High-Pressure Grinding Roller Presses for Minerals Processing

Specialists in High-Pressure Comminution

Köppern

Pilot Plant – Test Work

Helping you find the best solution

It is always advisable to conduct test work with representative materials in order to assess their relevant properties prior to defining the subsequent processing. This results in an optimized plant layout and keeps investment and operating costs to a minimum. Correct process settings right from the start will boost efficiency throughout plant operation. With our HPGR pilot plant facilities and specialist staff, Köppern is in a unique position to advise and assist customers in assessing the suitability of HPGR technology for their materials and process requirements.

The use of high-pressure grinding machines in minerals processing plants requires special attention to the following issues:

- Evaluation of ore performance and assessment of process and energy efficiency
- Careful assessment of ore body and definition of best- and worst-case scenarios
- HPGR feed preparation in order to ensure the maximum benefit from HPGR technology
- Evaluation of the treatment of HPGR products and the handling of process recycle materials






Our pilot plant facilities not only support our customers in choosing the right process parameters and roller surfaces, but also by defining the right technical process flow. Years of process-related know-how are concentrated in our pilot plants, so that all the relevant process data concerning the utilization of a roller press can be established under semi-industrial conditions.

Our technical centers are each equipped with HPGRs for comminution tests. These are industrial-scale machines especially suited to testing the comminution behavior of different feed materials destined for grinding.

The machines can be equipped with different roller surfaces. They are connected to the central operating data collection system to facilitate the preparation of test reports.

The test programs aim to:

» determine process parameters
» examine recirculation loads
» analyze feed characteristics
» select suitable HPGR sizes as well as material preparation and conveying equipment.

In order to simulate the processes required before and after roller press operation, the technical centers are also equipped with mixers, crushers, screens, furnaces and laboratory tools. The process data collected can be used to plan either individual units or complete comminution plants.

If required, the results can be entered in a basic engineering document in the form of a process flow chart to facilitate the definition and choice of components and plant. The additional plant design consists of all relevant lengthwise- and cross-sections of the required building. All relevant information for running the plant (instrument lists, logical diagrams etc.) is included. We are also able to add additional mechanical and electrical equipment to our scope of delivery, or to deliver complete plants. (Read more about the different engineering documents on page 20).

Data from the laboratory and pilot plant are continually updated in line with our field experience. Ongoing co-operations with various mining companies and research institutions also contribute to the continual expansion of Köppern's operational database in order to improve our process and technology knowledge for the best possible support of our customers.

Our main pilot plant facility is situated in Freiberg/Germany. In addition, Köppern operates pilot plants in Western Australia, Russia and North America.

Köppern pilot plant, in cooperation with the Technical University of Freiberg

Pilot plant roller press type 52/10

Separator for ore processing






Machine Design

Frame Designs for Rapid Roller Changes

Köppern has developed and patented different hinged frame designs in order to facilitate the exchange of rollers and therefore minimize maintenance shutdowns and expenses. For both solutions, no disassembly of any components of the material feeding system is required.

Hinged Frame design

Hinged Frame

The Hinged Frame is Köppern's classic frame configuration that has been used in more than 350 machines and delivered to some 140 customers since 1973.

