Phosphate Rock, RSA

Colemanite, Turkey

Aragonite, Italy

Bronite, USA

Phosphate Rock under direct light microscope

Banded Iron Ore Formation, Brazil

Chalcopyrite, Chile

Stranskiite, Namibia

Apatite, RSA

Titanium Slag, RSA

Baryte, Germany

Expanded Clay, Germany

Clay, Germany

Dolomite, Russia

Bentonite, Libya
LOESCHE-MILLS
FOR ORES AND MINERALS
Loesche technology – always one step ahead

The company Loesche has more than 100 years of experience in the comminution of coal, cement raw material, clinker, slag and minerals. With consistently new developments, Loesche is always one step ahead.

Since 1961 Loesche mills have been successfully used in the ore industry.

1961 Delivery of the first mill for phosphate rock, LM 12.20, Japan

1967 Commissioning of a Loesche mill, LM 12/850, for comminution of magnesite, Mitsuahami, Japan

1973 Delivery of the first Loesche mill for comminution of manganese dioxide, LM 9/760, Thessaloniki, Greece

1976 First use of a Loesche mill for comminution of baryte, LM 14/1120, Ijmuiden, Netherlands

1987 Installation of a Loesche mill for comminution of lithium feldspar, LM 13.2, Bikita, Zimbabwe

1993 Delivery of the first Loesche mill for comminution of copper matte, LM 31.2, Magna, USA

1993 Delivery of a Loesche overflow mill for titanium slag, LM 13.2, Vredenburg, RSA

1998 Installation of up to that point the largest Loesche mill for comminution of phosphate rock, LM 50.4, Phalabora, RSA

1999 Delivery of a Loesche mill for the test facility of Anglo Research for comminution of different ore types, LM 3.6, Johannesburg, RSA

2001 Delivery of a Loesche overflow mill for comminution of titanium slag, LM 13.2, Empagnini, RSA

Loesche grinding technology is a dry milling process which offers significant advantages over conventional crushing and grinding technologies in ore beneficiation:

- Low specific energy consumption
- Steep product particle size curve
- Reduced product overgrinding
- In-bed comminution
- Selective comminution
- Higher degree of liberation of the valuable minerals
- Combining of the crushing and grinding process stages
- Rapid response to changes in the feed composition
- Optimisation of throughput through online monitoring
- The grinding product has a positive effect on the downstream processes
- Compact design

Loesche grinding technology is particularly suitable for users:

- who aim to increase their recovery of respective ores and minerals by applying the Loesche grinding technology
- who must reduce their operating costs
- who are dependent on a limited or expensive energy supply
- who operate or are planning ore processing in arid regions
- who operate obsolete or inefficient grinding systems
- whose processing plants no longer comply with the ecological requirements
- whose space requirement for the building of complete plants or modernisation of plant parts is limited

Loesche Mill Type LM 46.4, Lengerich, Germany, 2003

Loesche Mill Type LM 60.4, Ras al Khaima, United Arab Emirates, 2006
Loesche grinding technologies allow users to choose different comminution principles. The spectrum ranges from a combination of compressive and shear stress right through to shear-free grinding, or pure compressive comminution.

The grinding material is comminuted in the Loesche mill between the rotating grinding track and the stationary grinding rollers.

There are two basic types of roller axis position in relation to the centre of rotation of the grinding plate. This gives rise to different comminution effects:

- Compressive comminution with shear component
- Pure compressive comminution.

Generally speaking, Loesche mills operate with a compressive comminution system with a shear component. This effect is created by tapered rollers, whose axes are angled below 15° with respect to the horizontal grinding track. The roller axes do not intersect the centre of rotation of the grinding plate. With pure compressive comminution, the introduction of shear forces is deliberately avoided.

This is achieved by tapered rollers, whose axes are angled in relation to the horizontal grinding track in such a way that the roller axis intersects exactly the centre of rotation of the grinding plate with its axis.

The different comminution principles are matched to the respective ore characteristics in order to achieve optimum mineral liberation.

