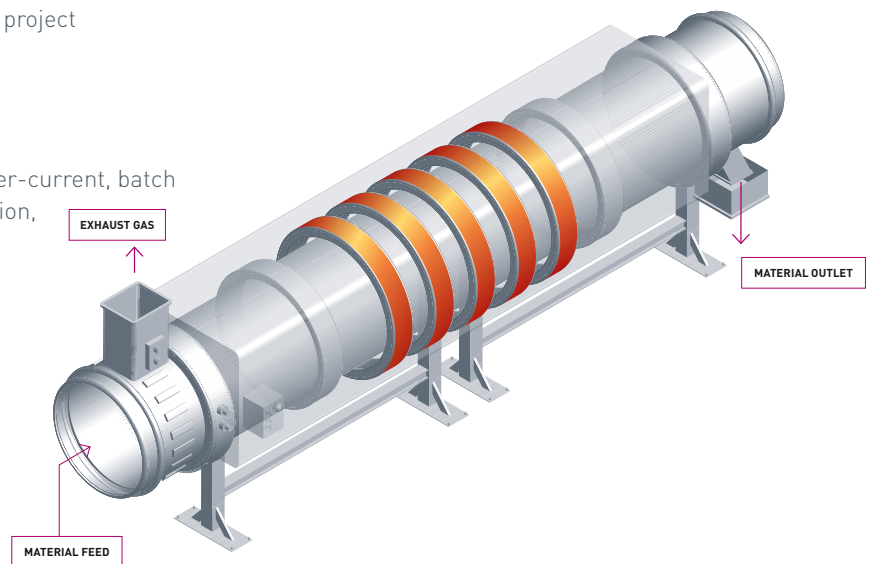


## Fact sheet

### Indirectly heated Rotary Kilns

Sixteen different rotary kilns are available for your project trials and production needs.

- ▶ 12 indirect heated rotary kilns
- ▶ Temperature range: 100 – 1,200°C
- ▶ Residence time: 15 – 180 minutes
- ▶ Reaction modes: continuous, co-current, counter-current, batch
- ▶ Typical Processes: pyrolysis, calcination, reduction, surface treatment of catalyst supports



Kiln name	Heated kiln length [m]	Inner diameter [m]	Heating type	Temperature range [°C]	Raw material throughput [kg/h]	Mode of operation	Special features
<b>IDO 10</b>	7	1	natural gas	300 – 1,150	<b>100 – 1,000</b>	counter-current	5 heating zones
<b>IDO 9</b>	7	1	natural gas	300 – 1,000	<b>100 – 1,100</b>	counter-current	defined gas atmosphere, 5 heating zones, afterburner
<b>IDO 11</b>	4.7	0.6	electrical	100 – 1,150	<b>40 – 400</b>	counter-current	inert and reducing, hydrogen-atmosphere, thermal oxidizer
<b>IDO 3</b>	4	0.5	natural gas	300 – 1,150	<b>25 – 250</b>	counter-current or co-current, batch operation possible	defined gas atmosphere, 6 heating zones, afterburner
<b>IDO 6</b>	3.75	0.45	electrical	100 – 900	<b>15 – 150</b>	counter-current	3 heating zones, thermal oxidizer, DeNOx
<b>IDO 5</b>	3	0.4	electrical	300 – 1,150	<b>10 – 100</b>	counter-current or co-current	defined gas atmosphere, 3 heating zones, afterburner
<b>IDO 1</b>	3	0.4	electrical	100 – 1,150	<b>10 – 100</b>	counter-current or co-current, batch operation possible	defined gas atmosphere, 3 heating zones, afterburner
<b>IDO 2</b>	3	0.4	electrical	100 – 1,200	<b>10 – 100</b>	counter-current or co-current, batch operation possible	4 heating zones
<b>IDO 7</b>	2.3	0.25	electrical	100 – 1,000	<b>3 – 30</b>	counter-current	inert and reducing, thermal oxidizer
<b>IDO 4</b>	1	0.1	electrical	100 – 1,100	<b>0.1 – 2</b>	counter-current or co-current, batch operation possible	defined gas atmosphere, afterburner
<b>IDO 8</b>	1	0.1	electrical	100 – 1,400	<b>0.1 – 2</b>	counter-current or co-current, batch operation possible	ceramic & metal tube, defined gas atmosphere, afterburner
<b>IDO 12</b>	0.9	0.4	electrical	100 – 1,100	<b>ca. 30 l/batch</b>	batch operation only	

