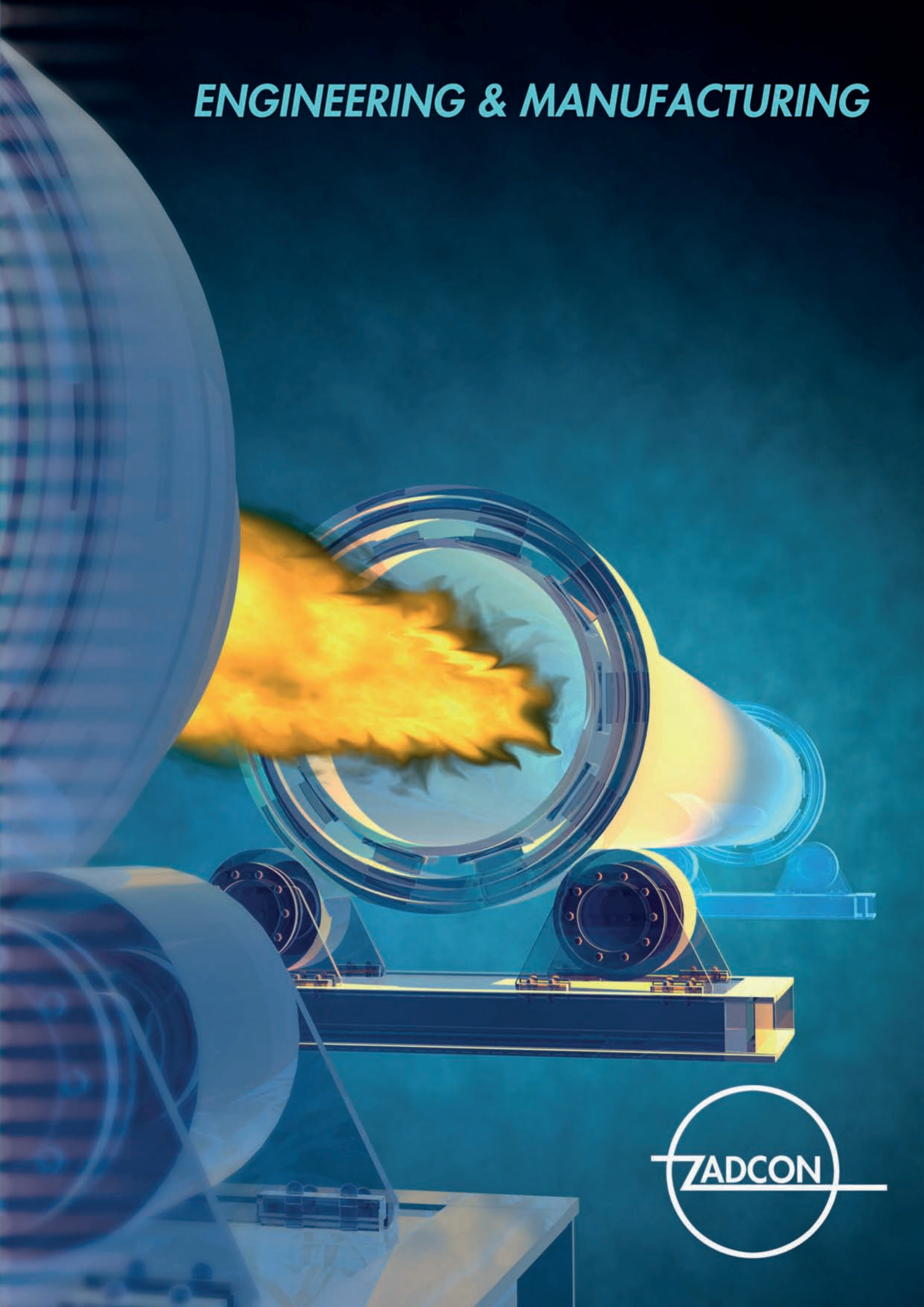


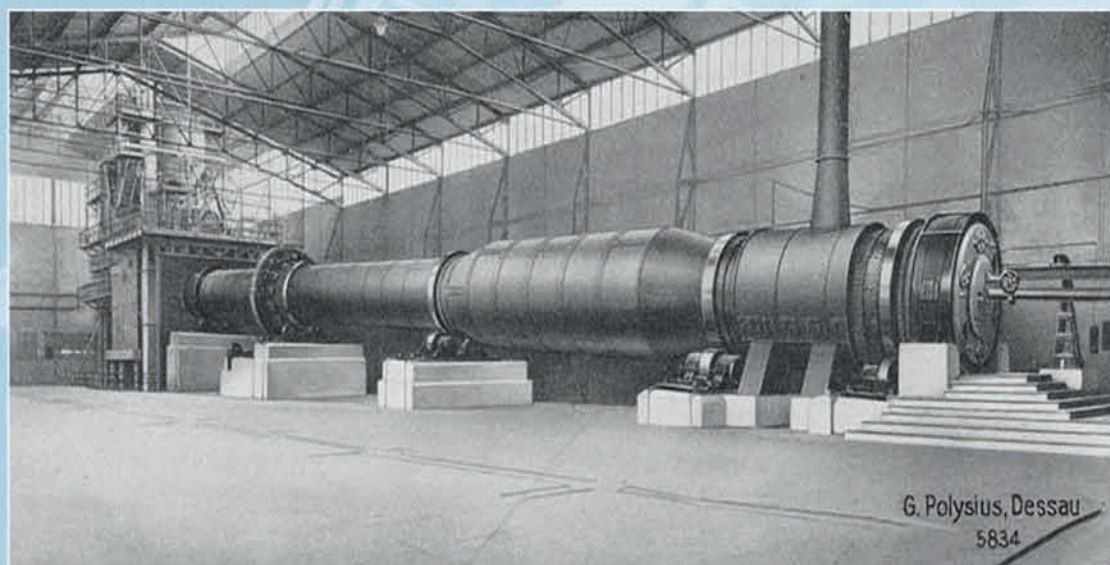
ENGINEERING & MANUFACTURING



ZADCON GmbH

Cement plant manufacturing originated in Dessau. More than 150 years ago a company was founded here by Gottfried Polysius, that has been building and marketing efficient mills for the cement industry ever since. In 1907 the first complete cement plant was shipped to Egypt, followed by another plant sent to China in 1908. After World War II Polysius' company was expropriated and Zementanlagenbau Dessau (ZAB) took over. Until the reunification of Germany several decades later, ZAB shipped over 350 cement plants to destinations worldwide. In 1990 the company became a subsidiary of the Cologne-based HUMBOLDT WEDAG. In 2000 former head of construction, Dipl.-Ing. Karlheinz Schäfer, and a group of experienced design and process engineers founded the ZADCON GmbH.

The employees of ZADCON have acquired all their expertise here after having been trained in this exclusive and traditional environment. Using their skills, we offer reliable services that fit the needs of our customers. Our services include i.a. development, designing, construction, implementing and delivery of machines and equipment for the chemical, mineral, construction and binders industry.



We also offer customized solutions for special requests of our customers. Furthermore we construct spare parts for existing facilities, ship them, and optimize them on request. Our employees can rely on decades of technical expertise in engineering. On the 1st of December 2015 Oliver Kahe became our new director, while Dipl.-Ing. Karlheinz Schäfer will stay with us in an advisory position. This change, and an expanding workforce will ensure the continuing growth of the engineering office ZADCON. Our core values have been and will always be carrying on excellent German engineering, quality, customized solutions and punctuality.

Oliver Kahe
CEO

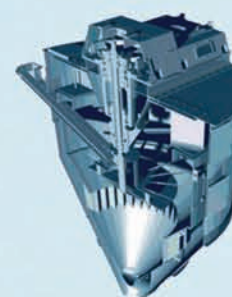
Process Engineering Design

Our own experts work at procedural dimensioning of rotary machines and their accessories. We also cooperate i.a. with the Institute of Fluid Mechanics and Thermodynamics of the Otto von Guericke Universität Magdeburg.

