Grinding Equipment

Metso Minerals design and manufacture a comprehensive line of grinding mills and entire grinding systems for mining, industrial minerals industry, coal and cement, including classifiers and related accessories for both wet and dry grinding systems. We offer a complete spectrum of engineering services, including testing, process design, installation, commissioning, start-up, and continuous lifetime product support services.

Our experience is more than 100 years in the size reduction industry with over 8,000 grinding mill installations worldwide.

Our experienced personnel understand the challenges minerals processing can present. Metso has the people, technology, expertise, and product support services to help you maximize the efficiency of your grinding circuit. Let us put our knowledge to work for you.

Metso provides quality equipment and quality services necessary to maximize the return on your grinding equipment investment. We will work with you from initial conception through the life of the project.

Metso is active in most countries where our products are used. We are committed to providing service to our customers with a strong local presence. Local Metso are/will be structured to provide the services required by local market customers.

Our vision is to be recognized worldwide as a supplier of superior quality products and services with on-time delivery and unmatched value.

Type of grinding mills

Our standard line of equipment for wet and dry grinding systems include complete range of:

• Autogenous/Semi-Autogenous Mills
• Ball Mills
• Pebble Mills
• Rod Mills
• Vertical Mills
• Vibrating Mills

Each of the different types of grinding mills are available in a variety of sizes, drives and liner types and configurations to meet your demands on maximum productivity at highest availability.

Systems

Metso’s capabilities include deliveries of single products, product systems, process systems and complete systems.
**Spiral Classifiers**

**Metso Minerals Spiral Classifier with tank design for optimal performance**

The Metso Minerals Spiral Classifiers are designed to provide the most effective pool area and overflow velocity requirements. By combining the proper submergence of the spiral with one of the tank designs a choice of 63 combinations is possible in Straight, Modified or Full flare tank designs. The proper combination of pool depth, area and spiral construction is important to secure a controlled turbulence in the slurry flow for accurate size separation.

**Typical Installations:**
The wet classifier may perform several applications:
- Separation of fine particles and liquid from coarse particles
- Separation of light particles from heavy particles
- Separation of the particles into a number of products graded according to size.
- Separation of liquid from solid particles

Optimal particle size range 800 to 75 microns

**Spiral classifiers:**
- Single Spiral range from 300 mm to 2 200 mm
- Duplex Spiral models 1 500 mm and 2 200 mm

These classifiers are developed to secure a controlled separation, give a trouble-free operation and offer maintenance friendly design.
The Flotation Concept

The RCS flotation machine is the latest design to use the circular tank concept and combines the benefits of circular cells with the unique features of the mechanism to create the ideal conditions to maximise flotation performance for all roughing, cleaning and scavenging duties.

Metso offers the full range of cell volumes required for modern ore processing plants with cell sizes from 5 to 200 m³.

DV™ Flotation Mechanism

The patent-protected DV™ (Deep Vane) Mechanism impeller consists of a unique arrangement of vertical vanes with shaped lower edges and air dispersion shelf.

The mechanism design produces powerful radial slurry pumping to the cell wall and gives strong return flows to the underside of the impeller to minimize sanding. Additionally it is the only mechanism to give maximum slurry recirculation to the upper part of the impeller. Vertical diffuser vanes promote these radial flow patterns and completely eliminate slurry rotation in the tank.

Reduces Operating Costs:

- Mechanism designed to give maximum bubble particle contact for improved coarse and fine particle recovery.
- Impellers and diffusers are supplied in high abrasion-resistant elastomers or molded polyurethane.
- Impeller profile is designed to minimize absorbed power.

High Recovery CISA Flotation Columns

CISA columns are establishing a new standard in column cell technology. Their unique sparger design consists of in-line static mixers and recycling of tailings slurry. High shear conditions within the static mixers produces fine, uniform air bubbles. This maximizes bubble surface area flux in the collection zone and thus increases mineral recovery.

Numerous sparger retrofit applications demonstrated 20 to 50% increase in recovery in comparison of conventional (air-only) sparger systems. Column cell design includes efficient wash water distribution system, internal launders and other features to produce high-grade concentrates.
Magnetic Separators

Metso Minerals have a long tradition in magnetic separation. Already in the end of the 19th century the first magnetic separator was manufactured.

