

SALA-HGMF®

# High gradient magnetic filter

A photograph of a large industrial high gradient magnetic filter system. It features two large, vertical, blue cylindrical tanks mounted on a metal frame. The tanks are connected to a network of pipes and valves. To the right, there is a large, grey electrical control cabinet with a door that is slightly ajar, revealing internal components. A red "DANGER" warning label is visible on the front of the cabinet. The background shows a concrete wall and a ceiling with a circular fan. The floor is covered with a metal grate.

Proven  
highest  
efficiency

# High gradient magnetic filter systems

The SALA-HGMF® High Gradient Magnetic Filter provides proven highest efficiency in removing iron and copper corrosion particles, from condensates as well as cleaning oils, glycols, etc. from sub micron iron particles. The filter maintains this efficiency even during heavy contamination and with varying flowrates.

Stable levels of iron and copper concentrations is maintained in large water circuits like 10,000 m³/h.

## The filter can:

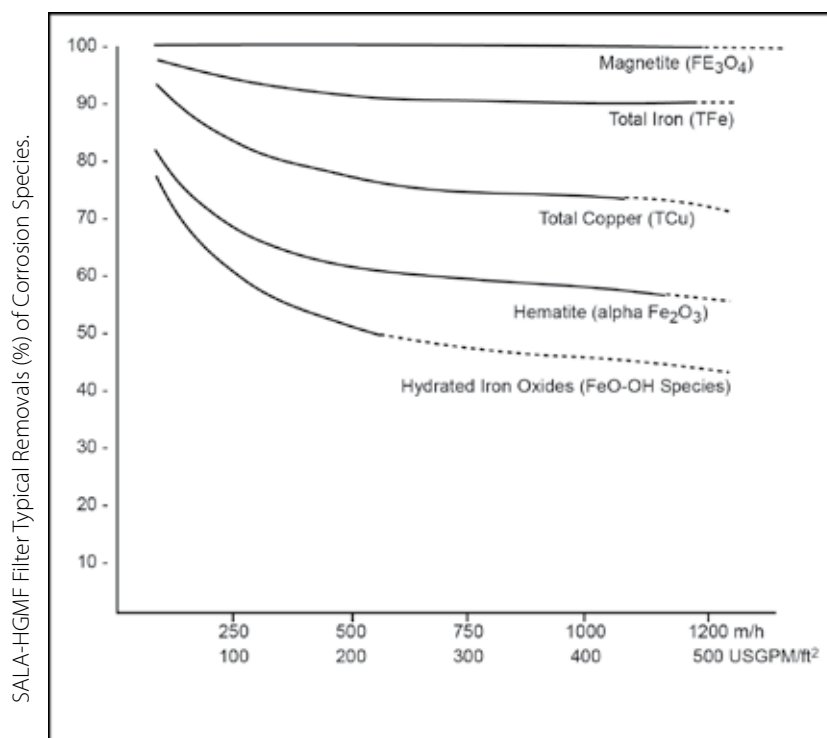
- Increase thermal efficiency by reusing more hot condensates of feed water quality for high pressure boilers.
- Remove high levels of iron and copper from condensates during startups and upset conditions.
- Treat condensates hotter than those accepted by resin polisher systems.
- Decrease losses in condensate and heat values during production upsets.
- Reduce iron and copper buildup rates in boilers.
- Increase time spans between boiler cleanings significantly.
- Save cost by requiring less fuel in the boilers.
- Allow more hot condensates to be used during mill restarts - even during first hours.
- Reduce dependence on alternate boiler feed water sources.
- Increase boiler availability and reliability.
- Reduce boiler cleaning and waste disposal costs.

The filter can be used alone or in conjunction with other polishing steps. When used alone, for high pressure power and recovery boilers, the filter achieves acceptable feed water qualities. Using the filter with other polishing steps downstream will increase the duty cycles of those steps significantly.

