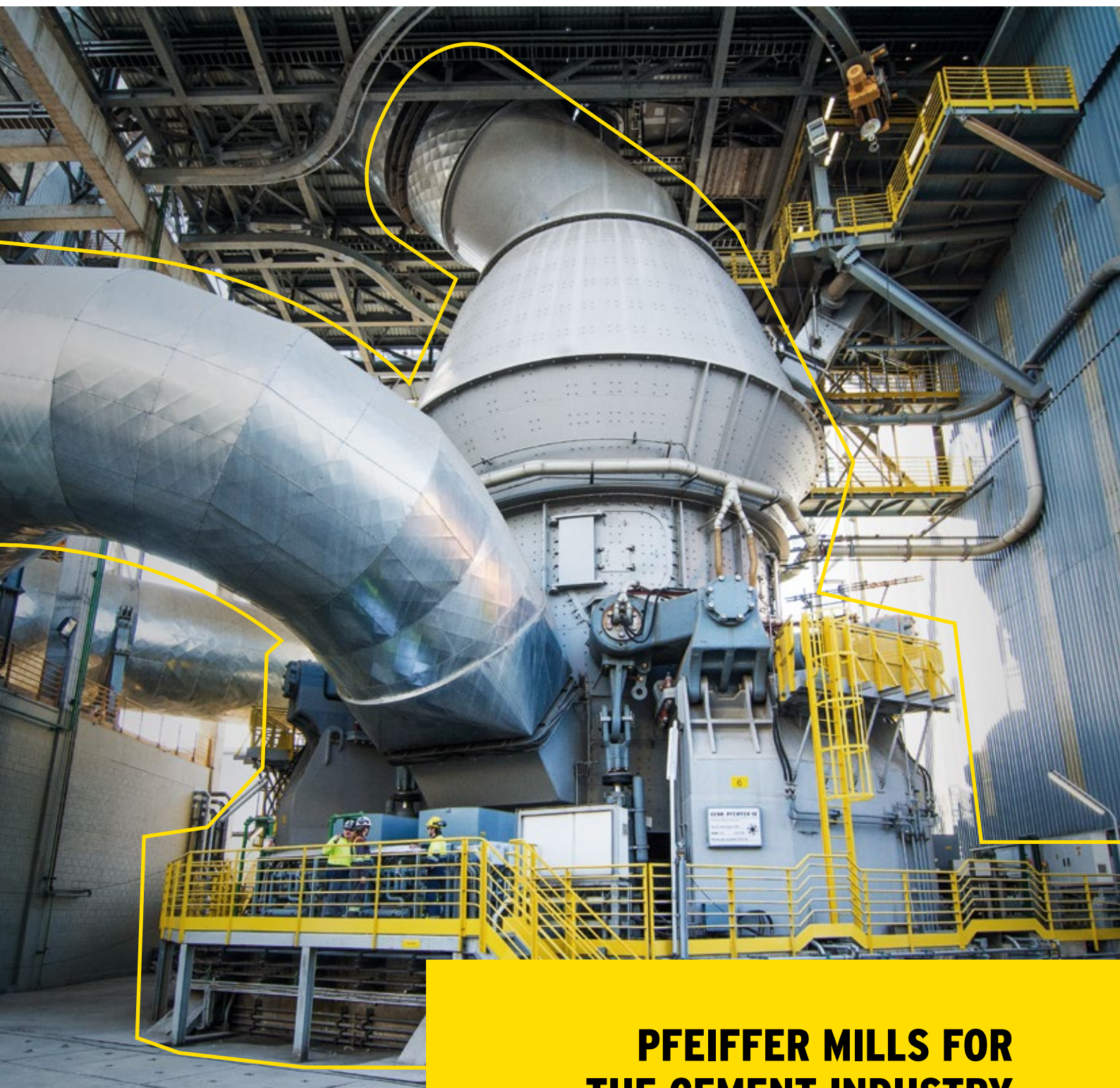




GEBR. PFEIFFER



**PFEIFFER MILLS FOR
THE CEMENT INDUSTRY**
POWERFUL. PROVEN. RELIABLE.



Groundbreaking drive power 11,500 kW: MVR 6700 C-6 with MultiDrive® operating in Brazil



Passion for grinding

// Tradition since 1864

As a family-run business with its head office in Kaiserslautern, Germany, Gebr. Pfeiffer has pioneered the development of modern grinding, separating, drying, slaking, and calcining technologies for more than 150 years. Today, some 500 qualified employees are all united in the endeavor to carry on the passion of our founder Jacob Pfeiffer. Our motto: long-term development rather than short-lived success. The result: ever new impulses ensuring our top ranking among the leaders in the industry.

// Quality made in Germany

One of the cornerstones of our success is the high degree of vertical integration. In fact, almost all components of our machines are produced at our Kaiserslautern facility. Committed in providing the highest quality standards for our products and services, we are orientated entirely on our customers' individual requirements. Reliability and efficiency without any unplanned downtime: this is what Gebr. Pfeiffer stands for.

// The world grinds with Pfeiffer

Customers all over the world rely upon Pfeiffer's innovative system solutions ensuring efficient production of cement, lime, gypsum, coal, raw material, clay and many other materials. Our clients profit from our global network of subsidiaries in India, Egypt, China, Brazil, Malaysia, and the United States along with an extensive network of cooperations, representations, and a selection of highly experienced service partners. So we are on the spot - worldwide.

