metso
Expect results

Metso comminution solutions

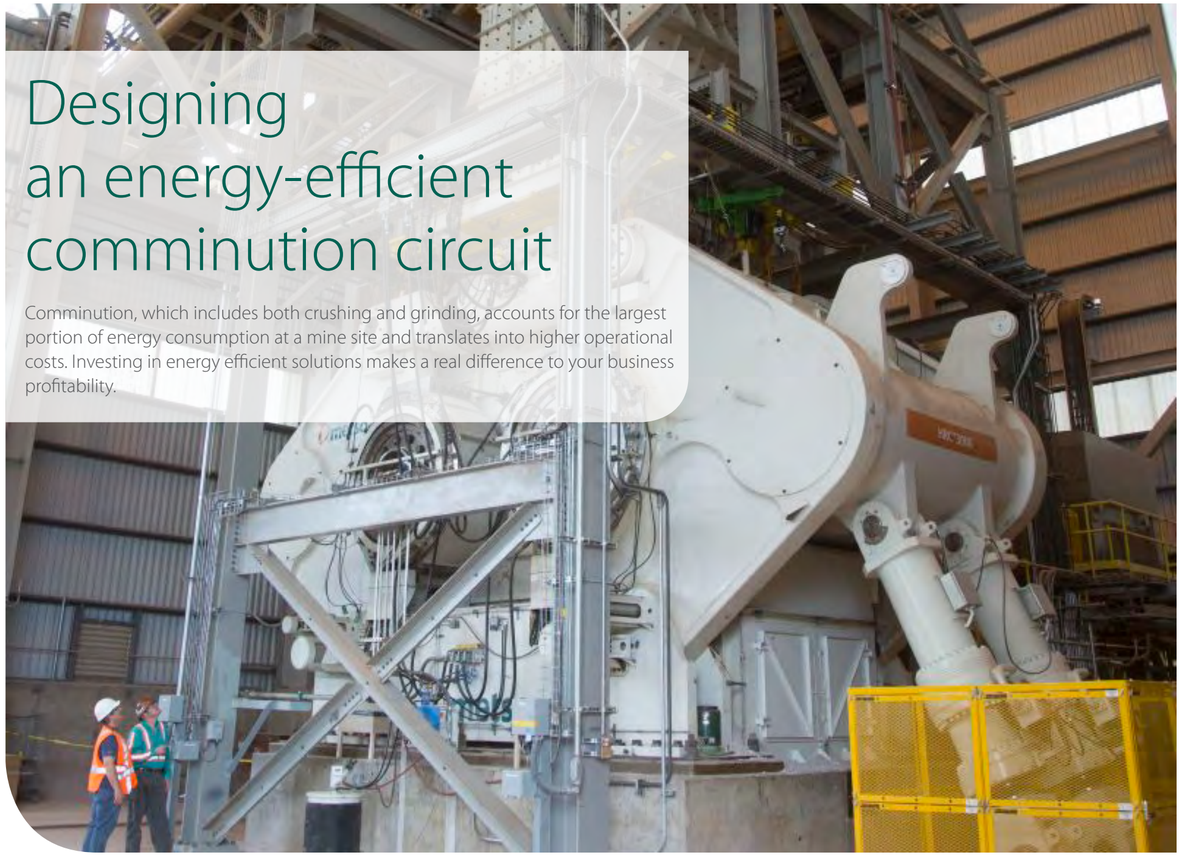
Grinding

Energy efficient solutions to maximize productivity and profitability

Rising energy costs in mining

There is only one way for energy efficiency in mining and mineral processing to go, and that is up. Increasing demand for metals and minerals coupled with declining ore grades mean that mines must process ever larger amounts of material to produce the same amount of product and consume an increasing amount of energy to do so. In tandem, global energy costs are rising, very quickly in the case of some countries, and so to keep their operations economically viable in the future miners are looking at different ways to optimize energy consumption throughout the mining process.

Improving energy efficiency in comminution is therefore key for companies that wish to remain competitive on the global stage and, given the potential scale of impact, reducing their energy intensity is also a big factor in allowing mines to maintain their social license to operate. However, rather than looking at this purely as a challenge, smart miners are also viewing it as an opportunity. Operations very rarely have control over the price of the energy. However, they can control what goes on at their sites, and influence potential cost savings that can be created by employing eco-efficient processes and technologies.



Designing an energy-efficient comminution circuit

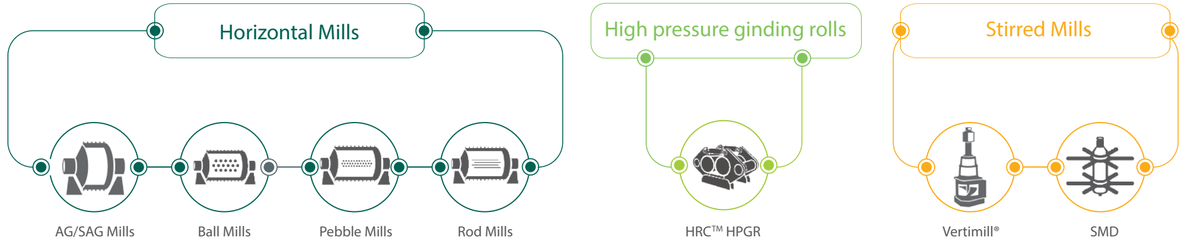
Comminution, which includes both crushing and grinding, accounts for the largest portion of energy consumption at a mine site and translates into higher operational costs. Investing in energy efficient solutions makes a real difference to your business profitability.

