Outotec® is one of the largest mill suppliers in the world and has over 100 years of experience with grinding technologies. Our dedicated team of specialists provides engineering, project management, testing, and analysis services to ensure your grinding solution helps to liberate your profit.

**BENEFITS**
- Improved performance, safety, and reliability
- State-of-the art technologies designed to minimize total cost of ownership
- Efficient operation and maintenance
- Mill design tailored according to unique application needs
THE GRINDING EXPERTS

Outotec extensive expertise in minerals processing encompasses comminution, separation, concentration, dewatering, and automation. We can provide a comprehensive range of advanced technologies for each process stage, from single equipment units to full turnkey deliveries.

Our grinding technologies are backed by over 100 years of industry experience, and our state-of-the-art designs are a result of years of development and encompass a full range of mills that can be customized for your specific requirements.

Ore testing offers an extra edge
To ensure the best possible results for your mill we offer total process testing at our test facilities as well as mineralogy and liberation analysis at our R&D center. Where specialized test work is required, we partner with other leading test centers around the world.

Advanced mill design analysis
Outotec mills are designed using the latest 3D computer-aided design (CAD) and drafting techniques.

Designs are fully verified with the latest finite element analysis (FEA) tools and techniques to predict peak stress levels in the mill structure and the ultimate life of the mill’s structural elements. Advanced computational fluid dynamics (CFD) and discrete element modeling (DEM) are used to analyze fluid and particle flow, energy, and wear. For mills with hydrostatic bearings, Outotec’s lubrication design analysis predicts the minimum thickness of oil in the bearing.

A global team of grinding experts
We have specialist mill teams located in Europe, the Americas, Australia, and South Africa. Our design and application engineers are recognized industry leaders in grinding and comminution, and we collaborate closely with a global network of experienced, qualified suppliers to manufacture the mill’s main components in the most cost-effective location.

Robust quality assurance
Our engineers perform progress inspections to verify compliance with all applicable specifications and standards. The results are recorded and form a part of the mill installation record, which is maintained for the life of the installation. Obtaining all spare parts and maintenance as well as process and equipment design from the same organization ensures optimal plant performance.
Outotec high-performance grinding mills use advanced simulation tools for the best possible process efficiency, mechanical reliability, and maintainability. Our mill range covers comminution applications.

**Autogenous and semi-autogenous mills**
Outotec has delivered everything from small, low-cost, single-stage SAG mills to the largest mill in the world – with a 40-foot diameter and 28 MW of motor power.

**Ball mills**
Ball milling is the most common application for horizontal tumbling mills. Outotec offers a full range of ball mills to suit a wide variety of duties, from a few hundred kW all the way up to 20 MW and beyond.

**Rod mills**
Outotec rod mills are designed to cope with the demanding nature of this heavy-duty application, typically used where a narrow product size distribution is required (for example, for subsequent gravity separation).

**MH Series Grinding Mills**
A standard range of SAG, ball, and rod mills with spherical roller bearing technology, enabling faster delivery and start-up lead time.

**Pebble mills**
Outotec has a long history of successfully implementing fully autogenous grinding circuits with pebble mills in secondary duty. This circuit arrangement eliminates steel grinding media, reducing operating cost and minimizing contamination and oxidation of sulfide grains.

**Scrubber mills**
Our scrubbers are built to the same exacting standards as the rest of our grinding mill range. They feature shell-mounted bearings to allow large feed and discharge openings, and a replaceable discharge weir to allow adjustment of retention time.

**Specialized mills**
Outotec has a long history of successfully implementing specialized grinding technology and applications including acid-resistant mills for grinding in raffinate or with acid-forming feed, as well as special feed and discharge arrangements and special bearing arrangements.
High intensity grinding mills
The Outotec® HIGmill® is an advanced, energy-efficient fine and ultra-fine grinding solution that relies on proven technology. The mill can handle increasingly complex ore bodies by taking advantage of gravitational forces and Outotec® GrindForce™ rotor technology to produce a finer grind for mineral liberation.

- High energy efficiency with patented GrindForce™ rotor technology
- Reduced CAPEX with small footprint and simple flow sheet
- Simple operation with multiple control modes
- High availability with long intervals between maintenance shutdowns
- Simple circuit arrangement with no recirculation required for classification
- Steep product particle size distribution with minimum fines generation

More than 200 HIGmill units installed globally over the last 50 years, including several with 5,000 kW installed power.

Mill reline equipment
Our range of mill reline equipment enables relining to be performed in the safest possible way with minimized downtime.

Outotec® Mill Reline Machine

Outotec mill reline equipment features:
- Designed according to the requirements of the European Machinery Directive and fully compliant with the ISO 15442, ISO 20332, and ISO 13849-1/2 international standards
- Remote operation with proportional control for all functions
- Touchscreen interface with live status, warning messages, and diagnostics
- Optional telematics unit for online monitoring

Digital and automation solutions
Outotec digital and automation solutions for grinding help to improve stability and efficiency, optimize mill performance, and reduce unplanned downtime. These solutions include:
- Outotec® MillSense® Mill Charge Sensor System
- Outotec® RockSense on-line particle analyzer system
- Outotec® Asset Analytics for grinding
- Outotec® PSI® particle size analyzers
- Outotec primary samplers for gravity flow
ROBUST DESIGN FOR RELIABLE OPERATION

Outotec mills are designed to produce optimal results even in harsh environments. We offer both trunnion and shell-supported mill designs, complemented by a drive solution that is tailored for optimum performance in any environment. Our mills meet the highest quality standards for design, manufacture, and supply.