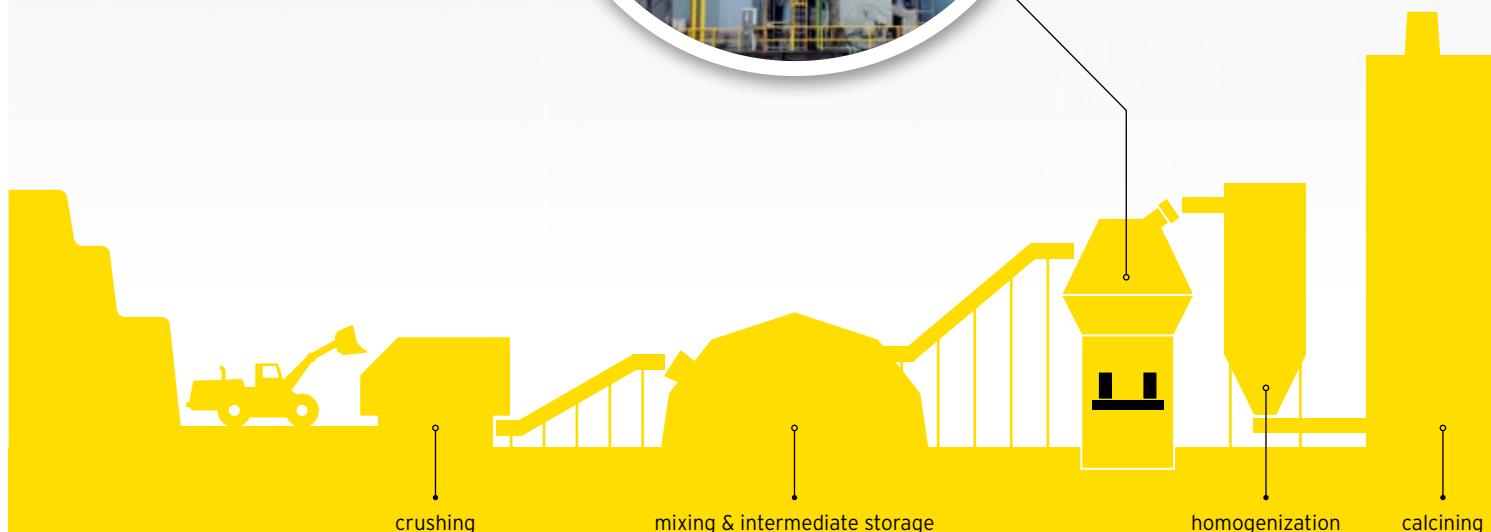
Knowing the business

// In cement production where the properties of the raw materials used are so different and production rates may vary extremely, mill solutions are needed that exactly meet your particular requirements. We at Pfeiffer can provide the whole range of grinding, separating, and drying equipment as needed to make your cement line work economically: for example, with our proven vertical mills MVR and MPS sold more than 2,800 times to customers all over the world for the most different throughput rates and equipped with high-efficiency classifiers.

Basing on our decade-long experience and best consulting competence, we can plan the ideal grinding plant for every customer in the cement industry, ensuring economical grinding of cement raw material, cement clinker, granulated blast-furnace slag, pozzolana, other additives, and coal. Highest plant availability, appropriate wear protection, and sophisticated maintenance concepts are guaranteed for all our mills.

Our revolutionary MultiDrive® and the ready2grind compact unit, for example, get innovations started. With our overall grinding plants, too, we can prove our competence and reliability as a supplier.

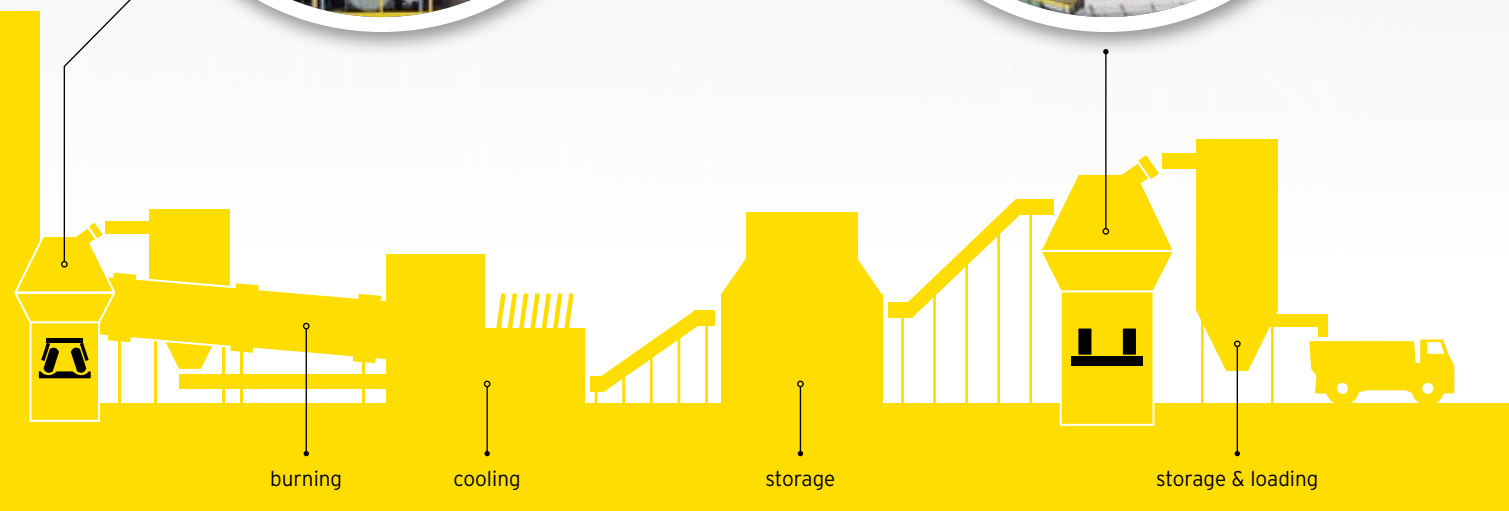
Cement raw material grinding
with MVR vertical mills



Coal grinding with
MPS vertical mills



Grinding of cement and
granulated blast-furnace slag
with MVR vertical mills



Individual solutions ensuring optimum results

// Our engineers conceive and plan new plants as well as rebuilds and extensions which have to be integrated into limited areas within existing cement works. Always in the focus: finding the best possible solution for any individual requirement by optimally adapting our products and processes to the prevailing

conditions. We provide best consulting services on all process-related issues and sophisticated maintenance concepts. We select the most appropriate wear materials to create grinding plants which are as compact and cost-efficient as possible.



Cement raw material grinding

// Almost any plant for the grinding of cement raw material is a combination of machines specially adapted to the particular physical properties of the material to be ground. As a result, our plants work efficiently without any trouble.

- » Highly efficient grinding, drying, and separating in one unit
- » Outstanding production capacities exceeding 1,400 t/h in one single mill
- » Grinding-drying of raw materials with moistures exceeding 20%
- » Target fineness degrees of 60 to 100 μm

Grinding of cement and granulated blast-furnace slag

// Depending on the requirement, cement can be produced by grinding cement clinker with gypsum or with several extenders either in common or separately and, in this case, by mixing the finely ground products afterwards. What we also do is discharge undesired material like metallic components and prevent extenders which already have the fineness required, e.g. fly ash, from being reground unnecessarily.