Metso Grinding Solutions

Every mining operation's grinding process is unique. Metso, with over a century of experience, designs and manufactures the most comprehensive line of grinding mills and entire grinding systems for the global mining industry. Wet or dry, horizontal or vertical, Metso makes sure to help deliver the precise equipment that will produce the best results and energy efficiency, while developing a partnership and providing any services needed during the operation duration.

Our expertise extends the supply of single unit equipment with our ability to provide total flowsheet solutions. Metso has an extensive history of technological development and is recognized as the world leader in the supply of grinding mills. Incorporating state-of-the-art engineering methods, Metso's intelligent designs deliver mills with the lowest cost of ownership and the highest availability.

Customizable grinding mills to fit any application



Horizontal mills

Winning combination of ruggedness and uptime

With more than a century of proven experience, Metso's horizontal mills embrace the latest technology and industrial knowledge to deliver high efficiency and performance.

Our robust mill designs withstand rugged and tough conditions provide high uptime and long life.

Today, Metso is known as a world leader in horizontal mills. With a wide range of field applications our horizontal grinding mills are optimal for both wet or dry grinding.

100+ years in horizontal mill designing and manufacturing


AG and SAG Mills


Ball and Pebble Mills


Rod Mills

Reliable and effective grinding technology

Metso horizontal grinding mills are known for the quality, reliability, uptime and long lifetimes. Our horizontal grinding mills have been very active in both new and mill replacement projects when larger mills are desired. As operations grow, so does the volume and capacity needed to maintain profitability. Metso horizontal mills provide the opportunity for high productivity no matter the challenges.

AG and SAG Mills

Metso offers AG and SAG mills in both gearless and geared options. Ideal for grinding run-of-mine ore or primary crusher discharge, both are available in a complete range of sizes and capacities. SAG mills are more likely to handle sticky feeds, but AG mills are still an optimal choice for wet grinding.

Ball and Pebble Mills

Both mills utilize tumbling media. Ball mills use steel balls and pebble mills use ceramic or natural rock for grinding. Operating in open or closed circuits, ball and pebble mills are designed for long life and minimum maintenance.

Rod mills

Metso rod mills are used in both wet or dry applications for a wide range of materials. Using rod as grinding media, these mills produce a uniform sized product while minimizing unwanted fines.

- **Replace** up to **3 stages** of crushing and screening
- Grind ore to **35 mesh** or lower
- Up to **64%** reduction in **downtime**
- Mill **motor power** up to **26,850 kW**
- **Feed sizes** up to **20 mm**
- Narrow particle distribution

High pressure grinding rolls

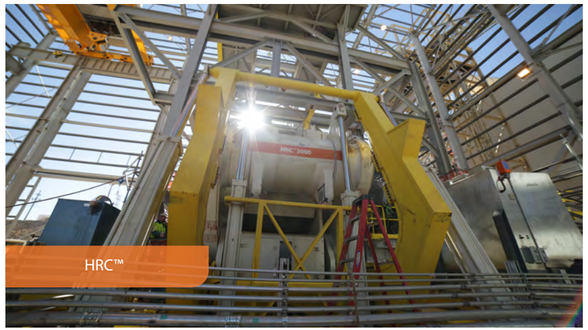
A step change in energy efficiency

Metso set the standard in high pressure grinding rolls (HPGR) when introducing the HRC™ HPGR. Designed from the ground up, Metso focused on developing an HPGR that would be for hard rock applications and provide the lowest total cost of ownership.

Metso's innovative and most advanced HRC™ helps you to get more value from every ton of ore with its sheer production capacity and state-of-the-art industry leading features. Our single line solution decreases the amount of capital cost and manpower required for routine maintenance, adding value to the customer operations.

HRC™3000
is the world's largest
and most advanced
HPGR

Metso high pressure grinding rolls (HPGR)



Maximizing crushing efficiency and circuit capacity

Metso has made several key innovations to traditional HPGR technology to increase throughput and decrease total costs of operations.

The patented arch frame design eliminates downtime caused by skewing and allows use of the flange tire design. The flange tires maximize the amount of material that is crushed by pulling material into the crushing tires for maximum energy efficiency.

The Metso HRC HPGR has been pushing boundaries with a pioneering design since introduction to the industry.

- Up to **20% increase** in **throughput**
- As much as **36%** in **energy savings**
- Up to **25% decrease** in **circulating load**
- Potential of **45%** in **OPEX savings**

HRC™
for sustainable,
energy efficient
mining operations

Stirred mills

Energy efficiency fine grinding technology

Metso stirred mills are the optimal choice for fine wet grinding. Ideal for grinding finer products, stirred mills are known for operational efficiency and smaller required floor space.

