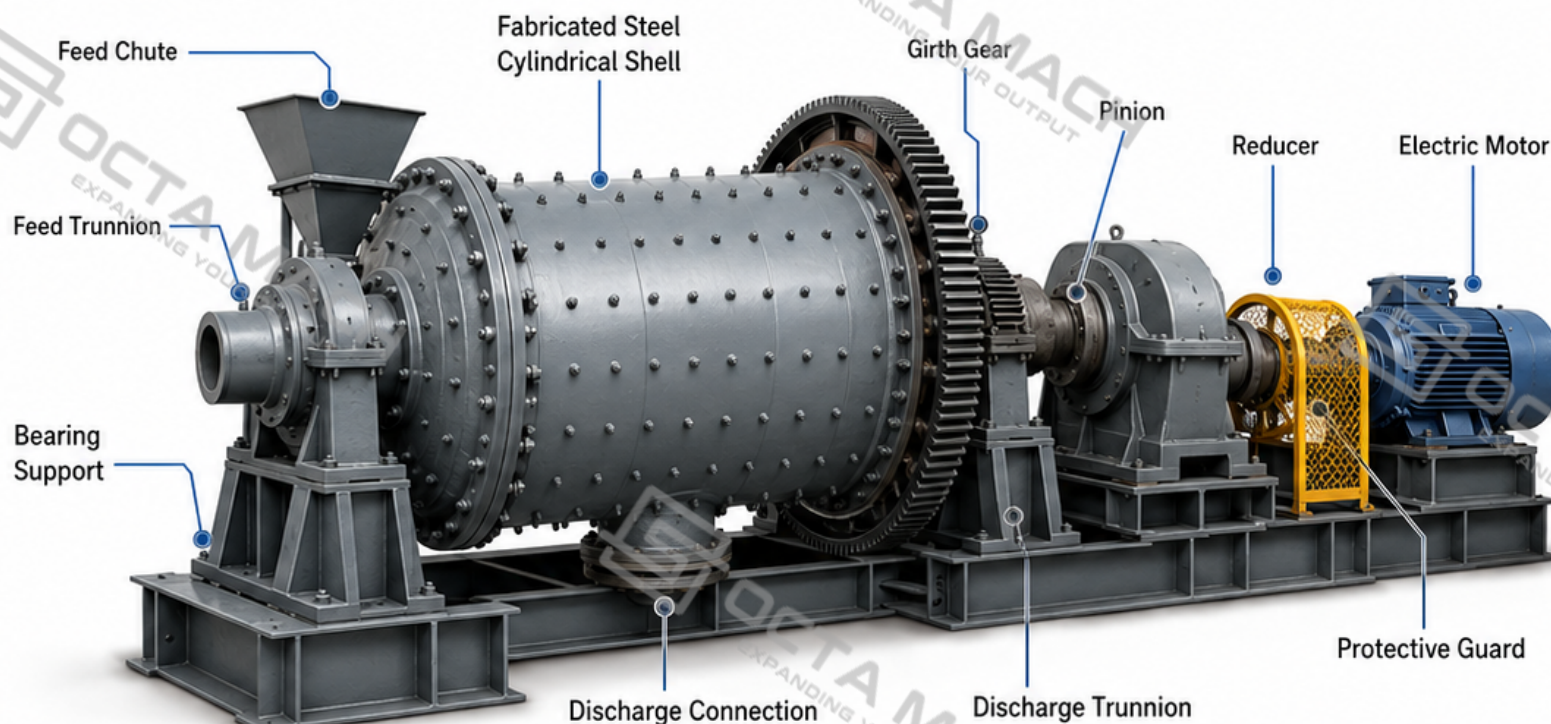


Product Overview and Confirmed Operating Range



An industrial ball mill reduces crushed ore to a controlled fine product through repeated impact and abrasion. Its lined cylindrical shell rotates a graded steel-media charge to support mineral liberation before flotation, magnetic separation, gravity concentration, leaching or other downstream processing.



