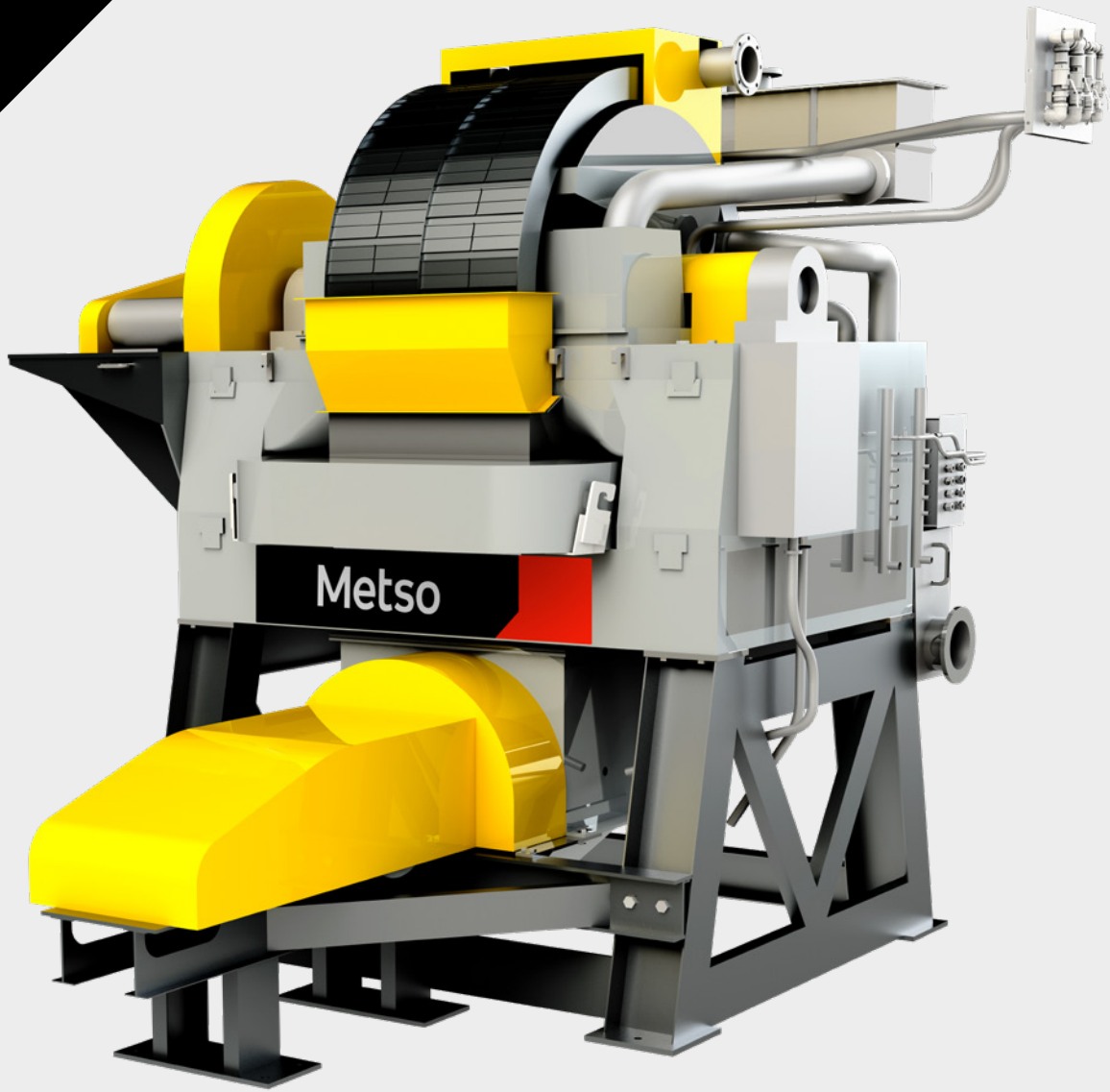