# Pre- & Post-Processing Equipment

## 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)
- ▶ Dosing belt scale
- ▶ Membrane pumps
- ▶ Spraying lances
- ▶ Rotary feeders
- ▶ Displacement and peristaltic pumps

## EXHAUS GAS TREATMENT

- ▶ Thermal afterburners and exhaust gas cleaning
- ▶ DeNO<sub>x</sub> 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

Type	Number on site	Typical size	Attainable throughput	Material type	Specifications / special characteristics
<b>EIRICH Intensive mixer R2</b>	1	Useable vol.: 3.5 l	N/A	Stainless steel	Laboratory mixer
<b>EIRICH Intensive mixer R09</b>	1	Useable vol.: 150 l	up to 300 kg/h	Stainless steel	Batch mixer, suitable for tests or production
<b>EIRICH Intensive mixer R11</b>	1	Useable vol.: 250 l	up to 1,000 kg/h	Carbon steel	Batch mixer, suitable for tests or production, automated
<b>Cone mixer</b>	2	1 x à 1,500 l 1 x à 2,500 l	up to 400 kg/h	Stainless steel	Batch mixer, suitable for tests or production
<b>Lödige ploughshare mixer</b>	6	4 x à 600 l 1 x à 300 l 1 x à 1,600 l	up to 600 kg/h	Stainless steel	Batch mixer, suitable for tests or production

## SCREENING AND SORTING

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

## SPRAY DRYING

Type	Number on site	max. Operating temperature	Drying capacity	Specifications / special characteristics
<b>GEA Mobile Minor Typ MM</b>	1	350°C	0.5 - 6 kg/h water evaporation	direct current or mixed process

# Laboratory Facilities

## PYROPROCESSING SYSTEM

- ▶ Specially designed dynamic gradient kiln for simulating firing conditions in industrial furnaces (DLA, max. 1,500°C)
- ▶ Laboratory swivel kiln (Carbolite) with firing material agitation and controllable kiln atmosphere (max. 1,100 °C)
- ▶ High temperature microscope with automatic image analysis (HTM) to determine melting and blowing behavior (max. 1,600 °C)
- ▶ Numerous muffle kilns (max. 1,600 °C)
- ▶ Macro TGA (max. 1,000°C, N<sub>2</sub>/O<sub>2</sub>)
- ▶ Vacuum furnace with heating option (up to 300°C)

## PROCESSING TECHNOLOGY

- ▶ 3 agitator bead mills (Netzsch Zeta RS & LabStar LS1, Drais)
- ▶ Cryomilling
- ▶ Homogenization
- ▶ Dispersing
- ▶ Stirring
- ▶ Drying
- ▶ Centrifugation

## CHEMICAL ANALYSIS

- ▶ Digestion technology (including melt digestion, microwave digestion, acid digestion)
- ▶ Optical emulsion spectroscopy (ICP-OES / ICP-iCAP 7600 Duo)
- ▶ Complexometry
- ▶ Colorimetry
- ▶ Photometry
- ▶ Potentiometry
- ▶ Gravimetry
- ▶ Elemental analysis
- ▶ Karl Fischer titration (furnace method)

## MINERALOGICAL ANALYSIS

- ▶ Phase analysis using X-ray diffraction / XRD (Bruker D2 Phaser), incl. Rietveld analysis

## FUEL ANALYSIS

- ▶ Elemental analysis (CHS & CHNS)
- ▶ Proximate analysis
- ▶ Ash analysis
- ▶ Calorific value determination
- ▶ Ash melting behavior (HTM)

## PHYSICAL ANALYSIS

- ▶ Specific surface determination (according to BET) by means of N<sub>2</sub> adsorption
- ▶ Determination of pore size distribution and pore radius distribution
- ▶ Dynamic and static laser granulometry with laser diffractometer, in situ (particle size analysis / PSD)
- ▶ Sieving analysis
- ▶ Determination of particle size, grain shape, grain distribution and strength
- ▶ Color value determination
- ▶ Density determination
- ▶ Light microscopy with digital image analysis

## ELECTROCHEMISTRY

- ▶ Closed cycle for electrode production, their installation in button and Swagelok cells
- ▶ Galvanostatic cycling (CC/CCCV) (I = ±5A, V = ±6V), impedance spectroscopy
- ▶ Planetary centrifugal mixer with degassing mode
- ▶ Applicator and calender with heating option (up to 100°C)