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BARITE | Dry Separation

Sorting by density difference.
HIGHEST sorting efficiency.
LOWEST evironmental impact.

Our sustainable solution for ecological barite processing.

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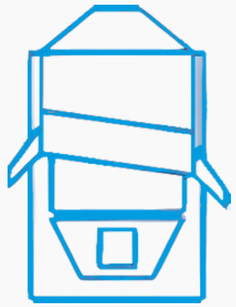
ABOUT

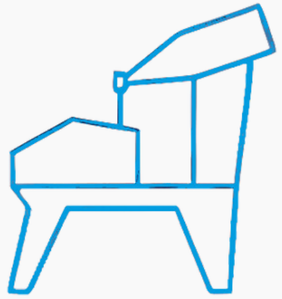
MOGENSEN Spain is specialized in the design and manufacture of customized systems for the classification, separation, washing, drying and cooling of a wide range of materials. Founded in 1966, our company is well established in various industries such as building materials, mining, recycling, waste processing, chemical and food.

Our engineering and manufacturing success is based on a team of highly skilled professionals. They bring the analytical skills necessary to meet the unique challenges of designing and configuring our machines and systems for each specific application.

MACHINES & SYSTEMS

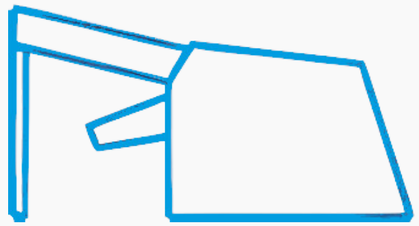


Densimetric Table



Sand-washing Plants

Sizers



Sensor-based Sorting

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FOLLOW THE LIGHT BLUE ROAD

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GSort FOR DRY SEPARATION

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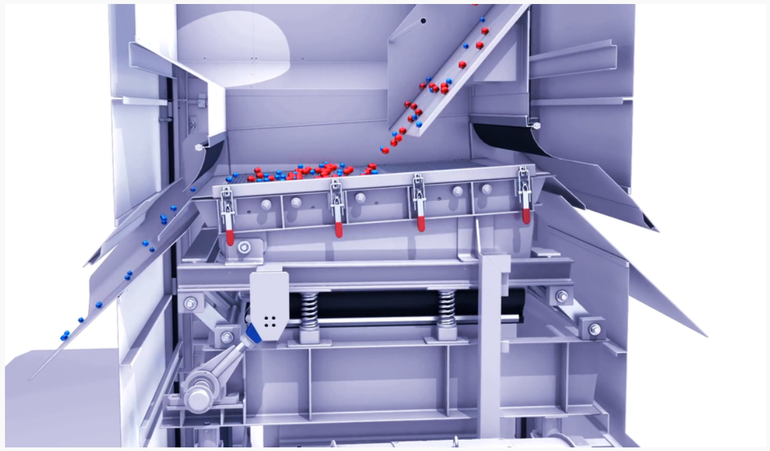
GSort | Working Principle

MIXED PARTICLE HANDLING

THEORY
Optimal separated single particles after crushing according to their density.

REALITY
Particles can have inclusions with different densities after crushing.



Adjustment of Airflow

By adjusting the air flow of the GSort fan it‘s possible to affect the separation result.

Higher Air Velocity

The mixed particles will be fluidized and discharged by the light fraction product outlet. This will lead to higher purity in the heavy fraction but less heavy material output.

Lower Air Velocity

The mixed particles will be transported to the heavy fraction outlet, due to the vibration movement of the air table. This will lead to less purity but higher heavy material output.

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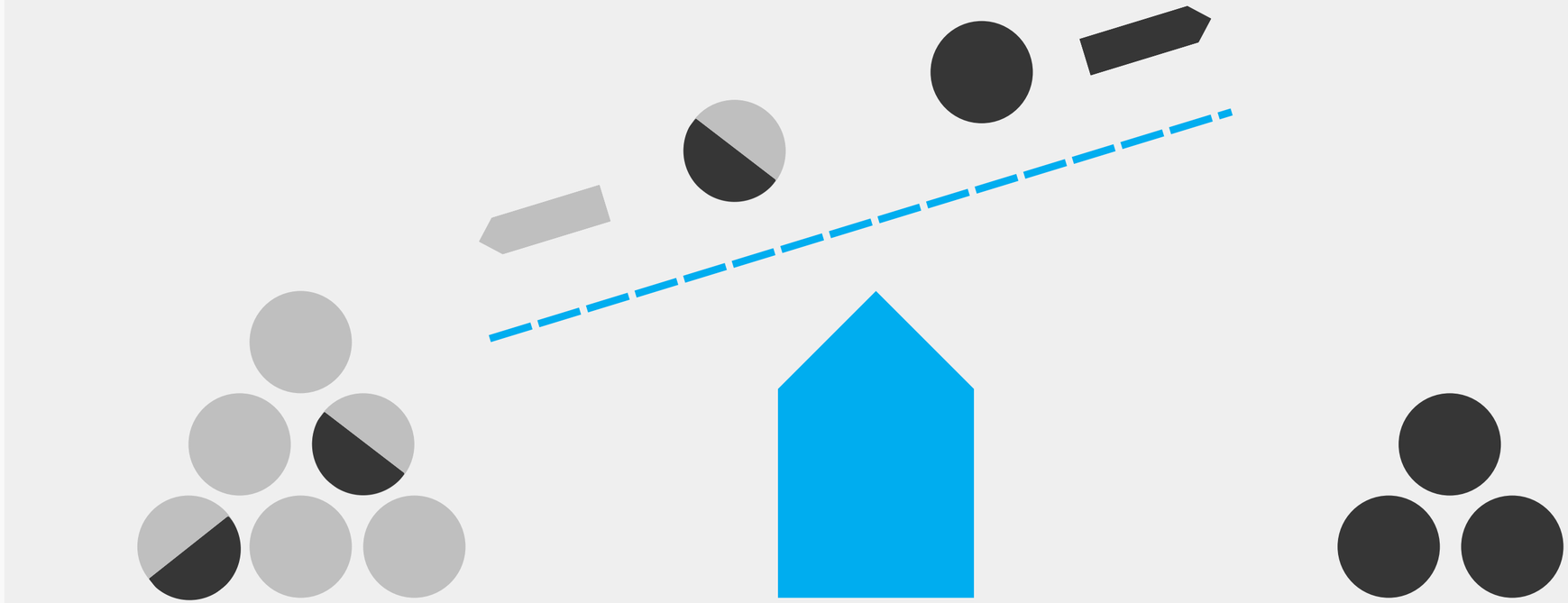
GSort | Working Principle