Machine Type
Horizontal Industrial
Ball Mill



Model Range
 $\Phi 900 \times 1800$ to
 $\Phi 3200 \times 4500$



Maximum Feed Size
Up to 25 mm



Discharge Range
0.074–0.89 mm



Published Capacity
0.65–90 t/h



Motor Power
15–800 kW



Grinding Method
Wet or Dry



Discharge Options
Overflow or Grate



Published capacity is a preliminary comparison range and is not an unconditional performance guarantee. The capacity of $\Phi 3200 \times 4500$ is project-dependent.

BALL MILL SELECTION INPUTS

A suitable ball mill must be selected from complete ore data, target product, capacity and circuit conditions.

1 ORE PROPERTIES



- Mineral composition
- Hardness
- Abrasiveness
- Moisture and clay
- Contamination restrictions

2 FEED CONDITION



- Maximum feed size
- F80
- Full feed-size distribution
- Near-maximum particle %
- Crusher-discharge stability

3 GRINDING DUTY



- Mineral-liberation target
- Primary grinding
- Secondary grinding
- Regrinding
- Dry-powder production

4 PRODUCT REQUIREMENT



- Target P80
- Acceptable oversize
- Downstream process sensitivity

5 REQUIRED CAPACITY



- Normal dry-solids throughput
- Peak feed rate
- Operating hours
- Future expansion

6 GRINDING CONFIGURATION



- Wet or dry
- Overflow or grate discharge
- Open or closed circuit

7 CLASSIFICATION

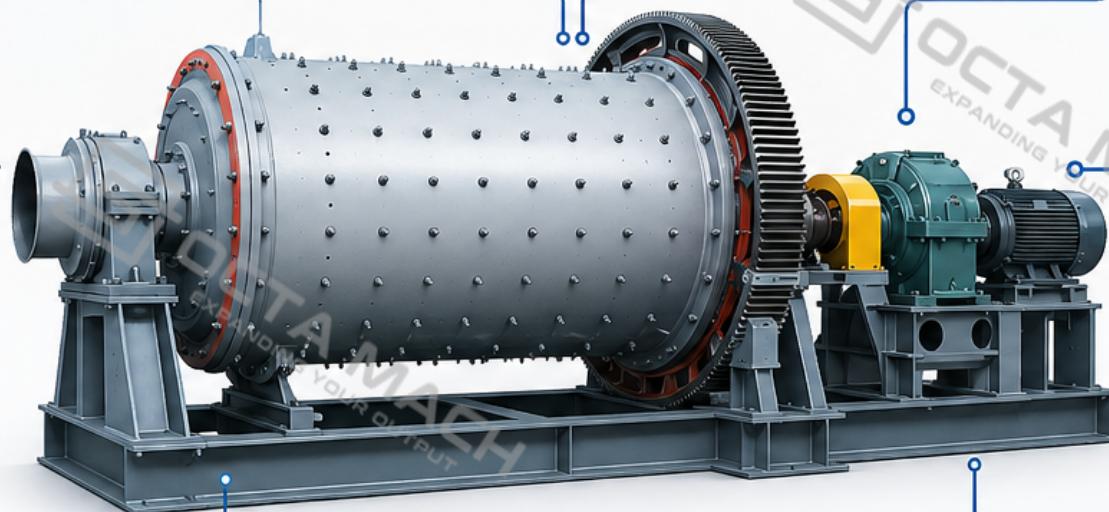


- Required cut size
- Spiral classifier or hydrocyclone
- Circulating load
- Classifier capacity

8 SITE CONDITIONS



- Voltage
- Frequency
- Foundation
- Elevation
- Maintenance access



ORE DATA

+



FEED DISTRIBUTION

+



TARGET P80

+



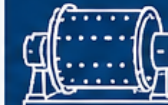
DRY-SOLIDS
THROUGHPUT

+



CIRCUIT CONDITIONS

=



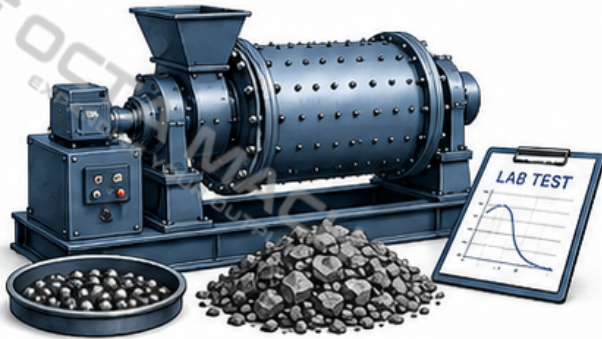
RECOMMENDED MILL
AND CIRCUIT
CONFIGURATION



WARNING: Do not select a ball mill only from cylinder diameter, motor power or catalogue capacity. Final selection must be based on complete ore data, target product, capacity and circuit conditions.