Low Intensity Magnetic Separators
Metso Minerals LIMS, Low Intensity Magnetic Separators, recover ferro-magnetic ores to produce pre-concentrates or concentrates.

The separators are available with three different tank designs using a common magnetic drum assembly. Two of the tanks are designed to enable easy multi-stage erection.

The magnetic system allows for very high loading with excellent selectivity at highest recovery, which reduces the number of units required. Fewer machines means less maintenance, lower capital and operating costs.

High Gradient Magnetic Separators
Metso Minerals HGMS, High Gradient Magnetic Separators, recover ferro-magnetic and para-magnetic material from ore slurries. The separators are designed around the unique magnetic system providing magnetic fields up to 2T (20 000 Gauss).

The separator handles particle sizes from 0,1 µm up to 1 mm and due to the excellent control parameters the metallurgical performance is superior. The cyclic HGMS is best suited for material with up to about 5 % magnetically produced fractions. With no moving parts except for actuated valves handling controlled slurry velocities the maintenance cost is extremely low.

High Gradient Magnetic Separators available in cyclic design with process vessel diameters from 220 mm to 3 050 mm and in continuous design with matrix ring mean diameters 1 200 mm, 1 850 mm, 2 500 mm and 3 500 mm.
Inclined Plate Settlers for Clarifying and Thickening

The Metso Minerals lamella principle uses several parallel inclined plates to maximise the settling area for any available floor area. In this way, the size and cost of the gravity settler can be minimised by matching the thickening and clarifying requirements more closely.

The two basic criteria for gravity settling equipment are good clarity of the overflow liquid and maximum density of the underflow solids discharge. The area needed to clarify a suspension is often greater than that needed for thickening. This means that by conventional thickeners the lower section with rakes and drive mechanism often is oversized. The Metso IPS is available as pre-fabricated units up to 500 m² settling area and as combi type up to 4800 m².

Typical installations:
Aggregates, Sand & Gravel, Mining & Metallurgy, Contaminated Soil Treatment, Chemical Process Industry, FGD, Sand/Water separation, Coal, Limestone, Potash Industry

Spiral Dewaterers

The Metso Minerals Spiral Dewaterer consists basically of an open trough with arrangements for collection of the products.

The inlet flow is evenly spread out by means of a feed distributor. Coarse material settles and is continuously removed by means of the transport spiral. The material will be dewatered by drainage in the upper part of the spiral before discharge.

Typical installations:
Mill Scale treatment in Continuous Casting, Hot Rolling and Scarfing. For industrial dewatering applications settling areas from 8 m² to 200 m². Flow Rates up to 1 500 m³/h.

Conventional Thickeners & Clarifiers

Metso Minerals Conventional Thickeners and Clarifiers are designed for continuous 24 hour per day operation.

Typical installations:
• Chemical and industrial mineral processing industries
• Ore processing industries.
Mechanical Dewatering by Pressure

As particles get finer the resistance against removing water increases. Gravity dewatering can no longer be used, pressure has to be used.

By creating a differential pressure $D_p$ across a cake of solids, liquid can be removed by

Compression

“Dewatering by compression means replacing the liquid in a cake with particles”.

For Tube Presses either compression or a combination of compression and air purge is used. Similarly by the same method, cake washing is possible on the Tube Press. This is known as displacement washing where liquid is forced through the filter cake by hydraulic pressure causing the remaining natural liquid to be displaced by the incoming wash liquid.

For Vertical Plate Pressure Filters either compression or a combination of compression and air through-blow is used.

For Vacuum Filters air through blow is used.

Vertical Plate Pressure Filter

VPA

The Pressure Filter model VPA is of “medium pressure” type operating in the pressure range of 6-10 bar. The machine mainly is based on the “air through-blow” dewatering concept, whereby water is displaced by air as it passes through a filter cake.

Typical installations:

Filtration of metallic minerals, industrial minerals, coal and tailings.