Light Fraction Outlet

High Airflow

Heavy Fraction Outlet

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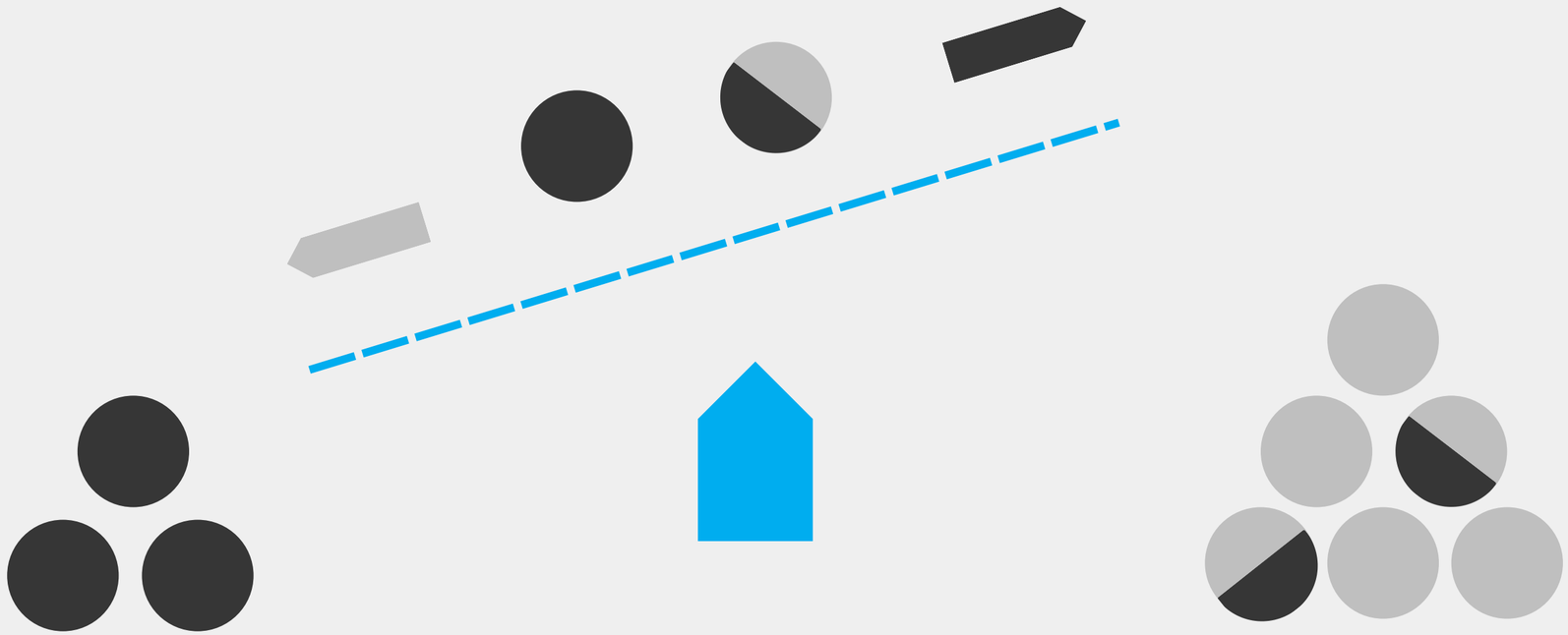
GSort | Working Principle