If an ore reacts positively to shear stress, a combination of compressive and shear is used.

The Loesche patented shear-free grinding is used where pure compressive comminution is desired. Through the use of shear-free grinding the percentage of finest grain can be additionally reduced with regard to the already steep product particle size curve. At the same time the percentage of medium grain size fractions is increased. Further positive effects are additional energy savings and the minimisation of wear.

The grinding product altered by shear-free grinding can reduce the amount of fines up to 50% and thereby result in significant advantages for the downstream sorting processes.
Comparison of the Loesche comminution principles

Accumulated screen underflow [weight %]

Particle size [µm]

Compressive and shear stress

Shear-free grinding
Advantages of the Loesche grinding process for ore beneficiation

Grinding is of central importance to the downstream sorting processes. The more complete the mineral liberation of the ground ore, the greater the chances of obtaining a good recovery.

The Loesche grinding principle is based on in-bed comminution. Due to the fact that the particles have many points of contact with each other, the grinding force is directed through the grinding bed. This results in a better degree of liberation compared with conventional grinding technologies. Online monitoring of the operating pressure of the grinding rollers and thus of the grinding forces provides a controllable and consistent product fineness.

Monitoring of the grinding forces in combination with in-bed comminution provides a selective ore comminution.

Direct classifying after each grinding contact helps to avoid unwanted overgrinding and to achieve a steep product particle size curve. In addition to the energy benefits, this has above all positive effects on the downstream sorting processes.

With a maximum feed grain size of 150 mm and grinding products up to P80 of 20 µm, the Loesche mill combines the crushing and grinding process stages in a single aggregate. Accordingly, the Loesche mill can, depending on process management, substitute two to three crushing and grinding stages. As well as simplifying process management, the compact design of Loesche grinding technology reduces the “plant footprint”.

In this way, the Loesche mill can be easily planned for incorporation in existing plant concepts or, in the case of new planning concepts, can reduce the amount of surface area used.
The advantages of the Loesche grinding process over conventional grinding systems can be summarised as follows:

- Controlled grinding; thus specific liberation of the valuable mineral
- Selective comminution by means of in-bed comminution
- Minimisation of product overgrinding
- Steeper product particle size curve
  - minimises the amount of finest grain
  - minimises the amount of coarse grain
  - thus improved fine-tuning of downstream sorting processes possible
- Higher degree of liberation
- Dry grinding product improves metering and conditioning of the following downstream process stages
- Activation of particle surfaces

**Advantages for the downstream process**

The use of Loesche grinding technology delivers not only advantages in the grinding process but also in the downstream ore-sorting processes. These advantages can be put down to the grinding characteristics of the Loesche mill and thus the optimised grinding product.

**Flotation**

- Flotation kinetics is improved through the grinding products
- The recovery can be increased thanks to the improved liberation of the valuable mineral
- Improved grade recovery relation
- The flotation times can be reduced, while recovery remains the same

**Energy savings**

- Energy savings of up to 45% can be achieved compared with conventional crushing and grinding circuits
- The operating costs are reduced by savings on personnel, energy and grinding auxiliaries
- Reduction of specific wear
- Use in arid or permafrost regions is possible
- Water consumption is reduced
- The Loesche grinding process is self-regulating such that the mill always runs at its optimum operating point
- Improvement in the environmental balance sheet thanks to conservation of resources

- Reduced consumption of flotation reagent thanks to low fines
- Dry grinding product provides for precise metering and conditioning
- Reduced mineral surface lining by finest grain and thus improved collector absorption
Density sorting:
- Improved recovery thanks to a better degree of liberation at coarser feed size
- Improved concentrate grade thanks to a reduced amount of finest particles in the feed

Heap and agitator leaching:
- Improved ore leaching solution contact thanks to higher liberation of valuable material and thus increased recovery
- Improved leaching solution flow through the heap by reduced amount of fineness
- Improved leaching kinetics