Ore Grindability, F80, P80 and Capacity

1 Ore Hardness and Grindability



- Ore hardness affects power demand and achievable throughput.
- Ore abrasiveness affects grinding-media and liner wear.
- Representative ore samples should be evaluated for important projects.
- The Bond Ball Mill Work Index is a locked-cycle laboratory test used to support grinding-power estimation.
- The test product size should be reasonably close to the intended circuit P80.
- Variable deposits may require testing of several ore domains.



Do not display a fake Bond Work Index value.

2 Feed Size and F80



COARSE **MEDIUM** **FINE**
Larger Particles → Smaller Particles



Maximum Feed Size

The largest particle expected in the mill feed.



F80

The size through which 80% of the feed passes.



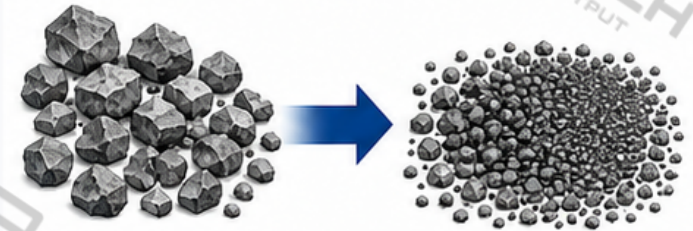
Full Feed-Size Distribution

The proportion of coarse, medium and fine particles.



A feed described only as below 25 mm does not provide enough information for final selection.

3 Target P80 and Capacity



P80

The size through which approximately 80% of the ground product passes.



Dry-Solids Throughput

The mass of dry ore processed per hour, excluding process water.

Main Capacity Variables

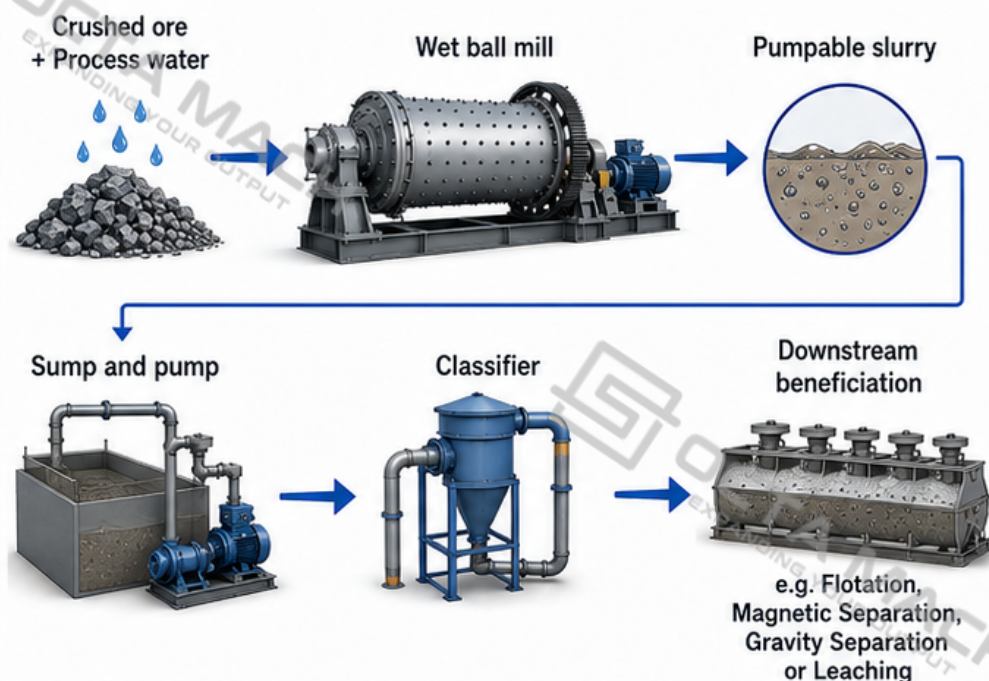
- Ore hardness
- Feed grading
- Target P80
- Ball charge
- Liner condition
- Slurry concentration
- Circulating load
- Classifier performance



Grinding significantly finer than the liberation target may reduce throughput and create excessive fines.