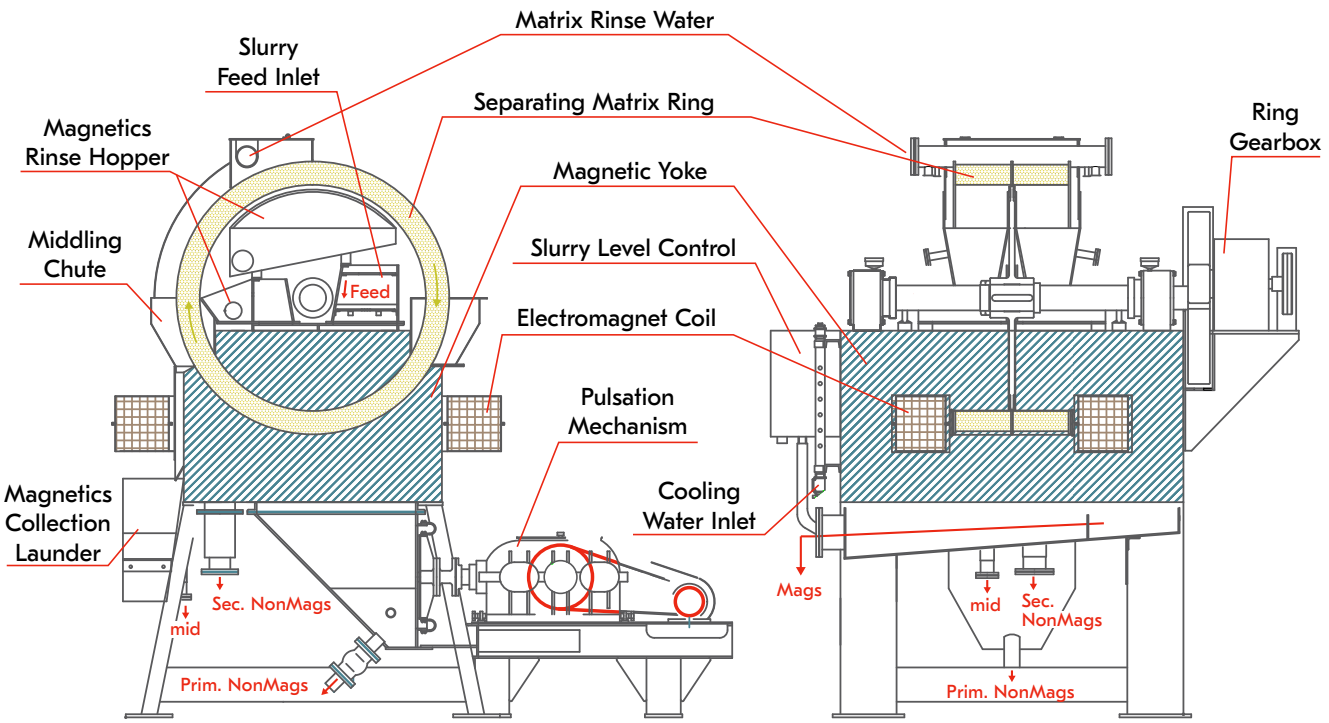
Metso