Metso offers two types of stirred milling technologies: Gravity induced and fluidized. With our proven experience in stirred mills, Metso has ensured to become the optimal choice for wet grinding circuits.

Metso has **100+** years of mill design & manufacturing expertise

Metso Stirred mills

Stirred Media Detritors (SMD)

Vertimill®

The most mature stirred milling technology

Stirred mills have proven to provide energy savings when compared with traditional grinding mills. Metso engineers and manufactures both types of stirred mills, delivering industry-leading efficiency and availability to fine and ultrafine grinding applications.

Vertimill®

Metso's Vertmill® is a gravity induced, vertical stirred mill. This stirred mill is capable of handling feed sizes up to 6mm and grinding product sizes of less than 20 microns. As the industry benchmark in stirred milling technology, Metso's Vertimill® has three decades of successful applications for customers.

- Up to **40%** higher **energy efficiency**
- **92%** increase in **uptime**
- **50%** less **installed footprint** (vs ball mill)
- Up to **50%** less **media consumption**

Stirred Media Detritor (SMD)

The SMD is a vertically configured, fluidized stirred mill for optimum fine and ultrafine grinding efficiency. The SMD utilizes the rotational energy of impeller arms to impart a high-energy motion to the mixture inside the mill. With its simplistic design and long maintenance intervals, SMD series provides the highest level of availability in the market

- Up to **250** microns **feed size**
- **Product** as low as **5** microns
- Up to **1100** kW (1475 hp) **motor power**
- Up to **50%** reduction in **carbon footprint**

Delivering results

A 64% reduction in rod mill downtime at Codelco's Chuquicamata

Challenge
Provide technology and services to replace 33 grinding mills for better production and overall results.

Solution
Metso provided 21 Ball mills ad 12 Rod mills along with a team of 30 people for the site.

Result
64% reduction in Rod mill downtime, and service break reduction by 9 days. Now it only takes 5 days for service breaks.

64%
reduction
in downtime

Read more:
metso.com/rod-mill-codelco

Delivering results

Increased energy efficiency at Anglo American's regrinding circuit

Challenge
The granulametry of iron ore in the Minas-Rio System at the end of the regrind process is only 80% less than 36 micrometers.

Solution
Metso provided 16 Vertmill® VTM-1500-WB grinding mills.

Result
The customer was able to achieve 30% reduction in energy consumption during regrind operations and provided more safety due to less moving parts.

30%
reduction in energy
consumption

Read more:
metso.com/vertimill-anglo

Delivering results

Energy efficiency provided to Freeport-McMoRan's copper mine in Morenci

Challenge
Develop a more efficiency HPGR crushing circuit for a new concentrator within the copper mine.

Solution
Metso provided the HRC™3000, the world's largest HPGR.

Result
This allowed for fewer lines of equipment, which reduced the amount of ancillary equipment needed. Overall, this brought in an estimated 13.5% increase in energy efficiency over other HPGRs based on pilot testing.

Estimated **13.5%** increase in energy efficiency

Read more:
metso.com/hrc-hpgr-mcmorans

Services built for performance

Maximize efficiency, availability and longevity

Spare and wear parts

Crafted to the same strict specifications and standards as our equipment, our genuine parts ensure complete compatibility for seamless operation. Our global distribution logistics network ensure that Metso OEM spare and wear parts are available when you need them.

Equipment upgrades and retrofits

Improve your equipment's productivity without the large capital investment. Our upgrades are offered as easy-to-implement packages or custom-engineered for your specific requirements, with the aim of enhancing safety, operating and maintenance features.

Maintenance and repairs

Proper maintenance is key to running your equipment effectively. Metso offers end-to-end service ranging from inspection and diagnostics, equipment and part repairs, shutdown solutions and planning, as well as emergency services.

Process optimization and controls

Metso process experts help in solving complex operational issues using analytical techniques, laboratory testing, and advanced control systems. Whether you need to optimize a piece of equipment, a circuit, or your entire plant, we have the tools and technology to help you make it happen.

Life Cycle Services

Metso's pre-packaged solutions are designed to assist you in meeting your business goals, from start-up to shutdown to end-of-life. We can support you on a specific activity or over a larger scope, combining elements from our large portfolio of services with unique commercial models.

Read more from the following links:
metso.com/services/mining-services/

The Metso Way -

Making the big difference to our customers

Everything we do is based on deep industry knowledge and expertise that makes the big difference to our customers. Decades of close customer collaboration and adaption to our customers' ever-changing needs have transformed us into a knowledge company.

Through our knowledge and experience, we work with our customers to create solutions that enable them to attain their objectives. We call this **The Metso Way**, which focuses on creating value to our customers. The Metso Way is built upon knowledge, people and solutions.

Knowledge -

We have deep knowledge about our custmers' business environment, processes and challenges

People -

Our committed and highly competent people make the difference to our customers

Solutions -

We create the technology and services required to meet our customer needs

metso
Expect results

Metso Inc.,
www.metso.com/mining