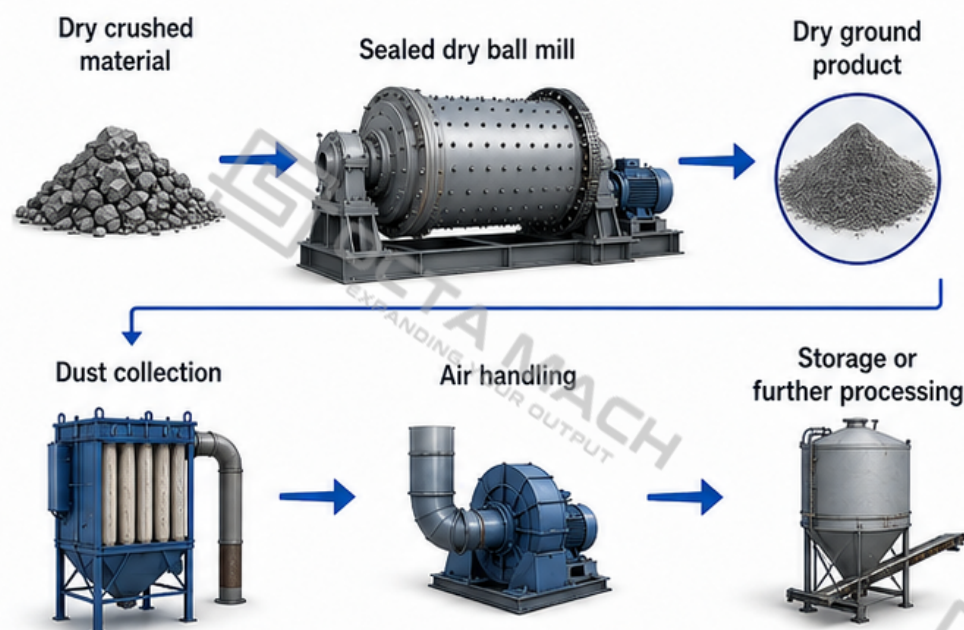
Wet vs Dry Ball Mill Grinding

WET BALL MILL PROCESS ROUTE



	Material Condition	Ore mixed with process water
	Typical Duty	Metallic-ore beneficiation
	Product Handling	Pumpable slurry
	Main Auxiliaries	Pumps, pipes, sumps and water control
	Main Selection Controls	Slurry concentration, water balance and classification