Light Fraction Outlet

Low Airflow

Heavy Fraction Outlet

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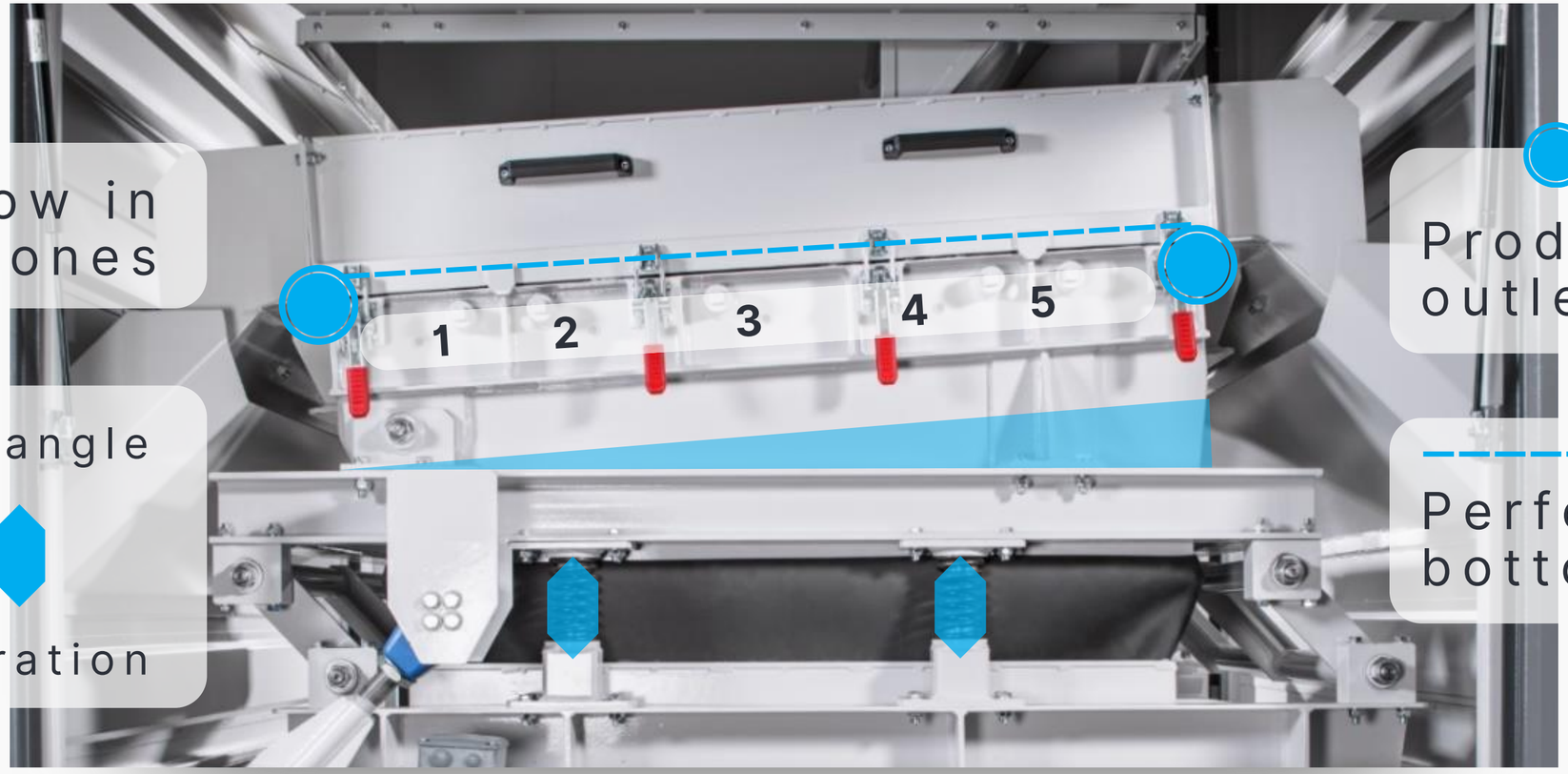
GSort | Working Principle