Magnetic separation:
- Higher recovery thanks to coarser feed size
- Reduced losses of valuable mineral in the finest particle fraction

Water management
- Reduced water consumption
- Reduced problem of slimes during filtration
- Improved recovery of process water thanks to reduced water absorption at the slimes and faster sedimentation of the tailings

Grade recovery curve

Flotation kinetics

<table>
<thead>
<tr>
<th>Recovery [%]</th>
<th>Time [min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball Mill</td>
<td>t₁, t₂</td>
</tr>
<tr>
<td>Loesche Mill</td>
<td>t¹, t²</td>
</tr>
</tbody>
</table>
Quality and reliability from the outset are the internationally recognised advantages of Loesche grinding plants. Ever since 1928, when the Loesche mill was first introduced to the market, the principle of the vertical roller mill with rotating grinding track and individually guided rollers has proven to be particularly energy- and resource-conserving.

These advantages of the Loesche mill are becoming increasingly more important in the face of increasing plant sizes and commitment to more economical use of resources, such as energy, water, etc.

Furthermore, because of the high product rates for Loesche mills the investment costs are significantly lower compared to smaller grinding plants.

From sales through to aftersales service, from project planning on schedule through to the handover of plants, Loesche is a competent partner to its customers. Our maxim is:

“Every Loesche grinding plant is a reference plant!”

The cornerstones of our competence include:

- Customised plant concepts from planning through to commissioning, based on our own knowledge and experience, paired with customer requirements
- Individual problem solutions with optimised process technology
- Close cooperation with suppliers of further processing equipment according to customer requirements
- Customer service: plant optimisations and advice on new technical developments
- Long-term commitment to deliver spare parts
Layout and function of the Loesche mill

Layout
The established basic principle of the modular system patented in 1970 is used for Loesche mills with two, three, four and six roller modules. Each roller module consists of the grinding roller, a rocker arm that transmits force to the roller by hydraulic spring loading, and the upper end of which the rocker arm is supported so that it can pivot. Large or small modules can be used in different numbers (two, three, four and six) in identical mill sizes (grinding table diameter). In this way, customer-specific requirements can be satisfied on a customised basis.

Loesche technology is characterised by the following features:
- Each roller is held by a locally secured rocker arm.
- The roller-bearing-mounted rocker arm roller system is supported and guided precisely in a pedestal with integrated spring assembly.
- The facility to raise the rollers serves as a starting aid for the mill during startup with the grinding track filled. It is an integral part of the hydropneumatic spring assembly.
- In each case two opposing rollers are connected to a common hydraulic unit (except on 3-roller mills).
- A virtually parallel grinding gap is maintained for the entire service life of the grinding parts between the grinding rollers and the grinding plates of the grinding table.
- Via the hydraulic system the grinding force can be optimised in correspondence with the characteristics of the comminuting ores.

Mill function, airflow mode
The ore raw material is fed via an air lock and falls via the chute onto the centre of the grinding table. Free ferrous foreign objects are separated out from the feed material magnetically before reaching the air lock and removed via a diverter gate. A metal detector operates in a similar way and ensures the separation of non-magnetic metal parts. The material to be ground moves on the grinding track towards the edge of the grinding table under the effect of centrifugal force and in this way passes under the hydropneumatically spring-loaded grinding rollers. The material that has been drawn in is ground in the material bed in the gap between the rollers and grinding track. The rollers are displaced upwards as they roll over the material bed. As a result the functional unit consisting of rocker arm, spring rod and pistons from the hydraulic cylinder are moved. The piston displaces the hydraulic oil from the cylinder into the gas-filled bladder accumulator unit. Nitrogen-filled rubber bladders in the accumulator units are compressed and act as gas springs. The gas springs can be set to be harder or softer by selecting the gas pressure in relation to the hydraulic operating pressure, depending on the fracture behaviour of the material to be ground.