DRY BALL MILL PROCESS ROUTE

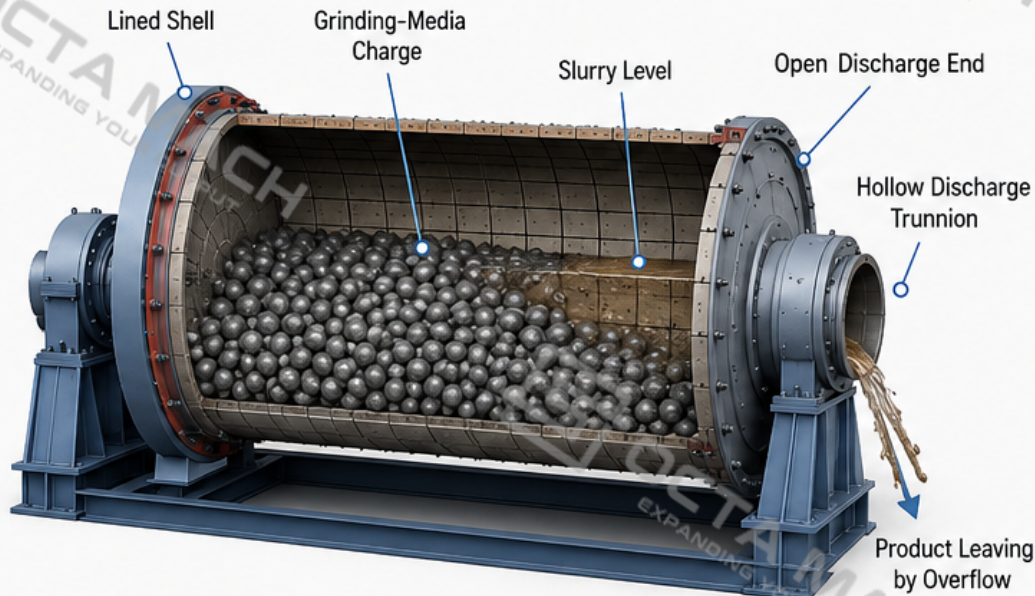


	Material Condition	Dry feed
	Typical Duty	Limestone, cement raw materials and industrial minerals
	Product Handling	Dry powder
	Main Auxiliaries	Dust collection, air handling and sealing
	Main Selection Controls	Moisture control and dust containment



Grinding method must follow the complete process route, available utilities and downstream product-handling requirements.

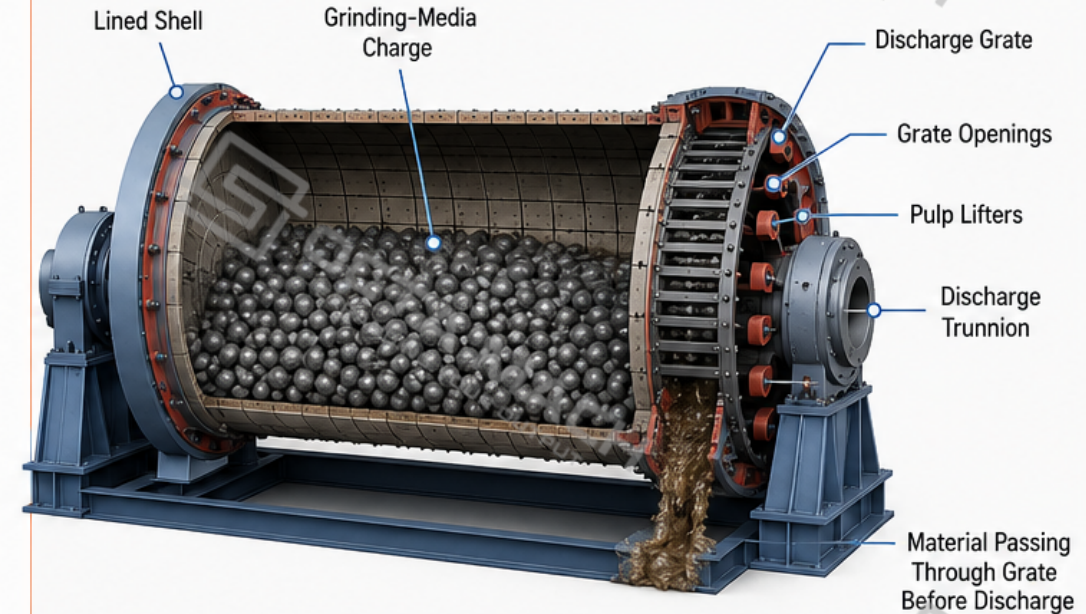
OVERFLOW BALL MILL



OVERFLOW BALL MILL – KEY CHARACTERISTICS

↓	Discharge Principle	Overflow through the hollow discharge trunnion
⌚	Material Retention	Generally longer
⋯	Product Tendency	Relatively finer product
⚙️	Commonly Evaluated For	Secondary and finer grinding duties
⚙️	Main Control Points	Slurry level and risk of overgrinding

GRATE-DISCHARGE BALL MILL



GRATE-DISCHARGE BALL MILL – KEY CHARACTERISTICS

↓	Discharge Principle	Product passes through grate openings and is lifted out
⌚	Material Retention	Generally shorter
⋯	Product Tendency	Faster discharge
⚙️	Commonly Evaluated For	Primary grinding and higher-discharge duties
⚙️	Main Control Points	Grate condition and discharge capacity



Discharge type must also consider target particle-size distribution, slurry density, circulating load, classifier arrangement and downstream process sensitivity.