- » Common or separate grinding of all main components of cement
- » Highly efficient grinding, drying, and separating in one unit
- » Outstanding production capacities exceeding 550 t/h in one single mill
- » Separate feeding of moist, dry and warm feed materials
- » Target fineness degrees of up to 6,000 cm^2/g Blaine

Grinding of solid fuels - hard coal, lignite, petcoke, etc.

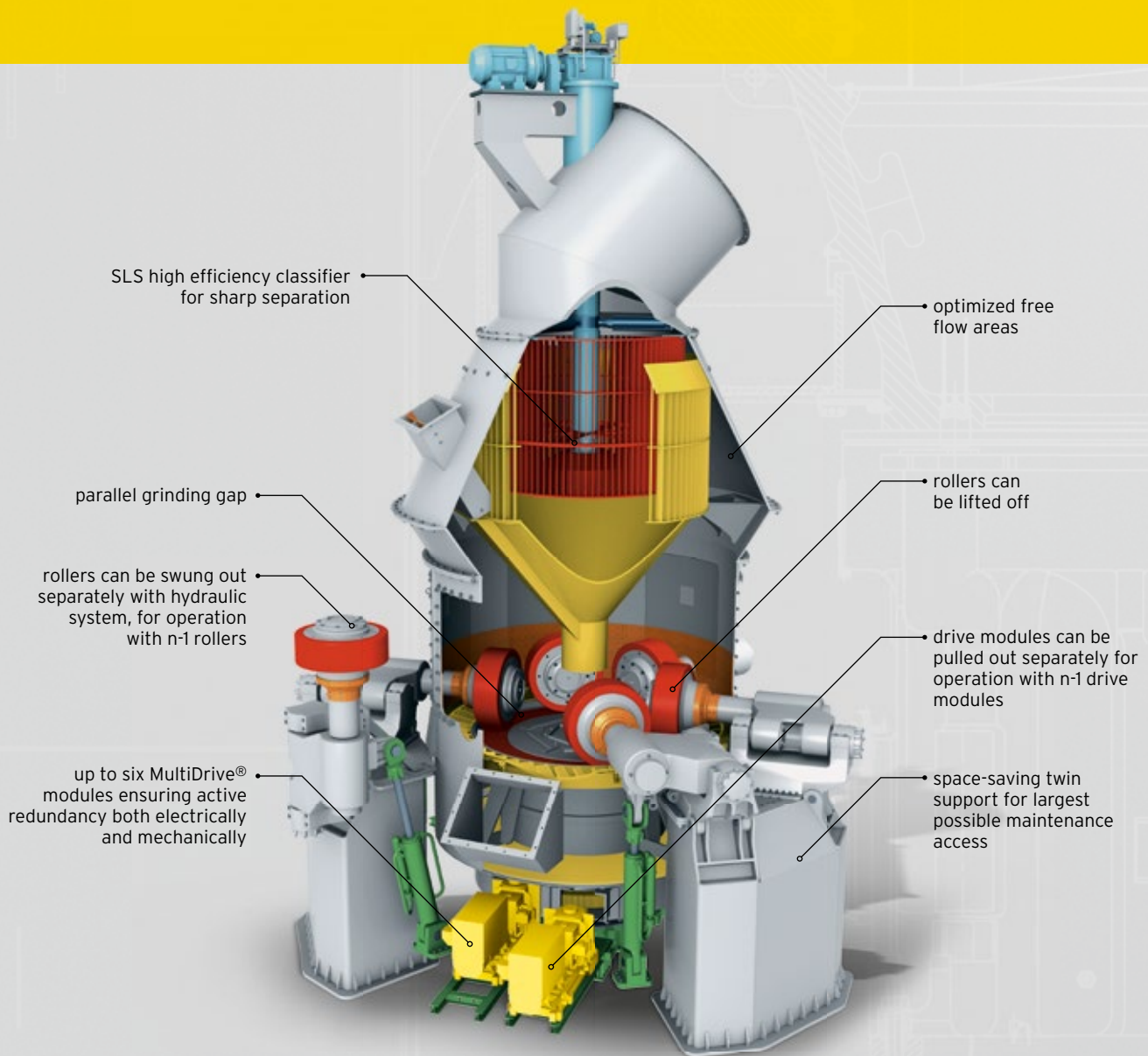
// Coals and similar materials are combustible and may also be explosive depending on the amount of volatiles they contain. Thanks to our experience gained by the supply of more than 2,200 coal mills to the most different industrial sectors, we know everything about safety issues: when is inert operation imperative, when is it dispensable provided specific safety concepts are implemented, and how do these safety concepts have to be integrated into the grinding process?

- » Safe grinding using available hot gases from the process or from a hot gas generator
- » Stable and smooth mill operation even when grinding sphere-shaped petcoke
- » Highly efficient grinding, drying, and separating in one unit
- » Grinding-drying of raw coals with moistures exceeding 35%
- » Grinding can be performed in an inert atmosphere

Maximum throughput – 100% reliability: Pfeiffer MVR mills with MultiDrive®

// When grinding raw material, cement and granulated blast-furnace slag, what's the point? Maximum throughput and utmost technical availability! This is ensured by the Pfeiffer MVR vertical mill with its revolutionary MultiDrive®. With a drive power of up to 18,000 kW, throughput rates of more than 1,400 t/h can be reached on a single mill. An additional important

feature of this system is the double active redundancy ensuring highest availability and productivity without downtime. In fact, if a roller module or a drive unit is out of service, mill operation continues at the same or just slightly reduced throughput rate. This is unique and available at Gebr. Pfeiffer only.



Your advantages at a glance:

» **Throughput rates of more than 1,400 t/h on a single mill**

Owing to the MultiDrive® specially conceived for the Pfeiffer MVR mill, two mills equipped with conventional drives can be replaced with just one mill.

» **Highest availability thanks to double active redundancy, i.e. for grinding rollers and drive modules**

An MVR mill may have up to six grinding rollers and up to six drive units. Thus both systems are actively redundant meaning that one or several rollers can be taken out of the system for maintenance work while mill operation continues. The same applies to the independent drive modules of the MultiDrive®.

» **Utmost reliability and ease of maintenance**

High-quality wear materials, sophisticated maintenance concepts, and low specific wear rates reduce time and cost of maintenance to minimum.

» **Low electric energy consumption**

Electric energy consumption of Pfeiffer roller mills is reduced by up to 40% as compared with conventional ball mills.