The ground material is subjected to centrifugal force and rotates outwards and over the edge of the grinding table. In the area of the louvre ring which surrounds the grinding table, the stream of hot gas directed upwards captures the mixture of ground material and material as yet not completely ground and conveys this to the classifier.

Depending on settings of the classifier, it rejects coarse materials. This falls into the internal grit return cone and then onto the grinding table for regrinding.

The ground material passes from the classifier and is conveyed from the Loesche mill with the gas stream.

Foreign matter and small amounts of coarse material fall through the louvre ring into the ring channel as reject material. Scrapers connected to the grinding table transport foreign matter into the reject chute.
The grinding table is driven by an electric motor and an elastic coupling and the mill gearbox with vertical output. A segmental thrust bearing at the top of the gearbox absorbs the grinding forces.

Before the mill motor is started, the grinding rollers are lifted hydraulically from the grinding track. The mill can then be started at low starting torque not only empty, but also partially filled. The grinding parts are prevented from coming into metallic contact when the mill is empty or loaded by automatic lifting of the rollers via a level control.

A so-called “auxiliary drive” for starting up a filled mill at low revolutions is not necessary!

**Mill function, overflow mode**

In the case of ores with specific grinding characteristics or coarse comminution, it might be beneficial to separate the grinding and classifying processes. Overflow mode is selected for such materials.

In contrast to airflow mode, classifying in overflow mode takes place not in the classifier directly above the grinding chamber, but in an external classifier. The material is transported via corresponding conveying routes from the mill to the external classifier.

The material ground by the grinding rollers is conveyed by the centrifugal forces of the rotating grinding table over the dam ring into the ring duct. As a result of the high circulation of material it is discharged from the ring duct not by means of a scraper, but instead in a free material flow via sloping chutes.

**Maintenance**

Worn grinding parts, tires and grinding track segments can be easily and quickly changed.

The rollers are retracted out of the grinding chamber into a vertical position with a swinging-out cylinder. Complete rollers, tires and grinding plates are thus made accessible for lifting gear.

During grinding the grinding parts wear out for the most part over the entire service life to such a uniform extent that mill throughput decreases only when the grinding parts are completely worn. Partial wear can be compensated for by specific lining in the mill. This can be realised by removal of the grinding parts or insitu by means of a special welding unit.

Loesche has the necessary expertise for welding insitu with appropriate welding apparatus.
Combined drying and grinding and classifying

Combined drying and grinding
Ore raw material may be obtained with different moisture contents as a result of the upstream separation processes. However, when compared with a moist product, a dry grinding product allows for more exact metering and conditioning to the downstream sorting process.

Hot gases are supplied to the combined drying and grinding process to evaporate the material moisture. Hot gases can either be used from on site sources or by using the Loesche hot gas generator.

As soon as the ground material leaves the table for the area above the louvre ring, the water contained in the feed material evaporates spontaneously on contact with the hot-gas flow.

Classifying
Depending on the application, Loesche vertical roller grinding mills can be operated in so-called airflow or overflow mode.

In both modes direct classifying after the grinding process eliminates the risk of product overgrinding.

Airflow mode combines the functions of grinding and classifying in one aggregate. The air flow uplifts the material from the grinding chamber to the classifier. In the classifier above the grinding chamber the material ground to spec is separated from the coarse particles (grit), which can drop back onto the grinding table to be comminuted again or can be removed for further treatment.

In overflow mode the ground material is discharged over the edge of the grinding table and classified in an external process. The grit is fed back into the grinding chamber. By isolating the classifying process from the grinding process, it is possible to provide for several classifying or sorting stages in order to recover intermediate products.

Dynamic Loesche classifier (LSKS)
The Loesche LSKS-type caged-rotor classifier operates with highly selective separation. It produces grain distributions of both narrow and wide bandwidths. By varying the process-technology setting parameters and thanks to appropriate built-in classifier components, it is possible to satisfy these differing demands made of the grain structure.

The gas/particle flow rising from the mills is directed via a static guide vane assembly ② to the classifying chamber. The gas/solid-matter mixture flows, depending on the flap position, specifically into the space between the guide vane assembly ② and the concentric-running rotor with blades ③.