Mechanical Design

Our experienced designers use CAD workstations and modern software (e.g. 3-D) to work on a wide range of problems.

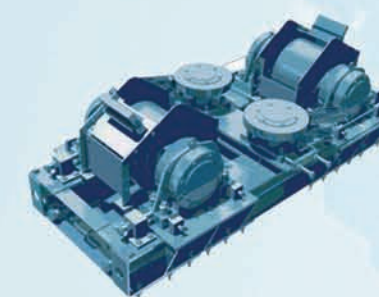
- designing machines or different components depending on the requests of our customers (e.g. rotary chambers, preheaters, post-combustion chambers, drives, sprockets, sealings, rollers and more)
- optimization or designing of spare parts and wearing parts
- special constructions
- engineering of parts for research and development or for our own projects



Air separator



Hydraulic sealing



Roller stations



Preheater

Contract Manufacture

ZADCON is not bound to any particular manufacturers, even though we work closely with several excellent partners, some of them near our headquarters. Because of our way of working, we utilize both quality and short distances.

Quality Management

- Quality control during manufacturing is being handled by special ZADCON engineers.
- Acceptance of components and apparatus by ZADCON employees

Assembly

Our products are assembled locally by specialized installation companies supported by ZADCON engineers.

Customer Support

- implementation through our sales department and on-site through our specialists
- carrying out measurement of existing plants or equipment that might be exchanged
- oblique setting and positioning of rotary tube bearings
- assessing and elaborating of reports on existing rotary tube equipment
- supply of spare parts and exchange of malfunctioning parts
- optimizing existing plants and inspection of plants under maintenance contracts

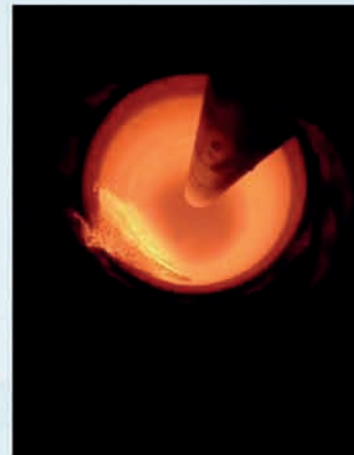


Commissioning

Both cold and hot start-up of plants can be conducted by our employees. We gladly help you at your locations worldwide.

Maintenance

Inspection, maintenance and repair of plants



Spare Parts

- Engineering, manufacturing and worldwide delivery of spare parts for machinery and equipment
- Spare parts for rotary tube technology
- Spare parts for containers and other structural components, e.g. rollers, pinions, bearings and shafts

Technical Consulting for the following areas:

- Manufacturing and process engineering
- Plant components and equipment
- Optimizing equipment and increasing plant output
- Assembling and conduction of commissioning of plants and equipment
- Plant layout
- Elaborating of reports on existing plants and equipment

Small Plants

- Drying of solid bulk material like sand
- Drying of grain



Medium Sized Plants

- Production of aluminum oxide
- Production of kaolin



Large Plant

- Cement plants
- Expanded clay plants
- Dolomite sinter plants



Portfolio / References

BASF - Kronos Titan GmbH - BP p.l.c. - Evonik Degussa GmbH - Liapor GmbH & Co.KG - Almatix GmbH
- Eisenmann Anlagenbau GmbH & Co.KG - Flourchemie Unternehmensgruppe and many more

ZADCON developments

Longitudinal Adjustment to Kilns

We provide hydraulic longitudinal adjustments of kilns, dryers and drums or ones powered by electric motors. These serve to evenly load the surfaces of the surfaces of sprockets, pinions, rollers and tires. This can be done using either of two thrust rollers.