» **Optimum utilization of process heat**

The thermal energy of process gases can be used on Pfeiffer roller mills.

» **Favorable control behavior**

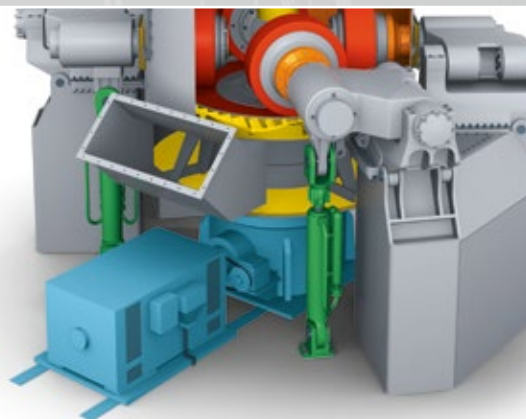
High drying capacity, short dwell time of the material to be ground, and remote control of grinding pressure and classifier rotor speed ensure a fully automatic operation of the MVR mill even with varying raw material characteristics.

» **Homogeneous compaction of the material to be ground**

Thanks to the geometry of the grinding rollers in combination with their specific suspension, there is always a parallel grinding gap, ensuring a homogeneous compaction of the material to be ground. Moreover, due to the symmetric shape of the grinding roller tires, these can be turned when worn.

For smaller throughput rates: Pfeiffer MVR mill with conventional drive

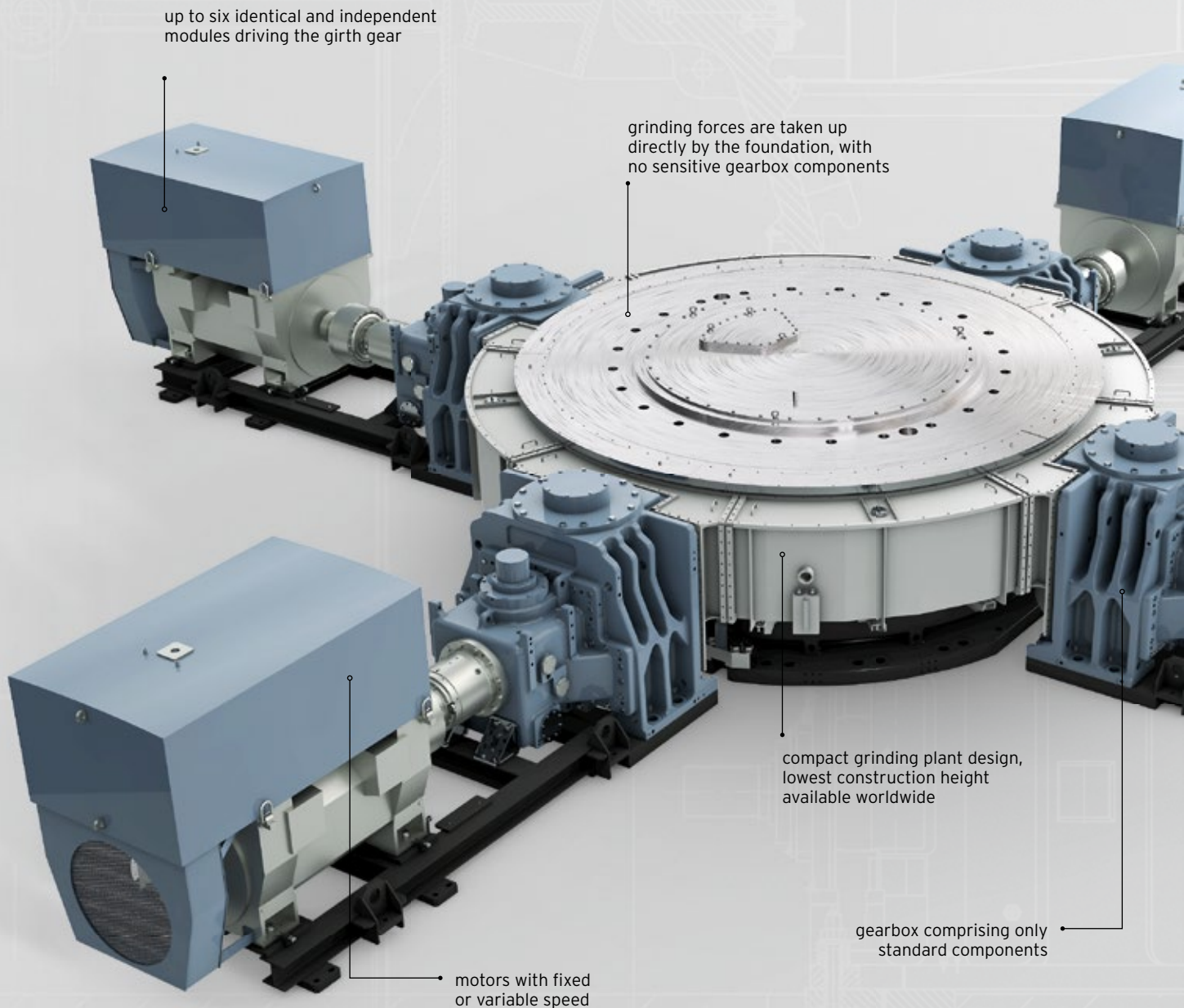
You don't always need a MultiDrive®: for example, whenever your particular application calls for a mill drive power rate of less than 5,000 kW permanently, our MVR mill equipped with a conventional planetary gear is the most economical solution. With this system, too, you will have an increased protection against downtime thanks to its active redundancy of the grinding rollers. Good to know: maintenance and repair are as easy as on all Pfeiffer vertical roller mills. Ask us for advice. We know which solution is the best for you.



MultiDrive®: safeguard against total failure

// The MultiDrive® is the only drive available on the market which is actively redundant both electrically, hence as far as the motor is concerned, and mechanically, i.e. on coupling and gearbox. Moreover, with its revolutionary design, none of the gearbox components are located under the mill

where they would be exposed to the grinding forces. What does that mean for the user? A failure is hardly possible. And even if a complete drive unit is out of service, the mill continues operating, sometimes even without a reduction of throughput. In fact there can't be any better safeguard against failure!



Your advantages at a glance:

» Individual drive design

Depending on how much power you need, you may choose the suitable MultiDrive® with 3 to 6 identical drive units reaching a power rating of as much as 18,000 kW.