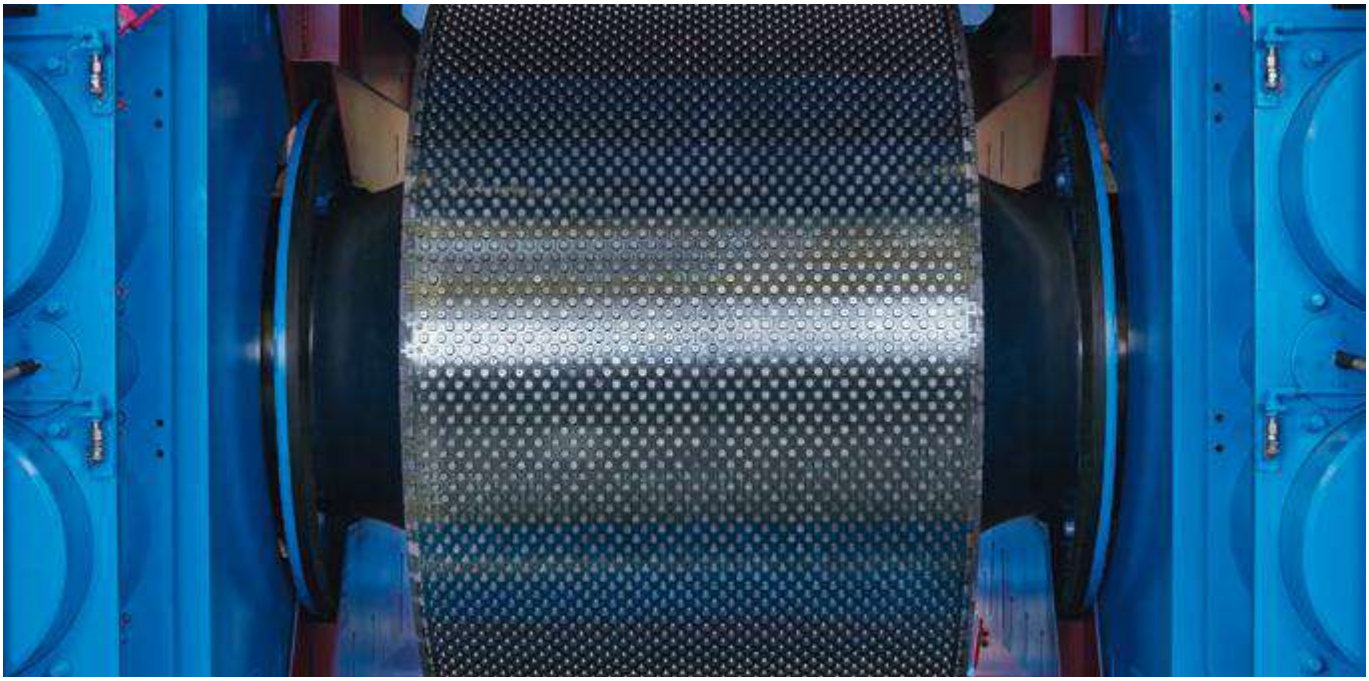
The outstanding feature of this design is that the frame is self-supporting at all times, which means both rollers can be exchanged with a minimum of disassembly and reassembly work. To enable this, both ends of the frame are hinged down. The roller assemblies will then slide out on their bearing blocks onto the respective frame ends by means of a winch or an extra motor-driven roller retraction device. From these positions, the roller assemblies are lifted away or transferred to a transport carriage. The steps for the reassembly of the new rollers subsequently take place in reverse order. Approximately 2–3 working shifts are required for a complete change of rollers from shutdown to restart of production.

Multi-Hinged Frame design

Multi-Hinged Frame

The Multi-Hinged Frame (MHF) design is a further development of the classic Hinged Frame. This patented design (DE 10 2012 112 102 B3, further patents pending) has all the advantages of the Hinged Frame, but allows both rollers to be removed at one end of the machine. This frame design is therefore particularly suited to situations where space or crane capacities are limited.

To facilitate the roller change, only one end of the frame needs to be hinged down. The first roller assembly will then slide out on its bearing blocks onto this frame end. From this position, the roller assembly is lifted away or transferred to a transport carriage. The intermediate pieces of the frame are then swung out on both sides of the machine, providing a passage for the second roller assembly to slide out onto the same hinged-down frame end. The steps for the reassembly of the new rollers subsequently take place in reverse order. Approximately 2–3 working shifts are required for a complete change of rollers from shutdown to restart of production.



Köppern Standard HPGR Sizes for Ore Processing

Köppern has defined a range of standard HPGR sizes which cover most demands of the ore processing industries. In addition to the 34 standard machine sizes, other HPGR configurations are available on request.