Tube Press

The Tube Press is a membrane type filter press designed in cylindrical format and capable of operating at high filtration pressures up to 100 bar. The use of these high pressures enables a higher degree of separation of the liquid and solid phases.

The Tube Press is suitable for applications:

- Where the process requires very low cake moisture e.g. smelters & driers
- Where cake handleability is critical e.g. underground slimes
- Where filtrate is a valued product
- Where cake transport costs are significant
- Where cake is to be disposed of to landfill
Projects and Aftermarket

Projects

Almost without exception, the equipment provided by Metso Minerals becomes part of a system. The system may be a wet grinding circuit or a complete iron ore concentration plant with a pelletizing system. At either extreme, Metso Minerals has the capability to provide a complete system to our customers.

An Optimized Plant
A system is designed to take an ore, mineral or waste material from one stage and turn it into a value added product one, two or more stages later. How this is done, how many steps and what equipment is used determines how well optimized a plant is. We start from the creation of a process flowsheet. Key parts of the design may be tested in one of the Metso Minerals test centers to verify equipment sizes. The final flowsheet will provide the lowest total cost of operation.

Technical Expertise
Metso Minerals has equipment design experience going back more than 100 year through our predecessor companies. In designing a system, we take this expertise, combine it, and create something greater than the individual parts. Metso Minerals’ engineers are recognized as experts in their fields.

Process Guarantees End-to-End
That’s what Metso Minerals provide as a system. To our customers, that means that there is never a question of who is responsible, never a question of one vendor pointing at another if there is an interface problem, never a question of who is going to make it work. Process guarantees are valid across all of the equipment supplied by Metso Minerals whether it is our proprietary equipment or from a third party.

Financing and Other Services
Metso Minerals can assist in obtaining financing for a project through internal and external sources. Other services we provide include process reviews, process upgrades, process automation implementation and maintenance evaluations. These and future care service are part of Metso Minerals providing the complete system.

Aftermarket

Metso Minerals own and maintain the drawings, specifications, manuals and design calculations for the mineral processing equipment previously sold under trade names including:

- Allis Chalmers
- Allis Mineral Systems
- Boliden Allis
- Cable Belt
- Charlestown Engineering
- Conrad Scholtz
- Denver
- Dominion
- Dravo Wellman
- Hardinge
- Koppers
- KVS
- Marcy
- McNally Wellman
- MPSI
- Morse
- NEI
- Pyrotherm
- Sala
- Simonacco
- Stansteel
- Stephens Adamson
- Strachan & Henshaw
- Svedala

These product ranges include Grinding Mills, Process Equipment, Slurry Handling, Pyro Systems and Bulk Material Handling Systems.

Spare Parts
As the original supplier Metso Minerals can provide spare and wear parts to the correct tolerances and specifications for all the equipment listed above while incorporating the latest design improvements. Metso Minerals experienced staff provide an accurate and timely spare parts service to keep your equipment in productive operation.

Site Services
Metso Minerals can provide experienced and safety certified engineers to perform the following site services:

- Installation and commissioning.
- Routine and predictive maintenance.
- Operation and maintenance training.
- Alignment services.
- Mechanical and Process Audits
- Emergency repairs.
- Troubleshooting

Refurbishment
Metso Minerals can provide repair and refurbishment services for all the equipment listed. Examples include:

- SMD rotors
- Mill bearings
- Complete Lopulco mills
- Pendulum roller arm assemblies
- Drive systems
- Riding ring re-surfacing.
- Flotation mechanisms

We are happy to negotiate ‘Service exchange’ agreements for key components.
Minerals Processing

Our ranges:
- Grinding Mills
- Flotation Machines
- Reactor Cell Systems
- DR Flotation Machines
- Flotation Columns

Classifiers
- Spiral Classifier

Magnetic Separators
- Low Intensity Magnetic Separators
- High Gradient Magnetic Separators

Sedimentation Equipment
- Inclined Plate Settlers
- Thickeners & Clarifiers
- Spiral Dewaterers

Filtration Equipment
- Vertical Plate Pressure Filters
- Tube Presses
- Vacuum Filters

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