Airflow in five zones

Inclination angle

Vibration



Product outlet weirs

Perforated bottom plate

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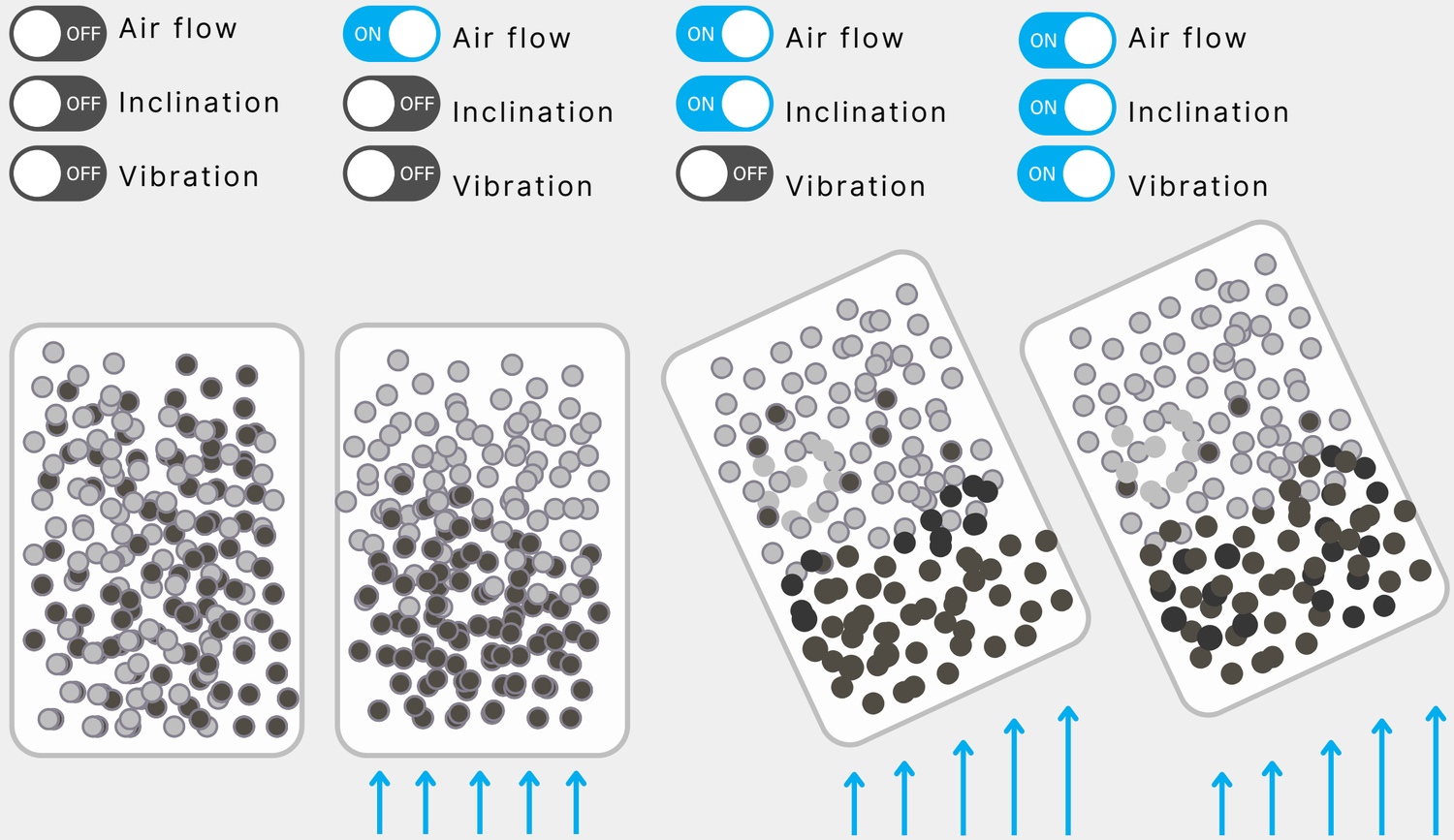
GSort | Working Principle



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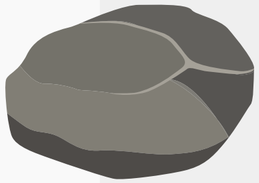
GSort | Working Principle

Particle size is based on absolute density and defines the power needs of the GSort fan. Approx. max. particle size: 80 mm

Light fraction

Heavy fraction

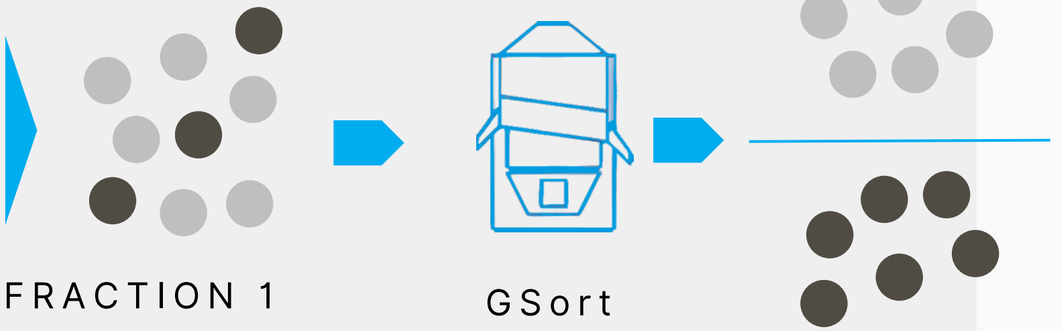
Abolute density difference between heavy and light fraction should be around 20%.

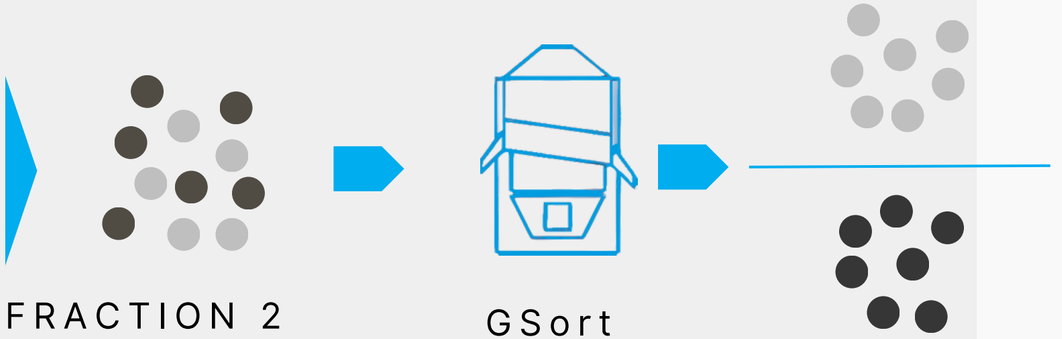


MINERAL

CRUSHER

SIZER





Prior to density separation, the material must be crushed. A two-step crushing process may be needed.

Approx. min. particle size: 0.5 mm

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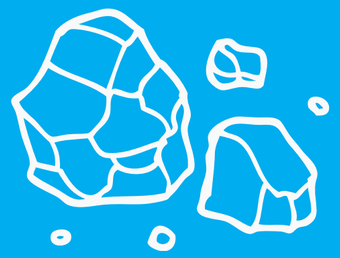

BARITE
GENERAL INFORMATION

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BARITE | Facts

The barite mineral (Barium Sulfate BaSO4) is mainly mined in the United States, China, India, Morocco and Mexico.