» Reduced space and costs

The MultiDrive® has the lowest construction height of all mill drive concepts available on the market. Your benefit: the MVR grinding plant is as compact and cost-efficient as no other system.

» Flexibility thanks to variable grinding speed

Depending on whether you need variable speed or not, the system can be run with or without frequency converter. It is no problem to fit such a frequency converter later on to adapt to changing requirements.

» Ease of maintenance

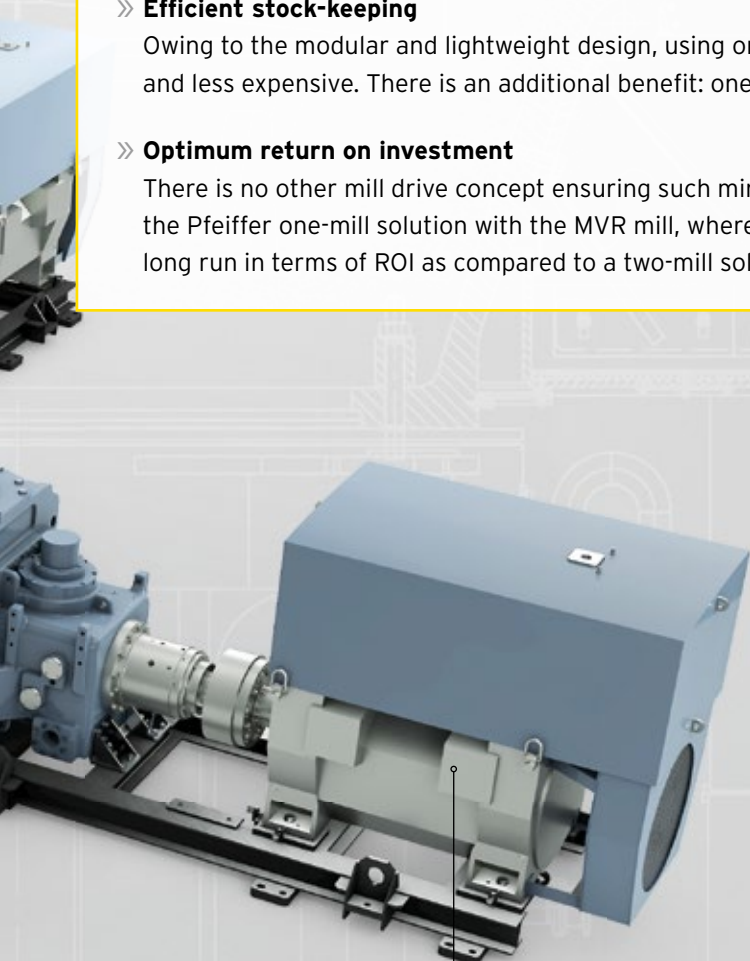
Radially arranged on movable supports, the drive units can be withdrawn easily from the mill. Moreover, with a maximum 25 t per drive unit, the MultiDrive® has a much lower weight than a conventional gearbox and is a lot easier to maintain.

» Efficient stock-keeping

Owing to the modular and lightweight design, using only standard components, stock-keeping becomes easier and less expensive. There is an additional benefit: one drive unit can be used for several mills with MultiDrive®.

» Optimum return on investment

There is no other mill drive concept ensuring such minimum downtimes. Even if unplanned shutdowns occur, the Pfeiffer one-mill solution with the MVR mill, where production can be continued, is always better on the long run in terms of ROI as compared to a two-mill solution.



lightweight drive units can
be removed separately
on movable supports



The economical alternative to the two-mill solution

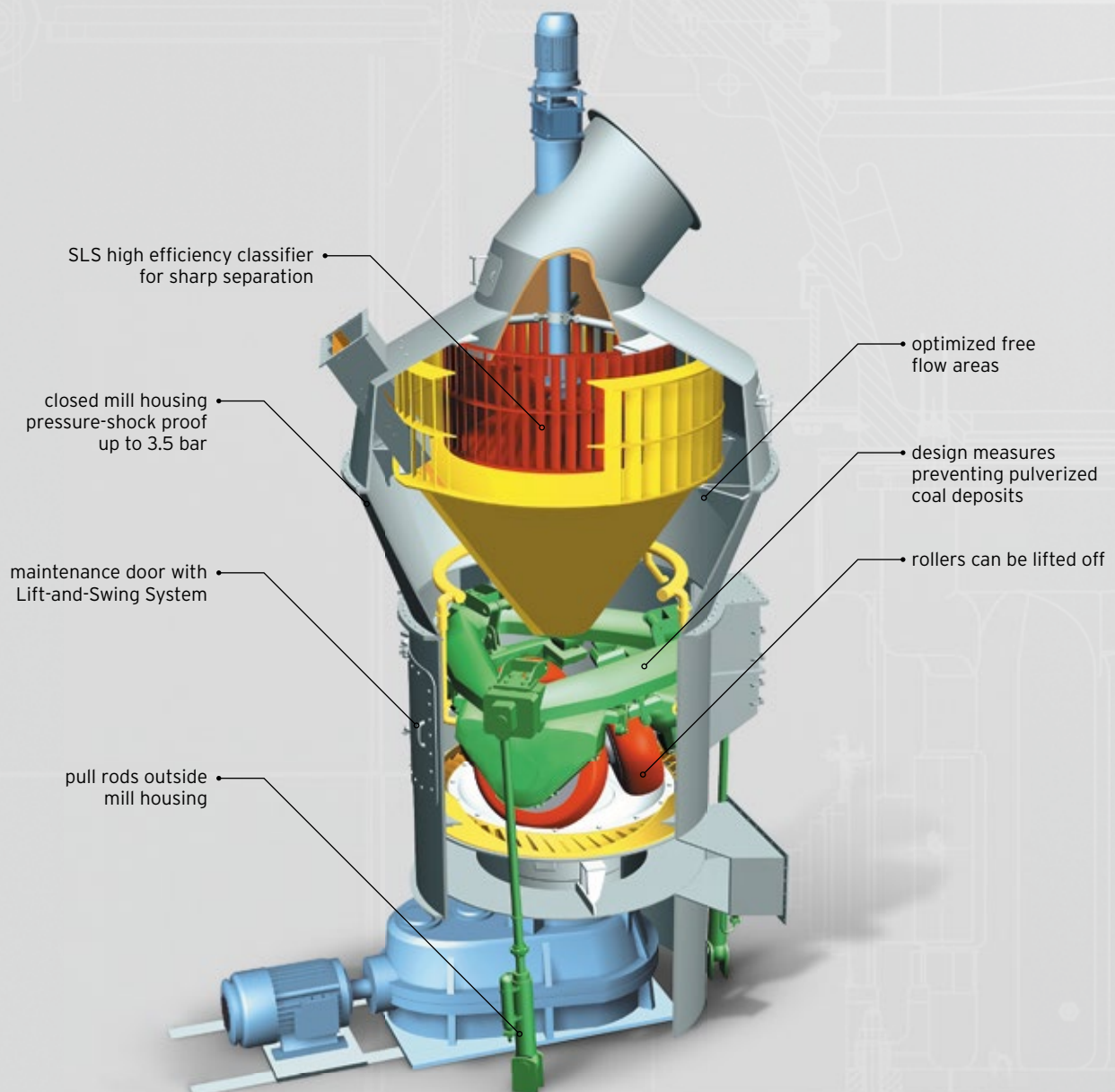
Thanks to its unique features - high throughput rates combined with double active redundancy - the revolutionary Pfeiffer MVR vertical mill with MultiDrive® allows the implementation of the economical one-mill solution where two mills had to be installed before.