Model	Working Surface		Specific Grinding Force (max)	Typical Installed Power	Capacity		Typical HPGR Mass
	Roller Diameter [mm]	Roller Width [mm]	[kN/m²]	[kW]	ρ ~ 1.7 t/m³ [t/h]	ρ ~ 2.2 t/m³ [t/h]	[t]
052–10,0	1,000	250	3,500 to 4,500	2 x 132	50–100	60–130	20
072–11,0	1,100	750–970		2 x 300	200–300	250–400	60
084–12,4	1,240	870–1,120		2 x 450	300–400	400–500	84
092–13,3	1,330	930–1,190		2 x 550	400–500	500–650	103
500–14,5	1,450	1,010–1,300		2 x 725	500–650	650–850	128
560–15,9	1,590	1,120–1,450		2 x 1,000	650–900	850–1,200	177
630–17,6	1,760	1,230–1,580		2 x 1,300	900–1,200	1,200–1,550	219
710–19,2	1,920	1,350–1,730		2 x 1,400	1,200–1,500	1,550–1,950	303
750–20,5	2,050	1,440–1,850		2 x 1,600	1,450–2,000	1,900–2,600	350
900–22,8	2,280	1,600–2,060		2 x 2,100	2,000–2,500	2,600–3,250	458
950–24,0	2,400	1,700–2,180		2 x 2,550	2,400–3,000	3,100–3,900	542
1000–25,4	2,540	1,800–2,310		2 x 3,000	2,800–3,600	3,600–4,700	630

Wear Protection

Challenge and Solution for the Mining Industry

The adoption of high-pressure comminution technology has led to significant inherent savings. The conventional one-piece welded rollers used predominantly in the past for HPGRs were subject to rapid and excessive wear. Today, almost all HPGRs for mineral grinding applications are equipped with rollers assembled with roller cores and shrink fitted tires. These are used with well-proven wear protection systems such as studded linings. Among other advantages, this system allows roller cores to be re-used after the end of the service life of the tires.

Tire surface with studded wear protection

Tire Surface Wear Protection

The tire surface is protected against wear with the aid of inserted tungsten carbide studs. During the comminution process, the ore embeds itself between the studs and forms an autogenous wear-protection layer for the roller surface. Köppern offers a suitable range of studs aligned to varying ore characteristics. These studs are also available in different lengths. In order to provide reliable and lasting wear protection, Köppern uses only hard metal from reputable suppliers.

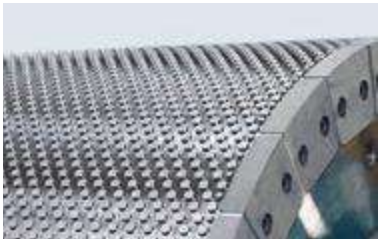
Tungsten carbide edge protection elements

Tungsten Carbide Edge Protection

Tungsten carbide elements are dovetailed directly into the tire. In order to more effectively prevent damage to these edge-protection elements, a separate pocket is provided for each element so that they cannot touch each other.

HYBRIDUR® – Edge Protection

HYBRIDUR® combines an innovative, highly wear-resistant edge protection solution with proven stud-lining technology. The outside edge-protection layer consists of elements made of hot-isostatically pressed (HIP) powder-metallurgical material, which is tougher than tungsten carbide and more wear-resistant than welded hard-facing materials. The single HYBRIDUR® elements are each housed in a separate pocket at the edges of the rollers, giving a high level of protection at the sides. The unique design of the HYBRIDUR® system means that there is less chance of chipping at the edges of the rollers in comparison to standard designs.



Studded tire surface with
HYBRIDUR® edge protection

Cost Efficiency

Rollers fitted with high-quality and state-of-the-art wear protection generate considerable cost savings due to their durability and length of service life. This in turn reduces costs arising from loss of production and repairs, as well as the cost of early tire replacement. These technological advances have resulted in a significant reduction in machine downtime caused by wear and repairs. The resulting rise in productivity, along with a parallel increase in grinding efficiency, enables our customers to compete more successfully in their own market segments.