Mostly used as an additive for drilling fluids (weighting agent), especially in oil-wells for oil production.

Due to its high density, the barite can achieve a high gravity pressure in the fluid, which stabilizes the borehole.

The density is a crucial criteria in the preparation and sale of barite. That's why it's necessary to reduce impurities and create concentrated barite mineral.

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BARITE | Global Market

© Fireside Minerals Barite Mine | Canada

Estimated world production in 2017: 8.65 million ton (aprox).

Global market demand in 2017: 8.1 million ton (estimated)..

China	3.60 Mt	USA	2.35Mt
India	1.60 Mt	China	1.60 Mt
Morocco	1.00 Mt	Middle East	1.55 Mt
Mexico	0.40 Mt	Europe	0.60 Mt
USA	0.33 Mt	Russia/CIS	0.50 Mt
Iran	0.30 Mt	South America	0.35 Mt
Turkey	0.25 Mt	Africa	0.25 Mt
EU-27	0.22 Mt	India	0.20 Mt
Russia	0.20 Mt	Canada	0.20 Mt
Kazakhstan	0.15 Mt	Iran	0.19 Mt

BARITE | Global Market Trend

© Fireside Minerals Barite Mine | Canada

The trend in the global mining market is to reduce / avoid the use of water in the mineral processing steps.

The prevention of using processing water will reduce the energy consumption and has less environmental impact.

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BARITE PROCESSING

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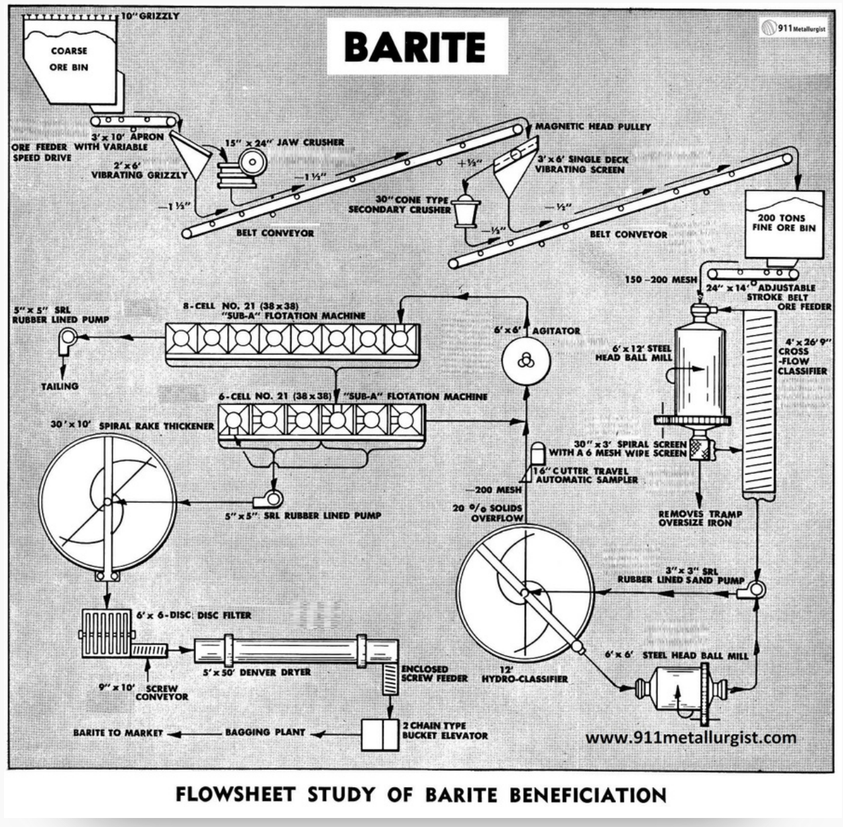
BARITE | Global Market Trend



FLOWSHEET STUDY OF BARITE BENEFICIATION

© Barite Beneficiation Process and Plant Flowsheet
911metallurgist.com

- Complex process of wet barite processing
- Needed Machinery:
  Hydro Classifier, Flotation Machines, Flotation Agent, Dryer and Process Water Treatment
- High volume of water is needed
- Contaminated Wastewater is generated and must be treated
- Wet Barite must be dried after concentration (thermal energy needed)
- YouTube Video of a wet process:
  Barite jig machine, barite jig, jig machine for barite - YouTube