SLon® vertically pulsating high-gradient magnetic separator





Operating principle

Slurry is introduced to the matrix - housed inside the vertical separating ring - through slots in the upper yoke. The magnetic particles are attracted to the matrix and are then carried outside of the magnetic field where they are subsequently flushed to the magnetic concentrate trough. The non-magnetic, or less magnetic, particles pass through the matrix through slots in the lower yoke to the non-magnetic collection hoppers.

Metso Upgrades

- Power supplies
- PLC controls
- Level control system
- Cooling system
- Rinse water reduction
- Worldwide safety standard compliance

Superior separation

The SLon® vertically pulsating high-gradient magnetic separator (VPHGMS) utilizes the combination of magnetic force, pulsating fluid and gravity to continuously separate magnetic and non magnetic minerals. The SLon possesses the advantages of high beneficiation ratio, high recovery, adaptability to varying particle sizes, and minimized matrix blocking.

Customers find the SLon reliable, and easy to operate and maintain. Thousands of units have been successfully implemented in minerals processing plants worldwide. The modern technology offers many advances over traditional WHIMS type separators including greater efficiency with smaller sized particles, higher grade and recovery, and lower maintenance and operating cost.

Benefits

- High capacity
- Low cost per ton
- High availability
- Superior fine particle separation
- Conventional WHIMS replacement
- Meets worldwide safety standards
- Magnetic or non-magnetic product upgrading

Metso SLon advantages over traditional horizontal carousel type WHIMS	
WHIMS Concerns	**SLon Solutions**
Low particle collection forces and capacities	High gradient rod matrix Increased collection points with rod type matrix
Matrix plugging	Rod matrix with pulsating slurry bath Minimal flux leakage at concentrate flush Reverse matrix flushing
Particle misplacement	Pulsating action
Fine particle recovery	Reduced particle velocities with slurry bath

Magnetic strength
Metso SLon units are offered in 0.6, 1.0, 1.3, 1.5 and 1.8 max Tesla versions with magnetic set points infinitely adjustable within the operating range. Magnetic intensity is based on the averaged value over the entire separating area rather than a single point max value achieved. Capturing intensity is even higher on the surface of the matrix. Example: The 1 Tesla version is modeled to reach 1.8 Tesla at the surface of a 2mm matrix. This helps explain why the SLon is outperforming other WHIMS claiming >1 Tesla fields.

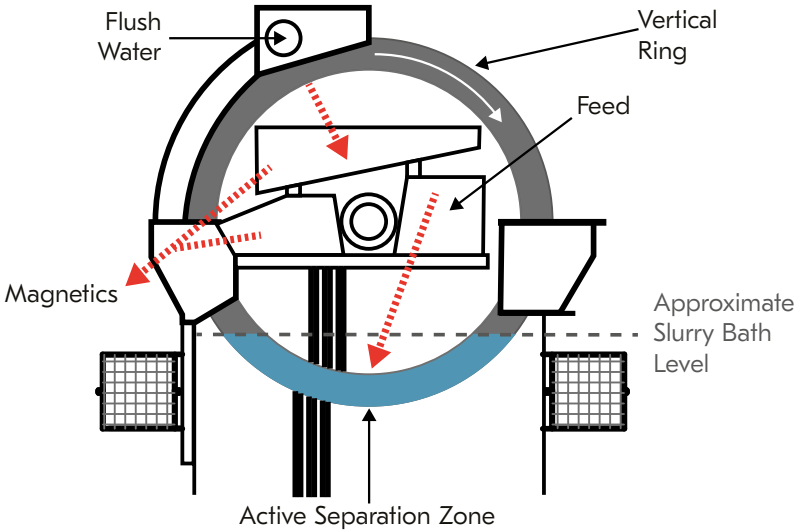
Applications:

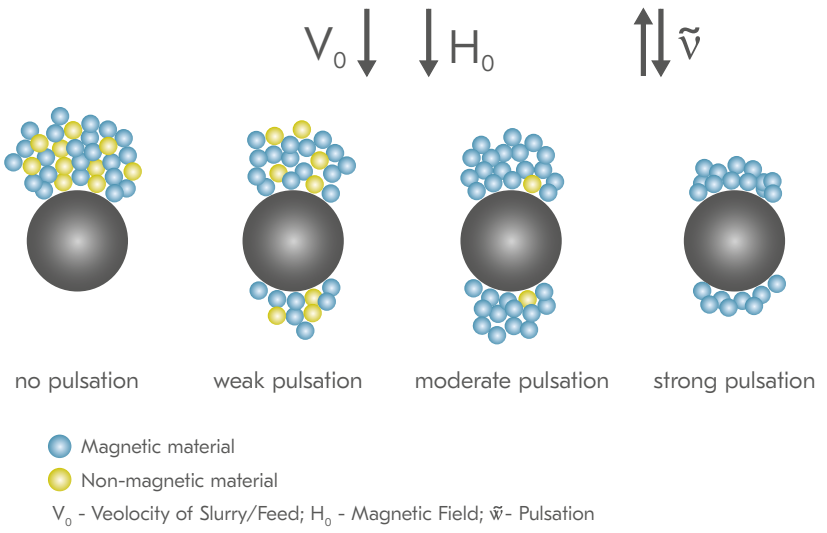
- Concentration of iron ore, ilmenite, chromite ore and other paramagnetic materials
- Purification of non-metallic minerals (feldspar, silica sands, etc.)
- Fine particle applications (<20µm)
- Replacement of conventional WHIMS
- Rare-earth ores
- Lithium/battery materials

Vertical ring configuration
The ring is arranged in a vertical orientation as opposed to a traditional Jones-type WHIMS which uses a horizontal carousel. The vertical nature of the carousel allows for reverse flushing, i.e. magnetics flushing in the opposite direction of the feed, enabling strongly magnetic and or coarse particles to be removed without having to pass through the full depth of the matrix volume. In addition, the magnetics flushing is accomplished in a location (near the top of rotation) with low stray magnetic field to reduce any residual grip on the magnetic particles. These combined benefits lend to high availability due to minimized matrix plugging.