Hydraulic Longitudinal Adjustments to Kilns

Typ ZAD OLV H 1

- Hydraulic cylinder is fitted in the kiln axis
- A displacement measuring system is integrated in the hydraulic cylinder
- Controls according to actual adjustment of kiln

Typ ZAD OLV H 2

- Hydraulic cylinder moves parallelogram slide

Longitudinal Kiln Adjustments Powered by Electric Motors

Typ ZAD OLV H E

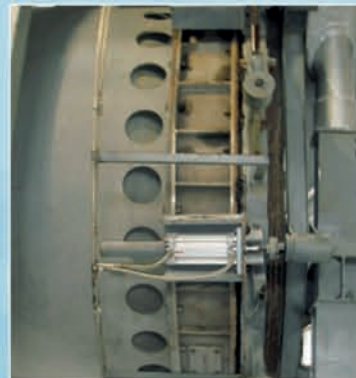
- Powered by electric motors
- Recommended for small systems



Hydraulic longitudinal adjustments



Longitudinal adjustments powered by electric motors



Pneumatic seal

Seals

Our seals serve the purpose of sealing the rotating tubes and their stationary inlets and outlets. ZADCON offers various seals each optimized for their specific use. Minimal leakage of false air reduces the energy usage and thus raises the efficiency.

Cable Pull	Single seals segments are pressed against the seal band radially by weight-loaded cables, guided into the housing axially or spring loaded.
Spring plate	The seal is achieved through bent stainless steel sheets that drag on the seal band. With or without impact airflow.
Pneumatic	Seal in radial direction with flange rings that are pressurized by pneumatic cylinders. Seal in axial direction by sealing strip.

ZADCON competences

Rotary Kilns

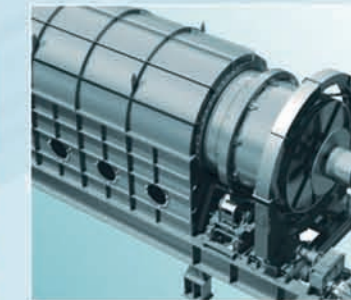
Rotary kilns are used for many different processes involving thermal conversion of free flowing, granular bulk solids. Once inside the rotary kiln, bulk solids can be calcined (lime), sintered (cement), roasted (phosphate), expanded (expanded clay), regenerated (lime slurry), or their crystalline structure can be changed (aluminum oxide). The bulk solid is brought into contact with the hot gas using a counter flow. The riding ring supports the weight of the rotary kiln over the carrying rollers and the foundation. Depending on the length of the kiln they are supported at least twice. Rotary kilns are driven via chains or girth gear/pinion drives, or via friction drives.

Specific advantages of rotary kilns are:

- Versatile equipment for the realization of thermal processes either individually or in combination of different operations
- Application for large flowing rates and long required wait times
- Applicable for high throughput and process-related, long retention times



Rotary Kiln



Pyrolysis Kiln



Rotary Dryer

Pyrolysis Kilns

The pyrolysis takes place excluding oxygen. Pyrolysis kilns are for instance used for pyrolysis of waste and similar processes. Other examples are the pyrolysis of old tires, wood, coconut shells, old battery casings, composite materials, brown coal, biomass, poultry manure, sunflower seed hulls, sewage sludge, aluminum shreds and much more.

Rotary Dryers

The rotary tubular dryers make the efficient drying of coarse-grit as well as fine-grit dry bulk such as agricultural products such as sugar beet slices, green fodder and wheat possible. The bulk material is feed into the dryer with or against the stream of the drying gas, which is preferably smoke from an external hot gas generator.

The cylinder of the dryer is supported horizontally on two riding rings in roller stations with dual bearings. The propulsion of the cooling drum is achieved with an electric motor and can be implemented with the help of a sprocket, a gear drive, a V-belt drive, or a friction wheel drive. The rotational speed is adjustable. The seal system we have developed reduces the influx of false air and thus the use of thermal energy. In order to intensify the material and heat transfer, the rotary tubular dryer can be equipped with various internals.