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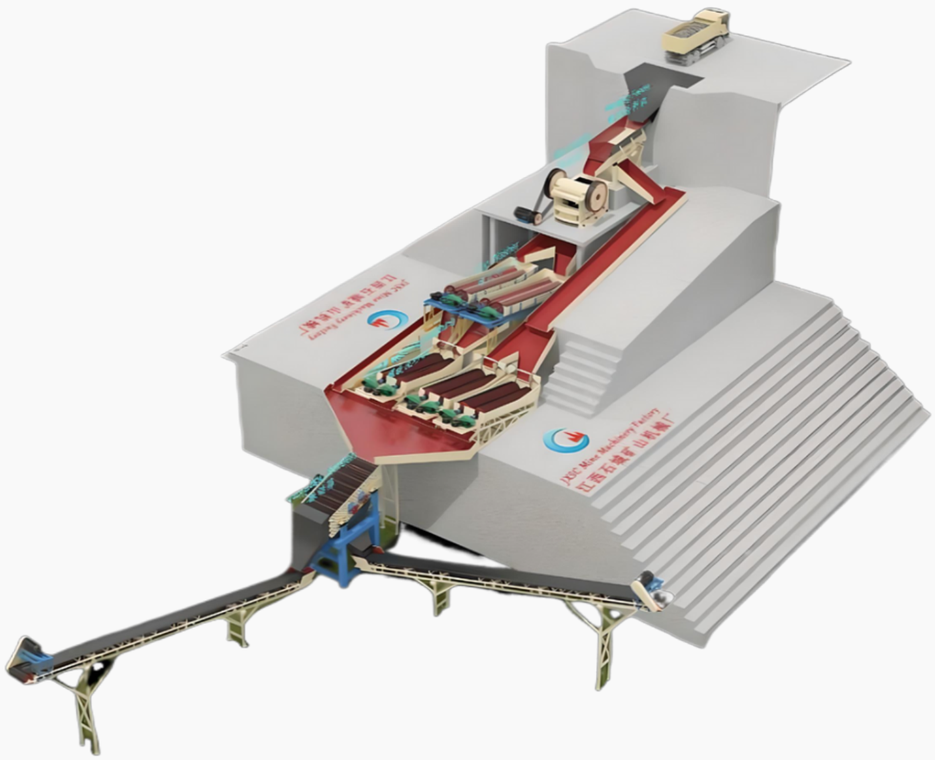
BARITE | Wet Process



Picture does not show the total scope of the required machinery.

© Barite Ore Beneficiation - Mineral Processing (mineraldressing.com)

Estimated investment costs of a wet barite processing plant for a feed capacity of 100 t/h.

Jigs	3	15.000 EUR	45.000 EUR
Flotation cells	2	50.000 EUR	100.000 EUR
Clarifier 6,5m	1	60.000 EUR	60.000 EUR
Auto Floc	1	10.000 EUR	10.000 EUR
Control Floc	1	9.000 EUR	9.000 EUR
Water tank 5m3	1	30.000 EUR	30.000 EUR
Control panel water plant	1	25.000 EUR	25.000 EUR
Screen	1	20.000 EUR	20.000 EUR
Conveyor belt	2	60.000 EUR	120.000 EUR
Pipes and pumps	All	120.000 EUR	120.000 EUR
Dryer for 60 t/h	1	600.000 EUR	600.000 EUR
Control panel for other eq.	1	100.000 EUR	100.000 EUR
Civil works (incl. tailing pond)	All	400.000 EUR	400.000 EUR
TOTAL		**ca.**	**1.639.000 EUR**

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BARITE | Dry Separation

HIGHLIGHTS

- Small footprint allows easy & quick installation.
- Less environmental footprint:
  No water is needed, and no wastewater is generated.
- Creating valuable product out of former disposal material:
  Fraction of 3 – 25mm can be concentrated by dry processing (not possible for tails in wet process).
- Less energy consumption means low operation costs.
- Maximum flexibility in case of changing input materials (different grain size).
- Low investment costs compared to wet process.
- Material tailings with density <3,7 kg/liter can be processed. To remove up to 60% of the contaminants (Silicate) with <3 kg/liter. (not possible in wet process).
- Dry process can deal with fresh mineral product as well as material coming from tailings.

QUALITY REQUIREMENTS IN BARITE CONCENTRATION

Oil-Industry	4,2 kg /liter
Chemical Industry	4,35 kg /liter
GSort can achieve	4,44 kg/liter

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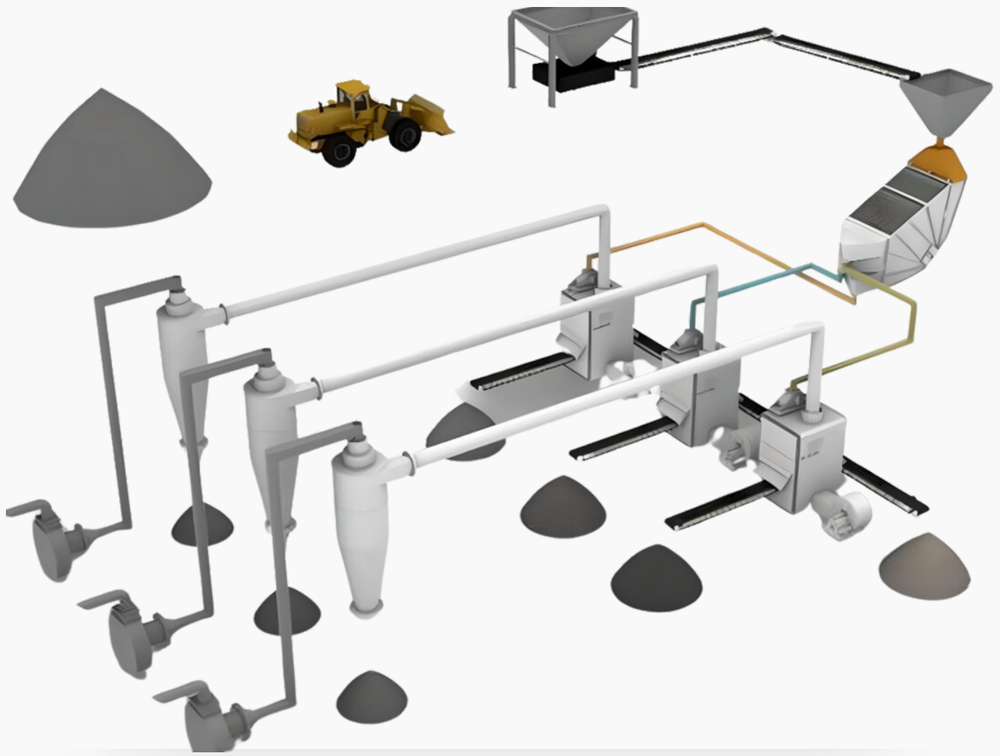
BARITE | Dry Separation