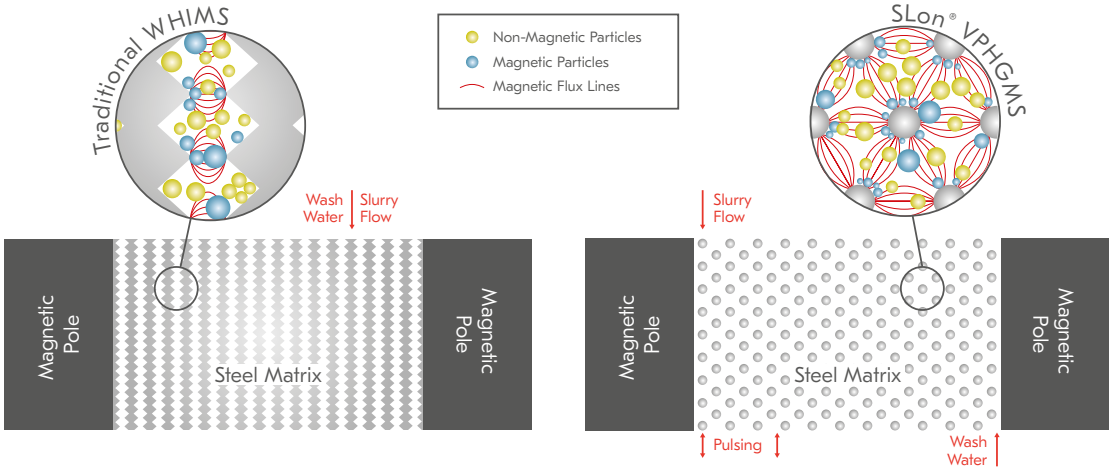
Pulsation and slurry bath
An actuated diaphragm provides pulsation in the separation zone to assist the separation performance by agitating the slurry and keeping particles in a loose state, minimizing entrapment. This mechanism also maximizes the particle accumulation (trapping) on all sides of the rod matrix creating more usable surface area for magnetics collection. A further benefit is to reduce particle momentum, which aids in particle capture by the applied magnetic force. This leads to improved find particle collection and separation.

Rod matrix
The SLon utilizes a filamentary matrix constructed of steel rods to accommodate various size ranges of feeds. The rods are oriented perpendicular to the applied magnetic field to enable optimum magnetic force to be achieved while minimizing the risk for entrapment of particles, when compared to grooved plates, randomly positioned filaments (wool) or expanded metal sheets.





Matrix material selection	
Rod (mm)	Largest particle (mm)
1	0.6
1.5	0.8
2	1.2
3	1.5
4	2.0
6	3.0



Model specifications	100	500	750	750II	1000	1250	1500	1750	2000	2250	2500	3000	3500	4000	4500	5000
	(lab unit)	(pilot scale)	(pilot scale)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)	(industrial)
Ring dia. (mm)	n/a	500	750	750	1000	1250	1500	1750	2000	2250	2500	3000	3500	4000	4500	5000
Capacity, dry feed (nominal) (tph)**	batch	0.03 - 0.13	0.06 - 0.25	2 - 4	4 - 6	6 - 16	15 - 27	25 - 45	45 - 70	60-100-	70 - 125	125 - 225	200-350	225 - 450	400-600	500-800
Slurry throughput (nominal) (m^3/h)	n/a	0.25 - 0.50	0.5 -1.0	5 - 10	10 - 20	20 - 50	50 - 100	75 - 150	100 - 200	160-300	200 - 400	350 - 650	500-1000	550 - 1050	800-1500	1200-2300
Feed concentration (typ.) (%)	n/a	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40	10 - 40	10-40	10 - 40	10 - 40	10-40	10 - 40	10-40	10-40
Available field strength (T)	1.2 & 1.7	1.0, 1.5 & 1.7	1.0	1.0	1.0, 1.3, 1.5 & 1.8	1.0, 1.3, 1.5 & 1.8	1.0, 1.3, 1.5 & 1.8	1.0, 1.3, 1.5 & 1.8	0.6, 1.0, 1.3, 1.5 & 1.8	1.0, 1.3 & 1.5	0.6, 1.0, 1.3, 1.5 & 1.8	1.0, 1.3, 1.5 & 1.8	1.0, 1.3	1.0, 1.3	1.0	1.0
Rectifier installed power* (typ.) (kVA)	31	31	31	31	30	55	69	70	75	102	94	133	180	158	250	281
Motor power req'd (typ.) (kW)	0.75	0.74	1.3	2.25	3.3	3.7	7	8	13	14	22	37	60	74	82	110
Flush water volume (m^3/h)	batch	0.75 - 1.5	1.5 - 2.5	5 - 8	10 - 20	30 - 45	60 - 90	80 - 120	100 - 150	120-150	200 - 300	350 - 530	400-500	600 - 1200	650-1200	700-1200
Cooling water volume (m^3/h)	4	4	5	4	5	6	8	11	12	14	15	20	22	24	25	26
Total machine weight (kg)*	1100	1500	3000	4000	6000	14000	20000	35000	50000	55000	105000	175000	195000	398000	420000	
Separator dimensions (LxWxH)(mm)*	1600 800 1600	1800 1400 1320	2000 1360 1680	2250 1700 1680	2700 2000 2400	3200 2340 2700	3600 2900 3200	3900 3300 3800	4200 3550 4200	4500 3700 4612	5800 5000 5400	6600 5300 6400	7300 5400 7300	8000 6000 7400	8931 7488 8815	9900 8000 10100