Ask our experts!

Coal grinding on MPS vertical roller mills - Pfeiffer quality you are used to

// When it comes to the grinding of coal or petcoke, don't make any concessions. Rely upon Pfeiffer's renowned quality. Our MPS vertical roller mills are perfectly suited for the grinding of fossil fuels, combining high availability, lowest wear rates, and highly economical operation. They ensure a

stable and safe operation, need only few peripheral machinery, save on electric energy and walled-in space, they have a low noise level, and of course, they run fully automatically - just as our MVR mills - even with varying raw material characteristics. Ask our experts for the right solution to your problem.



Your advantages at a glance:

» Applicable for the grinding of almost any type of coal and petcoke

Owing to the trough-shaped grinding track, the MPS mill ensures a stable and smooth grinding operation even if the feed material is very fine and various throughput rates are envisaged. The material to be ground may be the whole range from 100% coal to 100% petcoke or any mixture in between, with no frequency converter.

» High reliability and ease of maintenance

Thanks to high-quality wear materials, low specific wear rates, and modern concepts, maintenance times and costs are reduced to minimum.

» Low electric energy consumption

As compared with conventional ball mills, the electric energy consumption of Pfeiffer vertical roller mills is reduced by up to 40%.

» Optimum utilization of process heat

The thermal energy of process gases with a low oxygen content are used on MPS mills.

» Favorable control behavior

A short dwell time of the material to be ground along with remote control of grinding pressure and classifier rotor speed ensures a fully automatic operation of the MPS mill even with varying raw material characteristics.



coal



petcoke

With Pfeiffer coal mills, you are always on the safe side

With the geometry of the grinding elements of our coal mills, we make sure our mills run smoothly and safely even when grinding fine, sphere-shaped petcoke. With the grinding roller movement being controlled from inside, a closed housing design can be provided, thus reducing the in-leak of false air to a minimum. Gebr. Pfeiffer is certified according to EN ISO 9001, our experts know everything about safety issues with regard to national and international regulations which is of special importance when it comes to preparing and grinding solid fuels because coals and similar materials are combustible and may also be explosive depending on the amount of volatiles they contain.

Unrivalled ease of maintenance

// Cement production is a hard job to do, calling for utmost performance. To ensure this, even the best mill needs regular maintenance. This is true first of all for the wear parts of the grinding elements. To make

sure you don't waste any production time, all of the Pfeiffer mills are conceived with the aim of keeping wear as low as possible so that production will not be suspended for maintenance work. Simple and economical!

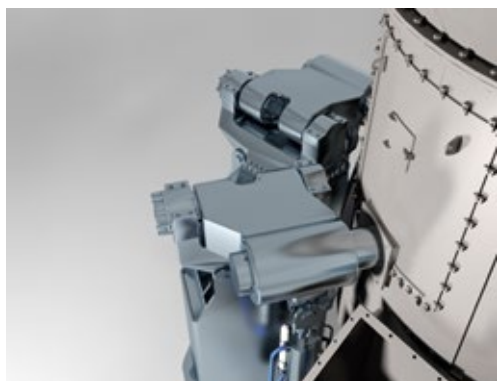
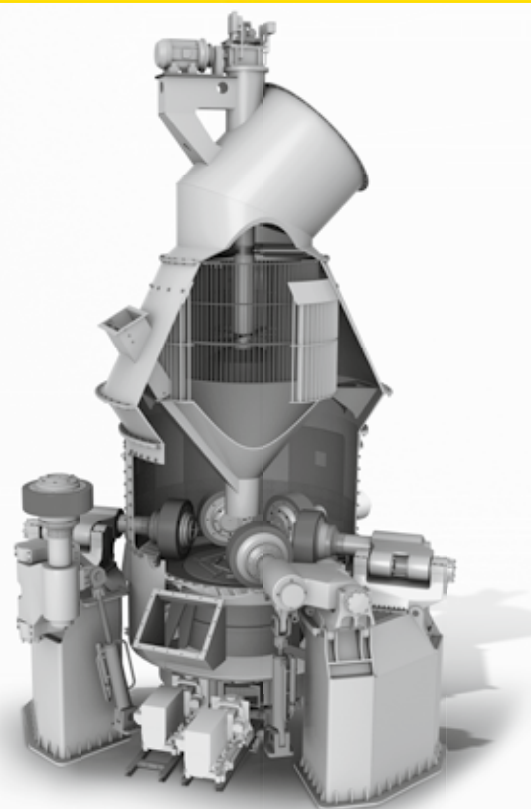
Your maintenance benefits with the MVR mill:

With Pfeiffer MultiDrive®

- » Simple and safe removal of drive units thanks to their easily movable supports
- » Very good access: owing to the maintenance friendly arrangement of the drive units, there is no need to pull components from underneath the mill.
- » Lightweight drive units of 25 tons each for ease of handling
- » MultiDrive® spare parts available all over the world

With all Pfeiffer MVR mills

- » Fast and safe replacement of wear parts
- » Thanks to the active redundancy of the mill, production continues after various rollers are swung out of the mill hydraulically for carrying out maintenance work outside the mill.
- » There is just one hydraulic system both for operation and maintenance.
- » Wear parts can be regenerated both inside and outside the mill.