Picture shows estimated scope of needed machinery

Estimated invest costs of a dry barite processing plant for a feed capacity of 100 t/h.

Sizer	1	150.000 EUR	150.000 EUR
MSort	3	250.000 EUR	750.000 EUR
Hopper	1	100.000 EUR	100.000 EUR
Conveyor belts | dif. length	8	Individual	250.000 EUR
Control + control panel	X	Individual	100.000 EUR
Concrete slab | control room	1	150.000 EUR	150.000 EUR
TOTAL		**ca.**	**1.500.000 EUR**

Installed electrical power of total equipment: ca. 290 kW*.

**In operation even less electrical power is needed than the mentioned installed electrical Power.*

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BARITE | Dry Process vs. Wet Process

MOGENSEN SOLUTION DRY PROCESS

- Input Material
- Pre-Screening
- GSort
- Storage | Further Process

Cyclone | Filter

OTHER SOLUTIONS WET PROCESS

- Input Material
- Pre-Screening
- Wet Separation
- Dryer
- Storage | Further Process

Waste Water + Water Treatment

Cyclone | Filter

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BARITE | Dry Process vs. Wet Process

EXEMPLARY COMPARISON OF OPEX

	Dry separation	Wet solution	Difference	Assumed prices*	Price difference
Electrical energy consumption	300 kWh	100 kWh	**200 kWh**	0,5 EUR/kWh	- 100 EUR/h
Process water consumption	0 m^3/h	80 m^3/h	**80 m^3/h**	2 EUR/m^3	160 EUR/h
Fossil fuel consumption	0	500 l/h	**80 m^3/h**	1,5 EUR/l	750 EUR/h
Additional Operating Costs for Wet Process compared to Dry Process				**810 EUR/h**	

*For this examplary caluculation average prices are considered for Spain in 2022.

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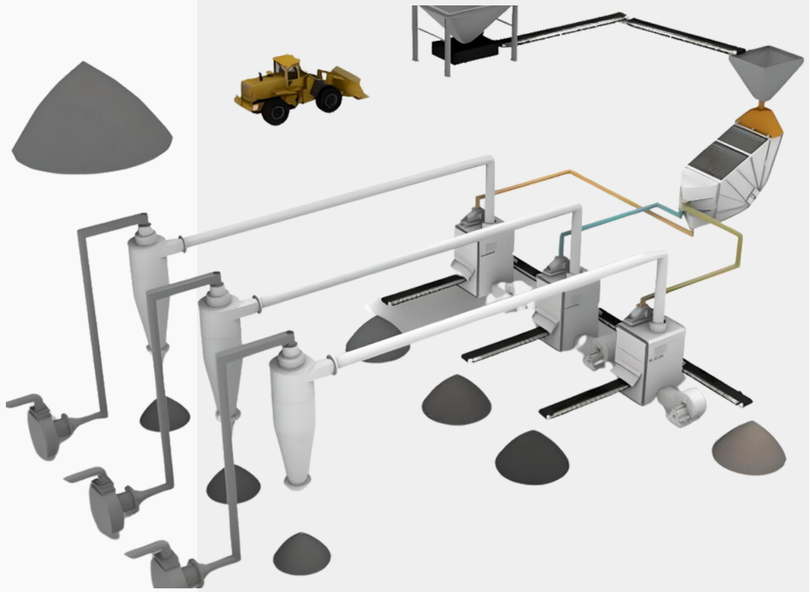
BARITE | Dry Process vs. Wet Process

Parameters	GSort dry separation	Conventional wet separation
Separation quality	Better separation quality especially for tail material	Not the same quality achievable as dry separation, especially for tail material
Investment costs	Less investment costs: Less equipment: no wastewater treatment, no dryer	Higher investment costs: More equipment: wastewater treatment and dryer
Operational costs (OPEX)	Less operational costs : Less electricity, no comprehensive wastewater treatment, no flocculent, no fuel for dryer	High operational costs: Electricity, personal, maintenance, flocculent for wastewater, fuel costs for dryer
Footprint	Very compact plant design due to limited components	Much bigger footprint due to additional equipment: wastewater treatment and dryer
Downtime	Less components and less critical components such as water treatment and drying	More components and more critical components such as water treatment and dryers causing more downtime
Wear | tear & service costs	A reduced number of components reduces wear & tear; requires less service	Higher number of components lead to more wear & spare parts and requires a lot of service

BARITE | Dry Separation



Estimated Investment for dry plant with capacity of 32 t/h:

1.500.000 EUR

Payback calculation for barite fraction 12 – 25 mm. This material can not be processed in typical wet barite separation and is often stored in mines.