Specific advantages of the rotary tubular dryer are:

- High specific water evaporation
- High drying temperatures and gentle treatment of the material when using concurrent flow

Segment Coolers

Segment coolers are used for the cooling of fine to coarse grained bulk material which require a careful treatment and a high cooling gradient. The dryer consists of a welded drum cylinder in which four to eight continuous sector-like chambers are installed in a specific form.

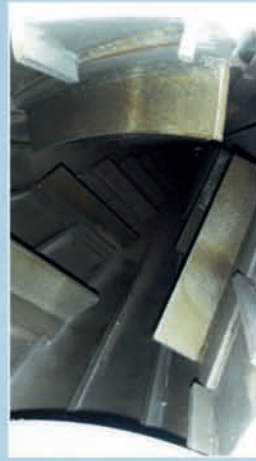
The bulk material that need cooling are moved due to the rotation of the cooler, while the coolant (preferably water) is transported either with or against the current of the bulk material. While the bulk material give off heat to the cooling surfaces, they are steadily brought to the output end of the cooler.

Specific advantages of the segment cooler:

- Intensive and yet gentle treatment of the dry bulk
- Effective cooling even with high throughput
- Optimal energy requirements
- Very well adjustable



Tube Cooler



Internals Segment Cooler



Segment Cooler

Tube Coolers

Tube coolers are mainly used to cool free flowing and fine-grained bulk material. The heat exchange takes place on pipes, which are located in the cylinder of the tube cooler. The bulk material to be cooled moves outside of these pipes. It is possible to use different kinds of coolants. The bulk material is continuously fed into the cooler either in the counter or concurrent flow. The bulk releases its heat to the coolant while being passed through the rotating main tube of the cooler. Tube cooler is a horizontal lying, welded cylinder, which is mounted. The cylinder is supported horizontally by two riding rings on rollers stations with double bearings (rolling or plain bearing).

Specific advantages of tube coolers:

- Large heat transfer area in a very small space
- High cooling capacity
- Exchangeable tubes
- Very well adjustable

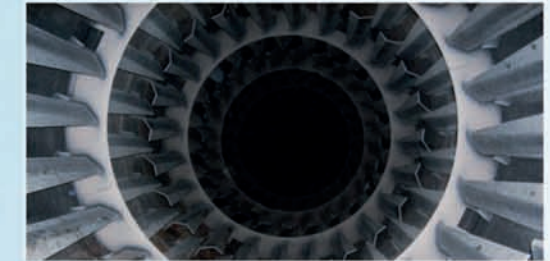
Direct Cooling Drums

The direct cooling drum is a direct rotary pipe cooler and is used primarily for the cooling of pourable, fine bulk material but also for the cooling of agricultural goods such as sugar beet and beet root slices, dry leaf, silage, pressed pulp, and grain. The coolant is air. The air cooler can be operated in co-current or counter-current flow, with heat exchange taking place between the air stream and the surface of the goods inside.

The cooling drum is a horizontally positioned, welded drum cylinder which is rotatably mounted. The cylinder of the cooling drum is supported and horizontally mounted by two riding ring on roller stations with dual bearings (roller or plain bearing). As built-in components of the cooling drum can be in the form of lifting blades, cross or quadrant installations in order to improve the material and heat transfer. The cooling drum is walled partly or completely depending on the temperature of the feeding bulk material.

Specific advantages of the cooling drum:

- Cooling of high-temperature goods
- Simple design makes maintenance easy and running reliable
- Possibility of sprinkling the casing with water to increase the cooling gradient



Direct Cooling Drum

Ascending Pipe Coolers

Ambient air is mixed with the hot material in the ascending pipe. The heated air can be used for other processes (e.g. as secondary air for kilns).

Specific advantages of the ascending pipe cooler:

- Even if several cooling stages are connected in series the required surface area is usually less than e.g. for a cooling drum
- There is no need for water supply and water treatment

Planetary Coolers

The planetary cooler consists of nine to eleven cooling tubes arranged parallel to the outer part of a rotary kiln and onto which the material is divided. To increase the efficiency of the cooler, water can be fed in as well. A disadvantage of the planetary cooler is, that none of the heated air used as coolant can be used as secondary heating medium. Also the combustion air has to be passed through the complete rotary kiln, and the amount of coolant that can be used is limited.