*1.0 & 1.2 Tesla version

** Feed capacity for iron ore processing. White minerals and other non-magnetics products feed is typically 50% of stated capacity

Metso supplier advantages

Power Supplies: Metso switch-mode and SCR water-cooled power supplies meet worldwide electrical standards with both IP65 and Nema 4X cabinet designs.

PLC Controls: Integrated PLC for ease of local control and integration to plant PLC system.

Level control system: Automated system to maintain slurry bath level by use of pneumatic valves and level sensor. Maintains optimum slurry level without frequent operator attendance.

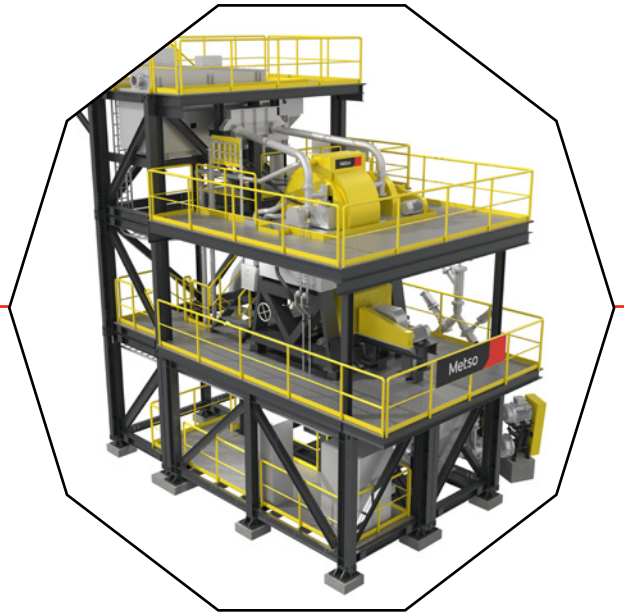
Cooling system: Closed loop cooling system to cool both SLon unit and power supply are offered with various external heat removal features (heat exchanger, air cooled, cooling tower). The closed loop system eliminates potential blockages within cooling system.

Global safety standards: Units designed to customer specified local standards in all market areas.

Services: Global presence means local support including: Spare parts, modernizations, and technical, operation and maintenance services. Testing services, feasibility and pilot studies, and flowsheet development services are also provided in select market areas.

SLon® Plant Unit models and capacities

Container Plant Unit



Description	SLon® sizes	Unit capacity
Prefabricated container modules	1250, 1500, 1750, 2000	**Iron Ore** 4 to 150 TPH **White Minerals** 2 to 100 TPH

Building Plant Unit

Description	SLon® sizes	Unit capacity
Prefabricated building modules	2500, 3000, 3500, 4000	**Iron Ore** 70 to 2000+ TPH **White Minerals** 50 to 1500 TPH

Metso is a frontrunner in providing sustainable technologies, end-to-end solutions and services for the aggregates, minerals processing and metals refining industries globally. By helping our customers increase their productivity, improve their energy and water efficiency and environmental performance with our process and product expertise, we are the **partner for positive change.**

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