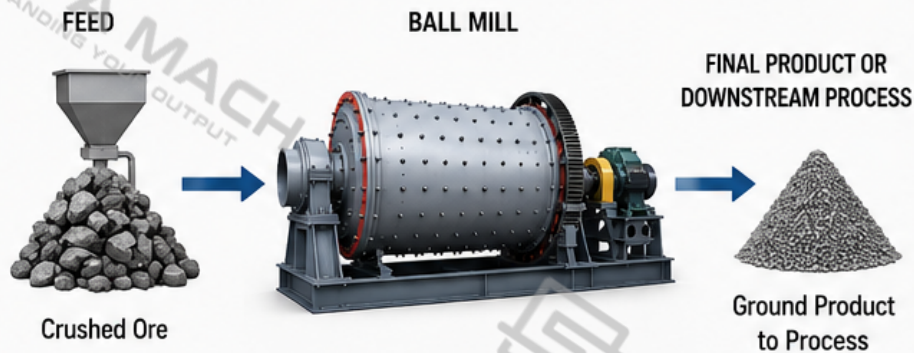


The internal structural difference must be technically obvious.

6

OPEN AND CLOSED GRINDING CIRCUITS

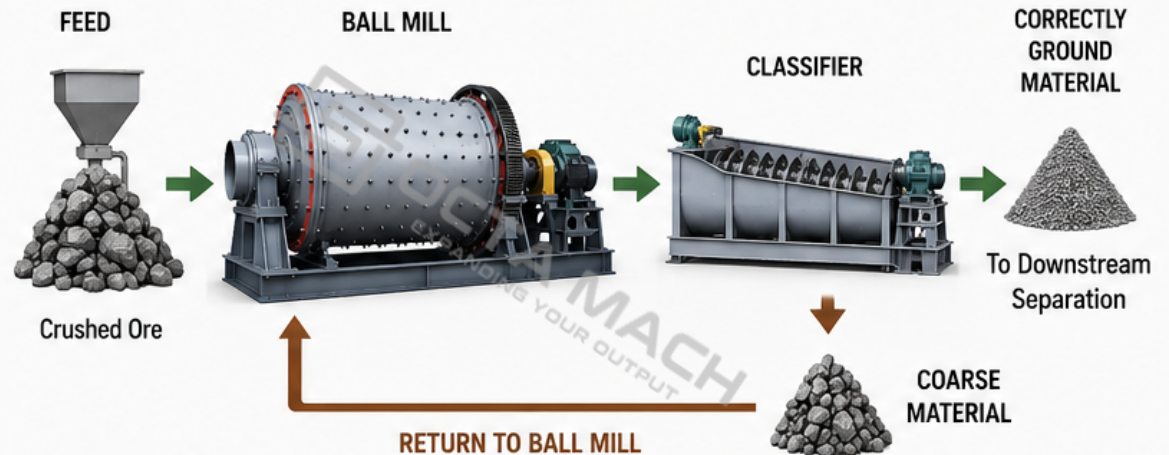
1 OPEN-CIRCUIT GRINDING



KEY CHARACTERISTICS

-  Simpler material flow
-  No coarse-particle return
-  Lower circuit complexity
-  Less control over final particle-size distribution
-  Suitable only when the process can accept the resulting product variation