Specific advantages of the planetary cooler:

- Resistant against abrasion (clinker)
- Flexible (vibration of the planetary cooler's pipes)
- Chemothermically resistant

Tube Mills

These are mainly used with balls (ball mill) to grind the material, but in some special cases rods may be used (rod mill).

Air swept Mills

The of the air swept mills is based on gravity grinding and, the proven classical method. The finished product is removed by the air stream out of the grinding process.

Single-Chamber Mills

These are usually built with diameters from 1,0 to 5,4 meters. In special cases they can also be build in larger dimensions. They have no partition walls inside.

- These mills are suitable for coarse or pre grinding as well as the fine grinding.

Multi-Chamber Mills

With the use of a variable amount of partitioning walls the camber is divided into at least two separate chambers. These are used as:

- open-circuit mills
- closed circuit mill with bucket elevator and end discharge
- closed circuit mill with bucket elevator and central discharg



Roller Mill

Roller Mills

The operation of the roller mills is very energy-efficient. There are roller mills with inner and outer circuit.

Specific advantages of the roller mill:

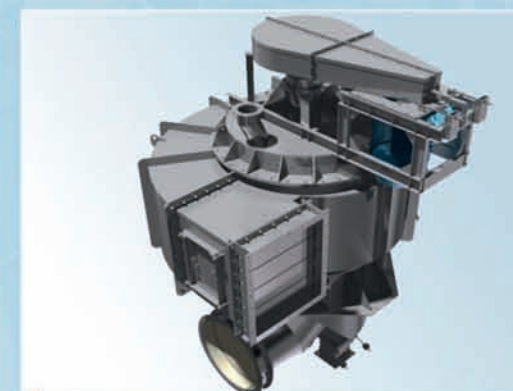
- Low specific energy requirements due to defined compressive stress ratios of thin layers of grinding material
- Drying of very moist feed materials
- Compact design
- Low specific wear
- Exchangeable parts are easy to replace

Classifiers

Classifiers are used for classifying, which means for separation of fine grained bulk material in different grain size fraction. The principle of the classification is based on the different sink rate velocities on different trajectories of air flow with particle size dependent resisting forces of the particles surrounded by the air flow. A ventilator wheel generates a field of flow in the classification chamber by superimposing a sinking and a swirling flow. The bulk material to be classified is thrown transversely to the air flow via a spreading disc. Due to gravitational and centrifugal forces the fine particles are carried upwards with the air flow and the coarser particles are carried downwards. The centrifugal system that is arranged above the spreading disc turns the air flow into a swirl flow. The fine material in the air flow is thrown through the impeller into the fine dust separation chamber and slides on the outer wall into the fine discharge. The shaft-mounted fan wheel with spreading disc and centrifugal system is driven by an angular gear with a speed-adjustable motor. The classification chamber is protected against wear by a wear-resistant lining.

Specific advantages of classifiers

- Use of a single drive and simple design due to an integrated fa
- Can be used for very fine classification due to exact separation



Classifiers



Recuperators, Preheaters

Recuperators, Preheaters

Recuperators are installed in front of rotary kilns and are used for different bulk material. ZADCON's recuperators are engineered, designed, and manufactured as classic, multi-stage cyclone preheaters and usually connected with a calcining line.

The heat exchange takes place by countercurrent process with intensive mixing and partial deacidification. The residual deacidification can be carried out in the calcining zone of the rotary kiln.

The ascending pipe dryer can also be used as recuperator

- Material heating is carried out in a vertical tube using preheated air, hot gases or exhaust gases, followed by segregation of the heated goods in the cyclone
- Low space requirement
- Preheating process is flexible with low maintenance
- Input material must be sufficiently free-flowing or the input is carried out by means of centrifuge drums for deagglomeration of larger agglomerates.



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