The unique design of the SALA-HGMF® filter allows it to function effectively under various conditions. The filter maintains its high efficiency in widely ranging flowrates. It can

polish more heavily contaminated and hotter condensates than can be polished efficiently - if at all - by using other techniques.

During mill and boiler startups, the SALA-HGMF® also performs with the same high efficiency. The filter returns more heat and water values to the boilers to operate the mill than other polishing techniques can achieve and less is lost to the sewer. As a result of its efficiency, the filter also allows less dependence on alternate feed water sources.



Basic performance of SALA-HGMF®





SALA-HGMF® for control of magnetite concentration in a district heat flow of 10.000 m<sup>3</sup>/h.

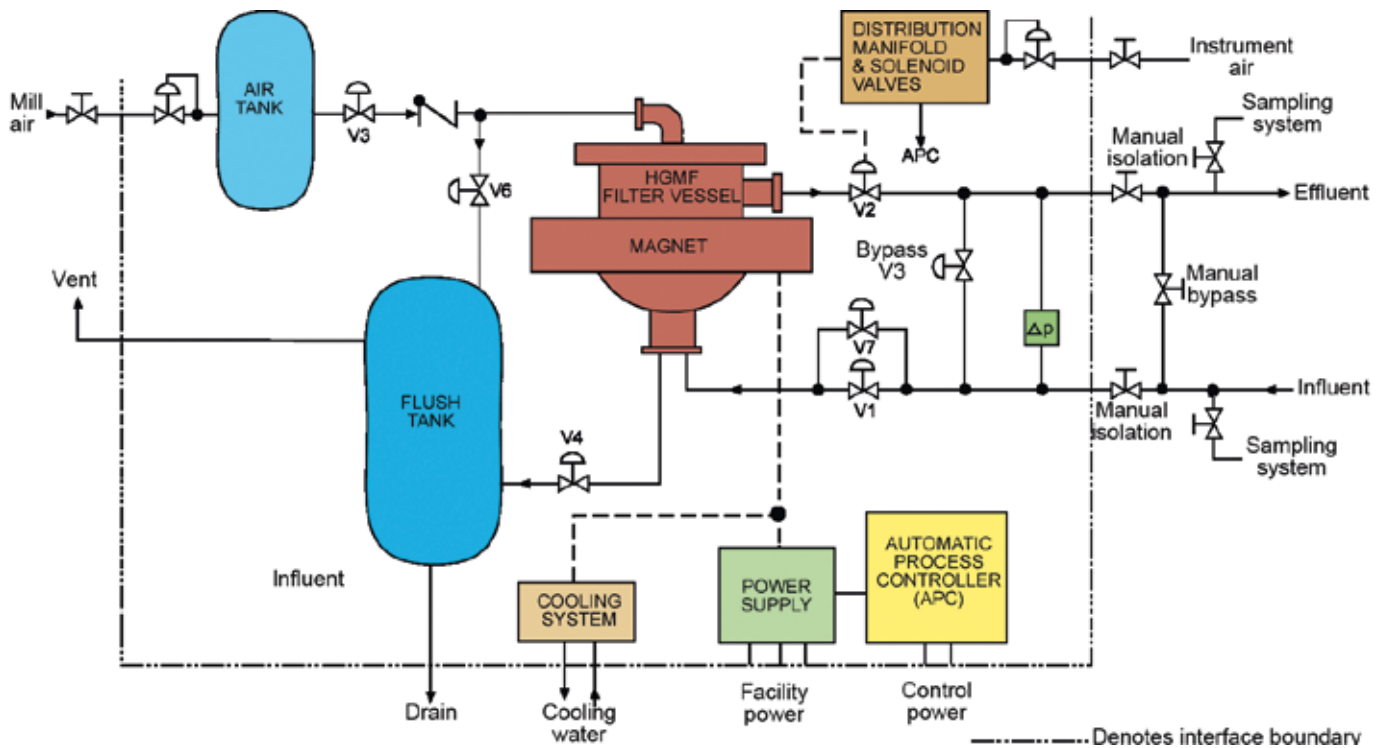
## Using the SALA-HGMF filter

### The filter will:

- Increase thermal efficiency by reusing more hot condensates of feed water quality for high pressure boilers.
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*Operating pressure is 16 bar (230 psi) but filters up to 100 bar has been made.*





## Operation

The SALA-HGMF® operates by magnetizing a filamentary matrix filter bed contained within a pressure vessel. When the condensate flows through the filter bed, the particulate iron and copper oxides are captured and held magnetically in the filter bed until the filter is back-flushed.