**Mill bearings**
The type of support bearing is selected on the basis of mill size, intended duty, and environmental conditions at the installation site. Outotec® Polymer Hydrostatic Shoe Bearings (HSB) offer fully self-aligning operation with unparalleled capability to tolerate operational disturbances such as contamination and lubrication system failure. The Spherical Roller Bearings (SRB) used in Outotec® MH Series Grinding Mills offer simple and low maintenance with high load capacity and good thermal expansion and contraction.

**Trunnion-supported mills**
A relatively small, stiff bearing journal provides an optimal surface on which to operate an oil-film bearing. This support option can accommodate mill body splitting, making it the preferred option for large mill sizes.

**Shell-supported mills**
Our shell-supported mills are more compact, occupy less floor space, and require simpler foundations than comparable trunnion-supported mills. The feed and discharge openings can be sized to meet process conditions without being constrained by trunnion bearing limitations.

**Mill drives**
We offer both high-speed induction and low-speed synchronous motors. High-speed motors require an intermediate gearbox. Although large mills exceeding 18,000 kW normally use gearless drives, Outotec can offer geared drives in excess of 24 MW. Smaller mills up to 450 kW are also available in a direct-driven arrangement.
Lubrication systems and system sealing
Lubrication is a key driver of mill downtime and lifetime. Our automated lubrication systems are specifically designed to provide high-quality lubrication for mill components whilst being safe and easy to maintain. Our proprietary barricade seal can be used to enclose large-diameter interfaces.

Mill linings
We offer a complete range of mill linings for various process conditions. Lining materials include cast steel, cast iron, solid rubber, rubber-steel composites, and ceramics. Wave or lifter bar linings can also be supplied if needed.

Discharge arrangement
Overflow, peripheral, grate and open-ended discharge options are available. SAG and AG mills typically have grate discharge arrangements which can be either with or without trommel screens. SAG and AG mills with open-ended discharge arrangements are usually more efficient than those with grate discharge arrangements.

Trommels
Outotec’s range of proprietary trommels has been designed using CFD flow control measures in order to optimize the usage of the available space.

Outotec® Spiral Turbo Pulp Lifter
The Outotec® Spiral TPL™ is ideal for mills with high throughputs and is the latest in pulp lifter development, combining industry-leading pumping efficiency with a simpler, lighter design. It reduces slurry pooling in the mill and can increase mill throughput by up to 15% while reducing specific energy consumption by up to 15%.
SERVICES AND SOLUTIONS THAT BOOST YOUR GRINDING PERFORMANCE AND PRODUCTIVITY

Maintaining the efficiency of your operations and protecting your profitability with the right technology is critical to staying ahead of the competition. As your service partner, Outotec ensures that every solution has the maximum impact on performance and productivity throughout your grinding plant’s entire life cycle.

We are committed to understanding the unique business needs of your grinding operation. We collaborate with you to develop a safe, sustainable, and reliable service solution based on our deep process knowledge, leading technologies, and operational and maintenance expertise.

Full service portfolio
Our extensive service portfolio and customized solutions cover all phases of your grinding plant’s life cycle – from maintenance inspections and spare parts to modernization and upgrades.

Maintenance services
Keep your plant in perfect working order and plan for the future with confidence with our comprehensive range of maintenance services. We specialize in wear monitoring, asset management and performance optimization. Outotec® MillMapper® and CrusherMapper® are the first technologies in the world which measure, model and manage liners in grinding mills and crushers.

Our maintenance services can include:
- Mill reline services
- Condition monitoring
- Corrective maintenance
- Emergency maintenance
- Installation and commissioning
- Preventative maintenance
- Repair and rebuild services
- Asset performance service agreements

Remote Services
Our state-of-the-art remote services provide you with exactly the right level of support for your needs, and include remote troubleshooting, assessment, and monitoring for equipment and process performance as well as the technical condition of your equipment.

BENEFITS
- Improved health and safety
- Improved environmental efficiency
- Improved equipment and process efficiency
- Decreased operating cost
- Improved capital efficiency

Upgrades
Restore and enhance your operational performance with our comprehensive portfolio of equipment upgrades and technology modernizations.

Hydrostatic bearing upgrade
The hydrostatic bearing (HSB) upgrade is a retrofit solution for grinding mills, replacing bronze bearing pads with advanced polymer compound pads that significantly improve the maintainability, reliability, and longevity of both radial and axial pads.

The Spiral Turbo Pulp Lifter
The Outotec® Spiral Turbo Pulp Lifter is the latest in pulp lifter development, increasing mill throughput by up to 15% and reducing energy consumption by up to 15%.

Our upgrade services also include:
- Barricade trunnion bearing seal
- Slurry wheel upgrade
- Pinion bearing oil system upgrade
- Trunnion liner upgrade