2 CLOSED-CIRCUIT GRINDING



KEY CHARACTERISTICS

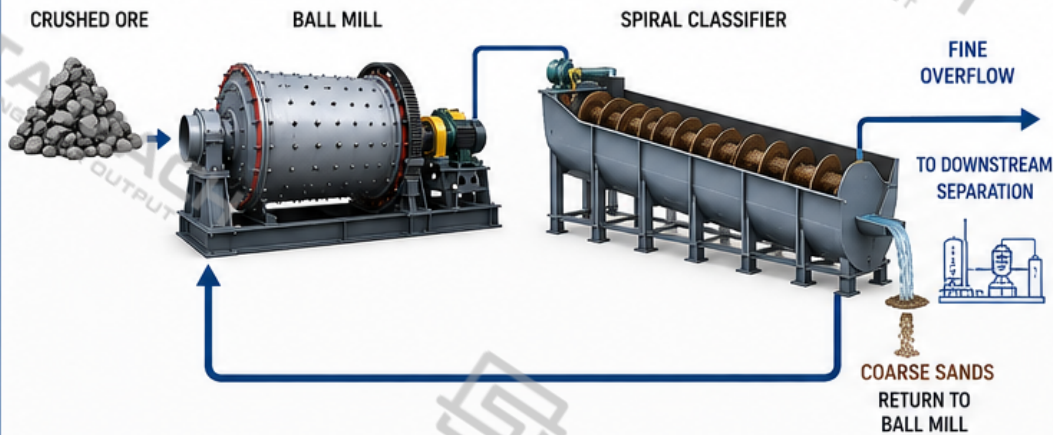
-  Better control of final P80
-  Coarse particles are returned for further grinding
-  Classifier and mill must be sized together
-  Circulating load affects mill duty and circuit stability



WARNING: Poor classification can increase circulating load, overload the grinding circuit and allow coarse particles to enter downstream equipment.



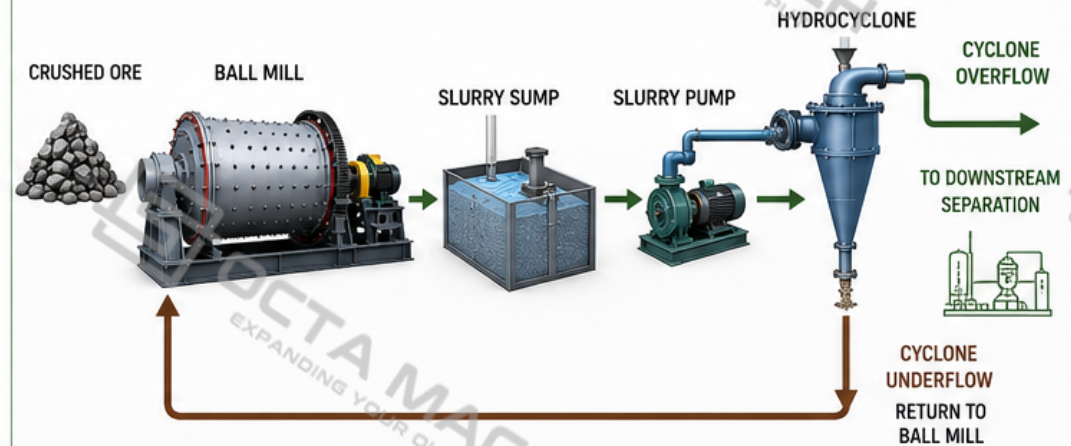
A SPIRAL CLASSIFIER CIRCUIT (CLOSED CIRCUIT)



SPIRAL CLASSIFIER – COMPARISON

	SEPARATION PRINCIPLE	Gravity settling and mechanical transport
	MAIN ADVANTAGES	- Mechanically simple - Visible operating condition - Common in small and medium circuits
	MAIN CONSIDERATIONS	- Larger floor area - Settling conditions - Spiral speed - Overflow control

B HYDROCYCLONE CIRCUIT (CLOSED CIRCUIT)



HYDROCYCLONE – COMPARISON

	SEPARATION PRINCIPLE	Centrifugal classification
	MAIN ADVANTAGES	- Compact layout - High circulating-load capability - No internal moving parts
	MAIN CONSIDERATIONS	- Feed pressure - Slurry density - Cyclone geometry - Pump stability

CLASSIFIER
SELECTION
MATRIX

SELECTION FACTOR	CAPACITY	REQUIRED CUT SIZE	AVAILABLE SPACE	PUMPING CONDITIONS	CIRCUIT STABILITY	MAINTENANCE STRATEGY
SPIRAL CLASSIFIER	Small to Medium	Coarser to Medium	Requires More Space	Low or No Pumping Required	Sensitive to Settling Conditions	Simple Mechanical Maintenance
HYDROCYCLONE	Medium to Large	Medium to Fine	Compact Footprint	Requires Pumping System	Sensitive to Pressure, Density and Cyclone	Minimal Internal Parts, Focus on Pump and Cyclone