The filament diameter of the SALA-HGMF® matrix must be small to create the high magnetic field gradients necessary to capture weakly magnetic corrosion particles, like hematite and hydrated iron oxides, in addition to the strongly magnetic particles.

The SALA-HGMF® filter bed matrix has a void volume of approximately 90 percent. Therefore, when operating, the filter has a low differential pressure drop - delta P - and a large holding capacity for trapped solids.

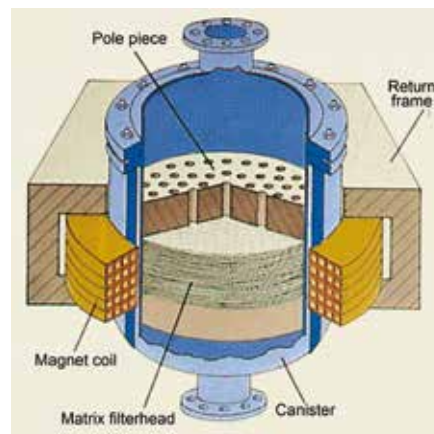
When the matrix is loaded, the SALA-HGMF® is flushed. The flush cycle is triggered automatically by a specified increase in delta P across the filter, or by a specified elapsed time, whichever occurs first. The flush cycle takes about 90 seconds. The only flush water used is that volume of water inside the filter vessel when flushed. The duty cycle is typically over 99.7 percent of total cycle time.

### System

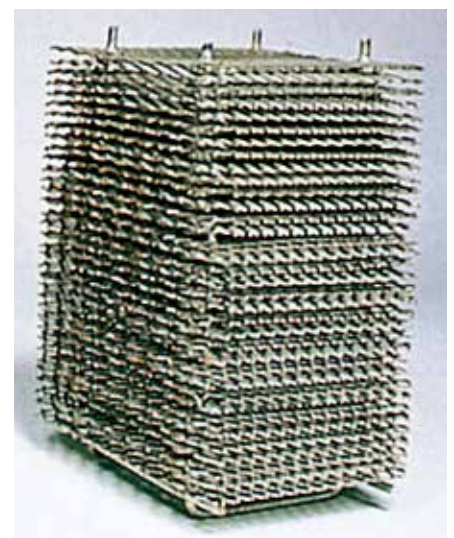
The SALA-HGMF® magnetic filter system consists of:

- The filter assembly
- DC power supply
- Associated valves
- Piping
- Tanks
- Instrumentation
- Automatic process controller

The filter system is shipped fully assembled on a support frame, shop-tested and ready for installation.