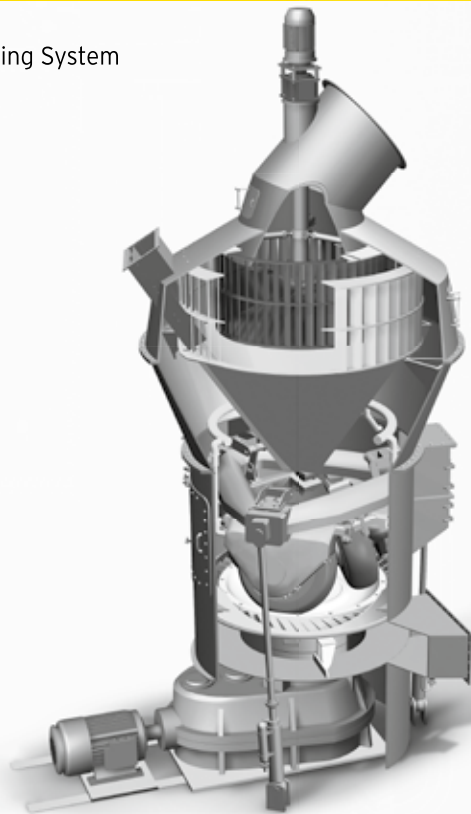


Design measures for wear protection

We know what your mill has to withstand. Therefore we use various wear materials for all the different wear zones of our vertical mills. These materials are perfectly adapted to the specific abrasiveness of the material you are going to grind. The grinding elements mainly consist of alloy cast iron as per DIN 1695, hardfaced cast iron or composite materials with high-chromium inserts or ceramic materials in ductile base materials. The housings and other mill components are protected against jet wear with highly wear-resistant steel plates or hardfaced composite plates. Components which are extremely exposed to jet wear like gas outlet ducts have additional ceramic liners. With all of these measures, we are aiming at ensuring minimum wear and ease of replacement of the wear parts. That's what Pfeiffer stands for.

Your maintenance benefits with the MPS mill:

- » Rapid replacement of wear parts with the proven MPS Lift-and-Swing System
- » One single maintenance door arranged for best access
- » Safe and simple handling
- » Short downtimes
- » Wear parts can be regenerated both inside and outside the mill.
- » The grinding rollers and grinding table segments are driven to the maintenance door with the maintenance drive and are swung out of the grinding area with the MPS Lift-and-Swing System.



ready2grind – the modular plant solution for the cement industry

// The ready2grind modular system conceived by Pfeiffer is based on Pfeiffer's proven vertical mill technology. With a capacity of up to 550,000 t/a, it is particularly suited for small-scale production of any type of cement and granulated blast-furnace slag. One advantage this compact system offers to the customer is increased flexibility at the production site so that he can respond rapidly to changing demands of the local cement markets. Thanks to the intelligent design, with all parts being sized to fit into standard containers, transportation and installation of the mill can be effected very fast and efficiently. Your benefit: reduced time for set-up ensures prompt market entry.

Your advantages at a glance:

- » Highest reliability, proven concept
- » Modules in standard container sizes for cost-efficient transportation
- » Rapid delivery, installation and commissioning
- » Highest operational availability with moderate investment
- » Immediate market entry, short amortization, reduced investment risk
- » Maximum flexibility, to react to changing market requirements at short notice



Precise analysis for optimum results at the Pfeiffer test station

// Detailed knowledge of material characteristics - this is what each individual plant solution is based on. Nothing is left to chance at Pfeiffer: we have a highly specialized test station for doing realistic testing and our own laboratories equipped with the latest analyzing equipment. Our experts develop processes and determine parameters that are perfectly suited

for the rating of your plant just the way you need it. Moreover, to increase the capacity of our machines, existing processes are optimized and modernized by our experts who are in close contact with universities and renowned research institutes.

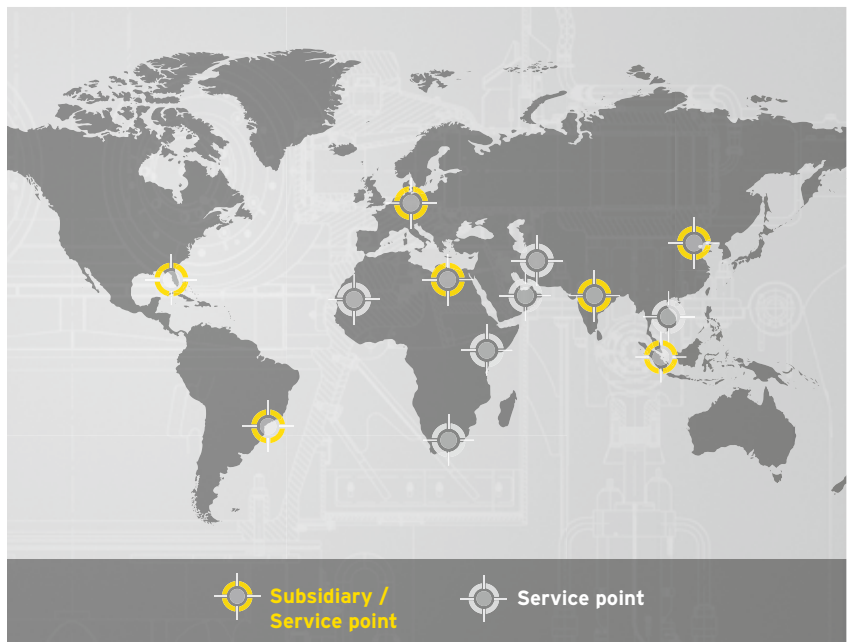
Range of services of the Pfeiffer test station:

- » Rating tests and feasibility studies on pilot plants
- » Upgrading and optimizing tests on pilot plants
- » R&D projects on pilot plants
- » Determination of grindability in the lab
- » Physical and chemical material characterization



Pfeiffer service: available worldwide

// With Pfeiffer, you profit from the wide range of services directly from the manufacturer plus a worldwide network of subsidiaries and experienced service partners who speak your language and will be on site rapidly. Our service team comprises skilled experts who are dedicated to using their knowledge and expertise for the sake of your productivity. No matter where your production site is: we will be there. Just ask us!