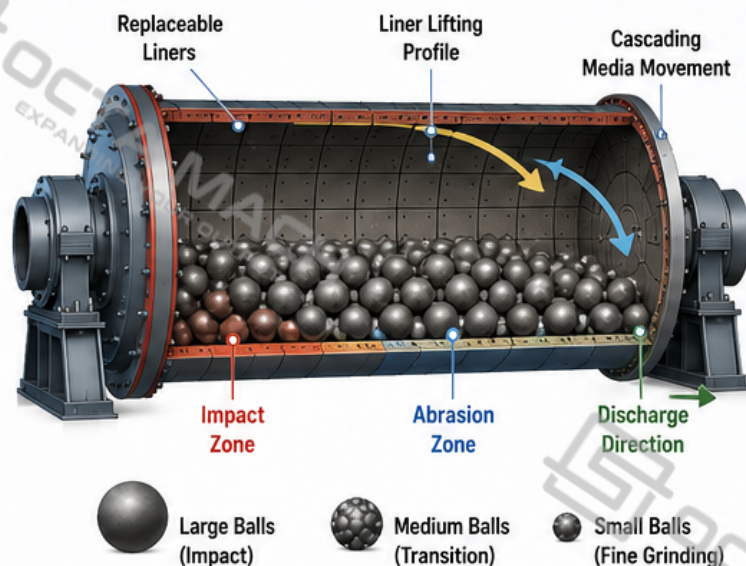


TECHNICAL NOTE: The classifier must be selected for the required cut size and circuit conditions, not simply matched to the ball mill by physical size.



Classifier performance directly affects circulating load, mill duty, product size control and overall circuit efficiency.

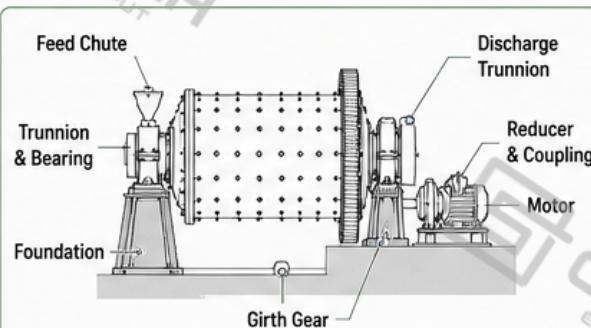
1 GRINDING MEDIA AND LINER CONFIGURATION



ITEM	PURPOSE AND EFFECT
Ball Diameter	Controls impact energy and contact area
Ball-Size Grading	Balances coarse breakage and fine grinding
Ball Filling Ratio	Influences power draw and media movement
Ball Wear Condition	Changes the effective charge over time
Liner Profile	Controls lifting and cascading action
Liner Condition	Affects shell protection and grinding stability

2 SITE AND INSTALLATION INTERFACES

Voltage and Frequency	☐
Motor Starting Method	☐
Foundation Dimensions and Loads	☐
Lifting and Maintenance Access	☐
Feed Chute and Discharge Connection	☐
Lubrication Requirements	☐
Water and Slurry Interfaces	☐
Upstream Feeder Capacity	☐
Downstream Pump and Classifier Capacity	☐
Control and Instrumentation	☐
Spare and Worn Parts	☐



3 FINAL SELECTION RULE



SUPPLY BOUNDARY (TYPICAL)		
	Main Machine (Ball Mill)	☐
	Motor	☐
	Reducer	☐
	Liners	☐
	Grinding Media	☐
	Electrical Control	☐
	Lubrication Equipment	☐
	Foundation Information	☐
	Installation Support	☐
	Technical Documentation	☐



TECHNICAL NOTE: A suitable ball mill must match the ore, target product, complete grinding circuit and site interfaces—not only the published model capacity.



Selection must be based on complete data, engineering judgment and realistic site conditions.