg/h</td>
<td>Carbon steel</td>
<td>Batch mixer, suitable for tests or production, automated</td>
</tr>
<tr>
<td>Cone mixer</td>
<td>2</td>
<td>1 x à 1,500 l</td>
<td>up to 480 kg/h</td>
<td>Stainless steel</td>
<td>Batch mixer, suitable for tests or production</td>
</tr>
<tr>
<td>1 x à 2,500 l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lödige ploughshare mixer</td>
<td>5</td>
<td>3 x à 600 l</td>
<td>up to 600 kg/h</td>
<td>Stainless steel</td>
<td>Batch mixer, suitable for tests or production</td>
</tr>
<tr>
<td>1 x à 300 l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 x à 1,400 l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Screening and Sorting
<table>
<thead>
<tr>
<th>Type</th>
<th>Number on site</th>
<th>Attainable throughput</th>
<th>Mesh dimensions</th>
<th>Specifications / special characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-deck screening machine</td>
<td>1</td>
<td>up to 1,000 kg/h</td>
<td>0.1 mm to 7 mm</td>
<td>7 decks</td>
</tr>
<tr>
<td>Vibration-screening machine</td>
<td>1</td>
<td>up to 500 kg/h</td>
<td>40 µm - 1,000 µm</td>
<td>2 decks / ultrasound cleaning</td>
</tr>
<tr>
<td>Vibration-screening machine</td>
<td>1</td>
<td>up to 350 kg/h</td>
<td>40 µm - 1,000 µm</td>
<td>2 decks / ball cleaning</td>
</tr>
<tr>
<td>Round-vibration sieve</td>
<td>1</td>
<td>up to 350 kg/h</td>
<td>40 µm - 1,000 µm</td>
<td>2 decks / ultrasound cleaning</td>
</tr>
<tr>
<td>Single deck screen</td>
<td>2</td>
<td>up to 100 kg/h</td>
<td>0.2 mm to 5 mm</td>
<td>1 deck / only for removal of oversized and undersized particles</td>
</tr>
</tbody>
</table>

## IBU-tec – Laboratory Facilities

### Experimental Kilns
- A gradient kiln of our own design is used to simulate processing conditions in industrial direct kilns (dynamic laboratory kiln, max. 1,500 °C)
- Pivot kiln (Carbolite) with a modifiable atmosphere, simulating sample movement (max. 1,100 °C)
- High-temperature microscope with automatic image analysis (HTM) for the determination of melting and expansion behavior (max. 1,600 °C)
- A large number of muffle furnaces (max. 1,600 °C)

### Mineralogical Analysis
- Phase analysis using X-ray diffraction / XRD (Bruker D2 Phaser), including Rietveld analysis

### Chemical Analysis
- Digestion (among others: fusion, microwave, acidic)
- Optical emissions spectroscopy (ICP-OES)
- Atomic absorption spectrometer (F-AAS)
- Complexometric titration
- Colorimetry
- Photometry
- Potentiometry
- Gravimetric analysis
- Elemental analysis

### Fuel Analysis
- Elemental analysis (C, H, N, S)
- Ash analysis
- Calorific value measurement
- Ash melting characteristics (HTM)

### Physical Analysis
- Specific surface area (Brunauer-Emmett-Teller, BET) by N₂-Physisorption
- Pore size distribution and pore radius distribution
- Dynamic and static laser granulometry (particle size analysis / PSD)
- Sieving analysis
- Determination of particle size, particle shape, particle distribution and strength
- Color value measurement
- Density analysis
- Light microscopy with digital image analysis