Our services at a glance:

- » Installation and commissioning
- » Technical service
- » Test station / material analysis
- » Service contract, inspection and maintenance
- » Spare parts supply including original spare parts
- » Upgrading and modernization
- » Training sessions
- » Emergency assistance (e.g. in case of production outage)

For more information on our services, visit our website:
www.gebr-pfeiffer.com

Technical data / Flow sheets

Grinding of solid fuels - hard coal, lignite

Technical data of MPS mill

Throughput rate	up to 110 t/h
Mill drive	up to 2,000 kW
Number of grinding rollers	3
Feed size	up to 100 mm
Feed moisture	up to 35% (surface moisture)
Target fineness degrees	60 to 100 µm
Classifier	high-efficiency classifier
Grinding bowl diameter	up to 4,500 mm
Pressure-shock resistance	3.5 bar

Cement raw material grinding

Technical data of MVR mill **with MultiDrive®**

Throughput rate	more than 1,400 t/h
Mill drive	up to 18,000 kW
Number of grinding rollers	up to 6
Feed size	up to 120 mm
Feed moisture	up to 20%
Target fineness degrees	60 to 100 µm
Classifier	high-efficiency classifier
Grinding bowl diameter	up to 6,700 mm
Gas volume flow	up to 2,200,000 m³/h

Technical data of MVR mill **without MultiDrive®**

Throughput rate	up to 650 t/h
Mill drive	up to 6,500 kW
Number of grinding rollers	up to 6
Feed size	up to 120 mm
Feed moisture	up to 20%
Target fineness degrees	60 to 100 µm
Classifier	high-efficiency classifier
Grinding bowl diameter	up to 6,000 mm
Gas volume flow	up to 1,500,000 m³/h

Grinding of cement and granulated blast-furnace slag

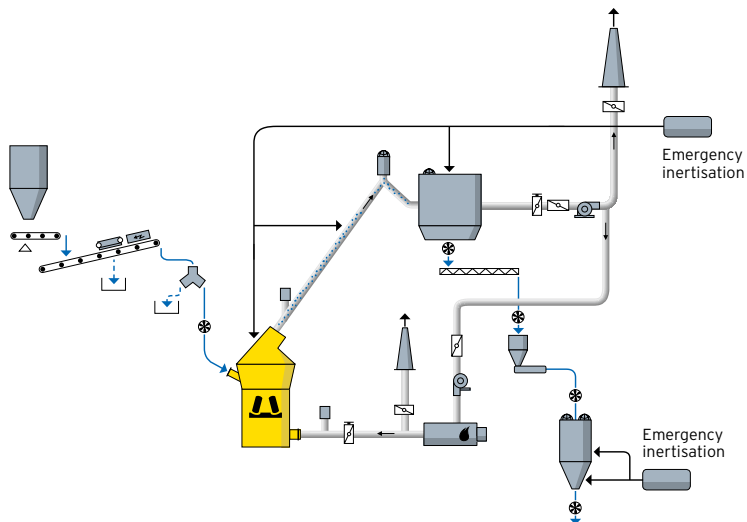
Technical data of MVR mill **with MultiDrive®**

Throughput rate	up to 550 t/h
Mill drive	up to 18,000 kW
Number of grinding rollers	up to 6
Feed size	up to 120 mm
Target fineness degrees	1,500 to 6,000 cm²/g Blaine
Classifier	high-efficiency classifier
Grinding bowl diameter	up to 6,700 mm

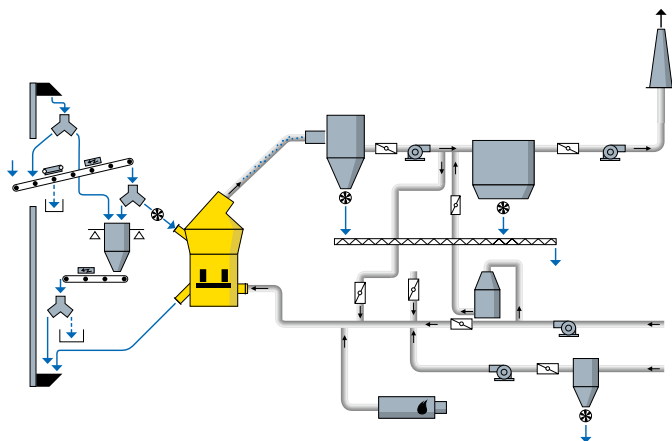
Technical data of MVR mill **without MultiDrive®**

Throughput rate	up to 320 t/h
Mill drive	up to 6,000 kW
Number of grinding rollers	up to 6
Feed size	up to 120 mm
Target fineness degrees	1,500 to 6,000 cm²/g Blaine
Classifier	high-efficiency classifier
Grinding bowl diameter	up to 6,000 mm

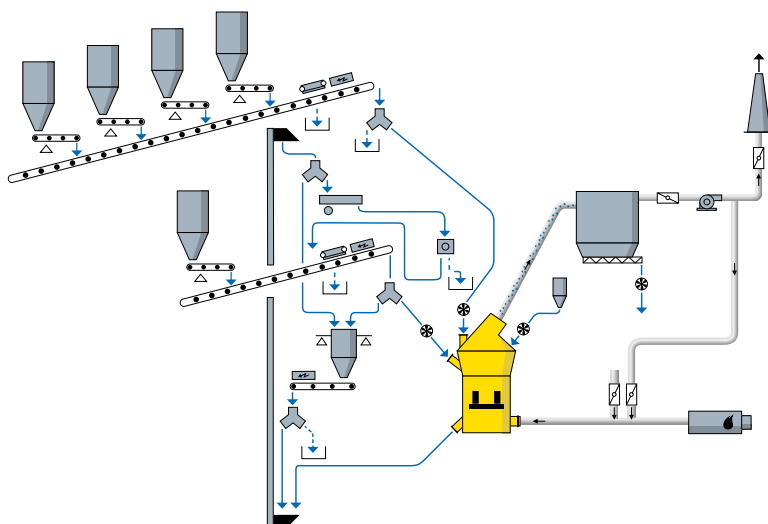
nite, petcoke, etc.



Coal grinding in Indonesia - **MPS 4500 BK**



Cement raw material grinding in Algeria - **MVR 6000 R-6**



Cement grinding in Australia - **MVR 6000 C-6**



Cement grinding in Brazil - **MVR 6700 C-6**



Coal grinding in Ukraine - **MPS 200 BK**



Granulated blast-furnace slag grinding in India - **MVR 6000 C-6**

Gebr. Pfeiffer in the cement industry – renowned all over the world



Cement grinding in Algeria - **MVR 6700 C-6**



Cement raw material grinding in Canada - **MVR 5000 R-4**

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