As it rotates, the rotor accelerates the supplied gas/solid-matter mixture tangentially. The centrifugal force generated in the process rejects oversized grain.

The rotor speed and the gas flow with its flow direction determine the desired separation diameter. This can be adjusted within wide limits.

A unique feature of this classifier type is the continuous reclassifying of the particle flows rejected by the rotor. When they fly outwards under centrifugal force in the annular gap, they are blasted again by the gas flow directed upwards/inwards. Here agglomerated particles dissolve in such a way that they follow the product flow as individual grains and do not drop as apparent oversized grains with the grit back onto the grinding table.
Sizing – model series – drives

**Dimensioning parameters**
The following standard parameters are decisive in the sizing of Loesche mills:

- **GRINDING PRESSURE**
  This lies between the minimum value for solid fuels and the maximum value for ores.
- **MATERIAL MOISTURE**
  The Loesche mill can process material with moisture of up to 25%.
- **PRODUCT FINENESS**
  In the case of air-classifying it is possible, depending on the customer requirement, to create product fineness figures of P80 of 500 µm to P80 of 20 µm.
- **DRIVE POWER**
  The specific energy consumption during the grinding test is decisive for gearbox and motor power.

In the development history of Loesche mills the sizes have been adapted to the constant demand for higher capacity and throughput figures. The modular construction of the mills also enables customer-specific solutions to be realised by combining standard components.

**Model series**

- The mill sizes are identified according to the outer effective diameter of the grinding track in decimetres [dm].
- The identification is – separated by a point – followed by a digit. This digit indicates the number of rollers operating in the mill.
- Loesche mills are modular in design. The units of rollers, rocker arms and rocker-related spring assembly components with their pedestal are the modules. They are arranged as required 2, 3, 4 and 6 times around a grinding table.
- The number and size of the rollers is dependent on the required product rate in conjunction with the “Loesche load factor”, the product of the grindability, moisture and fineness factors.

The required gas flow is decisive for sizing the housings of the mill and the classifier.
**Drives**

An electric motor is used as the drive. It drives a planetary gearbox with bevel gears. The input shaft is horizontal, the output shaft operates vertically upwards. The drive is enclosed at the top by a horizontal output flange. The gearbox contains a segmental thrust bearing which absorbs the grinding forces in the housing at the top. Loesche mill gearboxes are developed in cooperation between Loesche GmbH and well-known gearbox manufacturers. The field service conditions under which the gearboxes must operate are matched to each other. Decades of field experience with Loesche mills determine the design of the (mill) gearboxes and their peripherals under all climatic conditions.

Today’s modern gearboxes are, like Loesche mills, modular in design. Torque split provides for a reduction of rotating masses with simultaneous multiple use of engineering elements in gearboxes of different sizes and power outputs.

A lubrication unit ensures that the gear teeth, the shaft bearings and the segmental thrust bearing are supplied with sufficient oil. Filters and cooling systems condition the oil. Electrical and hydraulic monitoring instruments incorporated in the PLC ensure safe operation.

In accordance with today’s state-of-the technology the modular construction principle of gearboxes allows further power increases without the need to develop a new construction concept.

The Loesche mill does not require a motor with increased starting torque. Because the rollers are hydraulically raised, the breakaway torque of the filled mill amounts to only 40% of the full-load torque. A “standard motor” can easily deliver this starting torque.

The installed motor power is geared towards the mill’s energy demand and is determined in the Loesche technical centre during the grinding test. The closest matching commercially available motor is selected and recommended to the customer.
Complete grinding plants

An ore grinding plant is featured on the following page. Grinding plants that use Loesche mills are characterised primarily by their simple design and layout. A grinding plant consists of the following process stages and components:

- Material feeding
- Grinding and classifying
- Reject/circulation handling
- Product separation
- Mill fan
- Hot gas generator (optional)
- Process/measuring and control technology

Complete grinding plants incorporate material storage hoppers and conveyor systems suitable for the ore industry as well as metering elements to the Loesche mill. Included downstream of the classifying processes is a filter system, which features, as well as the actual filter and the piping system, the product discharge and process-air circuit assemblies. The Loesche grinding plant also features components for metal separation and Loesche’s own hot gas generators for drying purposes, if these are required for the process.