Raw Material Input	32	
Portion of valuable product	25	%
Valuable material Input	8	t/h
Price	120	€/t
Daily operation hours	16	h
€/day	15.360	€
Payback time	**98**	**Days**

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REFERENCES
BARITE DRY SEPARATION

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BARITE | Dry Separation Data

Specific Density of Input Material fraction 12,7 – 25,4m m	3,4	t/m³
Specific Density of Input Material fraction 6,35 – 12,7m m	3,32	t/m³
Feed rate	25-32	t/h
Recovery rate	ca. 25	%
Valuable barite	6-8	t/h
Specific gravity of output material	4,1-4,2	t/m³

BARITE | Dry Separation

REFERENCE

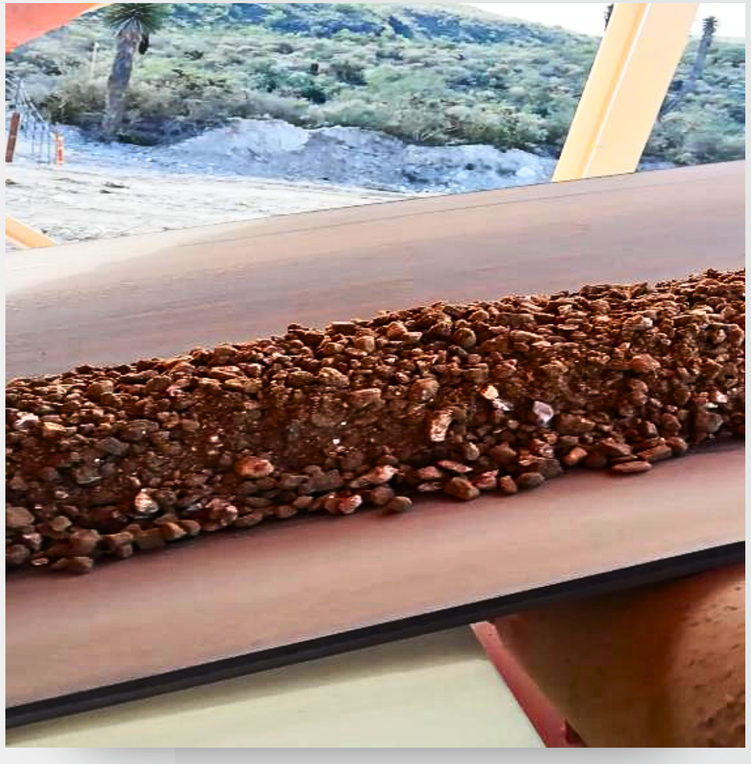
Main Customer Issues

- Conventional wet process with high operational costs - especially water costs in a desert area.
- Unable to process tailings (3 – 25mm) with wet / jig process
- Maximum concentration of 3,5 t/m³ with jigs, but demand for concentration on the market is > 4,1 t/m³

Process Optimization with Sizer and GSort

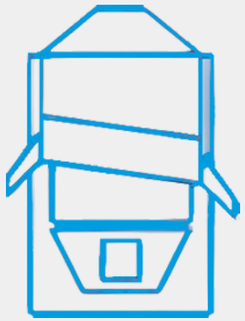
- Successful customer trials and customer decided to buy the first GSort.
- Payback of investment was reached after 100 days.
- With the Mogensen Sizer and the GSort the customer was able to process tail material between 3 – 25mm.
- Customer will use the separation plant for processing material from third party mines as well.

BARITE | Dry Separation



INPUT MATERIAL

OUTPUT MATERIAL



GSort

Light Rejects

Heavy Rejects

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TEST PLANT

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TEST PLANT

- Continuously optimizing products and processes
- Simulating real-world production conditions
- Customizing process parameters with customer materials
- Providing tailored, practical project planning

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WHERE WE ARE

MOGENSEN

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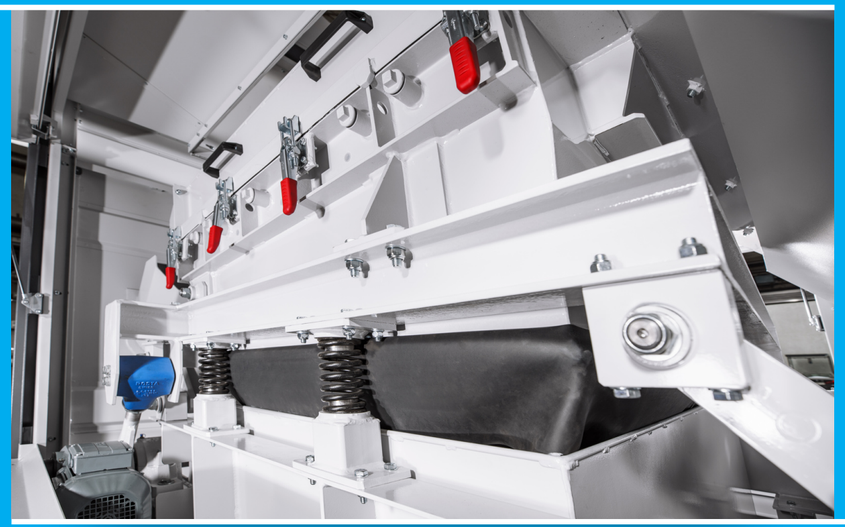

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