Material which has not yet attained the desired product particle size is returned to the grinding process.

Final product is intermediately stored in the hopper and is forwarded from there to the downstream processes.
**Overflow and airflow modes**

The Loesche grinding plant is incorporated between the primary crusher and the downstream process in an ore beneficiation plant. There are essentially two different processes for comminuting ores with the Loesche mill. The difference being whether the recirculating load is conveyed in an internal or external circuit.

When the ground ore leaves the grinding chamber after the grinding process under its own gravitational force, this is known as overflow mode. When the material is discharged by means of an air flow via a classifier, this is known as airflow mode.

The choice of mode is determined by the properties of the material and the objective of the grinding process.

**Overflow mode**

In the overflow mode the classification and grinding processes are separate. The material is transported from the mill to the classifier via appropriate conveying systems.

Prior to feeding the mill, the ore is classified in the pre-classifying stage. Ore already according to spec is separated in the pre-classifier and guided to the final classifying stage the dynamic classifier. Thereby overgrinding and unnecessary energy consumption are prevented. The coarse fractions of the pre-classifier and the dynamic classifier are fed to the mill. After the material has been ground it is discharged through the ring duct and re-fed to the pre-classifier, thereby the grinding classifying circuit is closed.

The final product of the dynamic classifier is separated in the filter.

**Airflow mode**

In airflow mode grinding and classifying are combined in a single machine (Loesche mill with classifier). Within the mill and to the classifier the material is transported via airflow.

The feed material from the primary crushing stage is directed after upstream metal separation into the grinding chamber of the Loesche mill. The ground material is directed with the uprising gas flow into the classifier. The grit drops back onto the grinding table and is comminuted again. Product of sufficient fineness passes the classifier and is separated in the filter.

In both processes the finished grinding product is finally removed from the filters and fed to the downstream process via a product buffer.

Both overflow and airflow modes are closed grinding/classifying circuits. By constant separation of the final product from the grinding process an overgrinding of the material can be avoided.
Primary crushing stages
Loesche overflow mill

1. Feed, crushing plant
2. Conveyor belt, mill feed
3. Overbelt magnet
4. Metal detector
5. 2-way chute
6. Defective material collector
7. Conveyor belt, classifier charge
8. Static classifier
9. Dynamic classifier
10. Conveyor belt
11. Loesche mill
12. Discharge system
13. Conveyor belt circulation
14. Filter system
15. Filter fan
16. Stack
17. Product discharge
18. Recirculation gas line
   with dumper (optional)
19. Hot gas generator (optional)
20. Product storage

Loesche airflow mill

1. Feed, crushing plant
2. Conveyor belt, mill feed
3. Overbelt magnet
4. Metal detector
5. 2-way chute
6. Defective material collector
7. Gate
8. Loesche mill
9. Reject system
10. Conveyor belt, reject system
11. Filter system
12. Filter fan
13. Stack
14. Product discharge
15. Recirculation gas line
   with dumper (optional)
16. Hot gas generator (optional)
17. Product storage
The perforated jacket combustion system developed by Loesche in the mid 1960’s consists of a combustion chamber of heat resistant steel with burner muffle, and is well known in the market under the name LOMA Hot Gas Generator. The LOMA Hot Gas Generator has been used worldwide for decades in many different types of thermal processes for optimization.

**Design and operation:**

- The combustion chamber consists of heat resistant steels – no refractory brickwork is necessary.
- When starting up the hot gas generator heat losses are minimised since it is not necessary to heat up refractory brickwork. A start at full load is therefore possible.
- Very good thermal shock resistance and rapid load changes with only a short delay.
- High cooling rate of the combustion chamber prevents thermal overloading of following units. An EMERGENCY chimney stack is not necessary in EMERGENCY-OFF SITUATIONS and when starting and stopping.
- Accessible within a short time for inspection.
- Low wear.
- Short installation times, low weight, small space requirement. Can be installed in existing plants. Complete preassembly is carried out – also for larger LOMA combustion units.

Loesche hot gas generators are used where hot gases are required for direct drying, e.g. in the cement, steel, industrial minerals, ore, wood, cattle food, agri-food and chemical industries.

**Mode of operation**

The process gas stream which enters the spiral housing 3 cools both the protective jacket housing 4 and the perforated jacket 5, as a result of the flow pattern. The process gas enters the interior of the combustion chamber through the annular gap 7 and holes in the perforated jacket, and mixes there with the hot flue gases from combustion. At the same time the flame and hot flue gases are kept away from the perforated jacket.

**Heating media**

- Natural gas, bio gas, coke gas, blast furnace gas and other low calorific value gases
- Light and heavy oils, wood and lignite dust

LOMA Hot Gas Generator units are constantly being developed and conform to current technical standards. More than 600 hot gas generators (of this type) have been commissioned for a heat flow of between 100 kW and 64,000 kW.
Feeding of Loesche CS mills is carried out via a rotary vane feeder in order to prevent false air ingress into the mill interior.

Material is fed continuously from above via the inlet hopper into every vane pocket of the slowly rotating vane feeder. In order to reduce wear from the abrasive feed stock the peripheral speed is low and the filling level limited to 40%. Adjustable sealing strips on the rotor prevent any large gaps between the wearing plate of the housing and the rotor. The material is discharged downwards into the feed chute of the mill.

Hot gas can be passed through the inside of the rotary feeder to prevent material caking. It is easy to dismantle for maintenance purposes.
The Loesche test facility for raw materials testing, Research and Development

Calibrated standard grinding tests for mill sizing

Loesche has many years of experience in designing grinding mills. The most important prerequisite for correctly designed grinding mills is an exact knowledge of the physical properties of the materials to be ground.

The most important characteristic values of a material to be ground are the Loesche grindability factor and the specific power demand in relation to a defined fineness. Depending on the geological formation of the material to be ground, materials with highly different properties are found in nature, even with materials which appear visually to be similar.

Three well equipped laboratory LM 3.6 grinding mills are available in the Loesche test plant for performing standard grinding tests.

Technological development through practical laboratory grinding tests

One of the first steps in introducing new technologies is the practical laboratory test. Within the framework of our research and development projects the following actions are carried out:

- New materials for grinding of future market requirements are examined
- Optimised mill settings for special products are determined
- Plant components and process configurations are optimised
- New wear materials and concepts are tested

Our test plant is constructed in such a way that various modes of operation and plant process configurations can be simulated in the tests.

Analysis possibilities

- Pure density determination with gas pycnometer
- Determination of mass-related surface according to Blaine
- Grain size analysis with Cilas laser granulometer
- Sieve analyses with Alpine air-jet screening method
- Sieve analyses with Retsch vibrating sieves
- Grindability according to Hardgrove
- Grindability according to Zeisel
- Microscopy with Zeiss Stemi SV11
- Drying ovens for moisture determination
- Coal testing (Cfix, volatile matter, ash content)
Loesche – worldwide presence

Loesche is an export-oriented company run by the owner, which was established in 1906 in Berlin. Today the company is internationally active with subsidiaries, representatives and agencies worldwide.

Our engineers are constantly developing new ideas and individual concepts for grinding technologies and preparation processes for the benefit of our customers. Their competence is mainly due to our worldwide information management.

This ensures that current knowledge and developments can also be used immediately for our own projects.

The services of our subsidiaries and agencies are of key importance for analysis, processing and solving specific project problems for our customers.

Please visit our homepage at **www.loesche.com** for up-to-date information on our overseas companies.