Cyclic high gradient magnetic separators



Matrix material



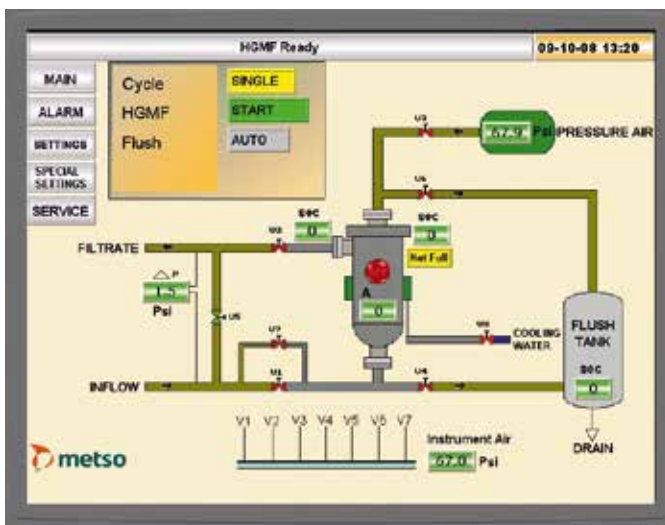






# Smart automatic control system

The magnetic filter is controlled by a system consisting of a PLC connected to PC screen, built in a well sealed and insulated cabinet. All control logics are implemented in the PLC. On the PC monitor the filter operator can follow and control the filter operation and information such as settings, statistics and alarms.



Control cabinet



# Applications

## Viscous media like oils, glycols etc.:

### Filter benefits:

- Unmatched filtration rates
- Remove iron particles from viscous media.
- Drainage of media before filter cleaning minimizes media losses.
- Filter cleaning with high pressure.
- Matrix cleaning sequence with hot water or preferable dissolvent can be added into the operating cycle if necessary.
- No moving parts except for valves

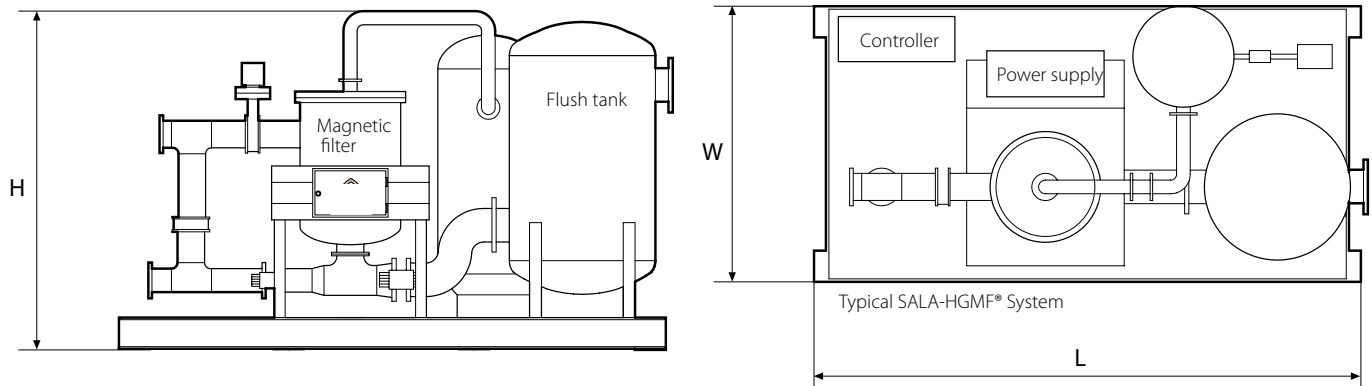
## Industrial references;

- Pulp and paper mills
- Power generation plants
- Nuclear power plants
- Steel mills
- Powder metallurgy plants
- Breweries
- District heat water plants
- Solar cell production
- Galvanizing rolling plants

## Performance rates:

The SALA-HGMF® can polish mill condensates at typical flow velocities of 700 to 1200 m/h (300 - 500 USGPM/ft<sup>2</sup>). And, with increased pressure differential – delta P – across the filter system, even higher flowrates can be treated at similar high performance levels.

The SALA-HGMF® accepts any flowrate to over 120 percent of the design flow. It is not limited to a narrow flowrate range for efficient operation. The filter operates at all condensate temperatures encountered in mill operations, and its efficiency increases with rising condensate temperature.



Model	H mm (ft)	L mm (ft)	W mm (ft)	Power(magnet) kW	Matrix area m <sup>2</sup> (ft <sup>2</sup> )	Coling water m <sup>3</sup> /h (gpm)
38-15-3*	1 905 (6)	3 048 (10)	1 321 (4)	9	0.07 (0.8)	0,4 (2)
45-15-3	2 032 (7)	3 556 (12)	1 524 (5)	12	0.11 (1.2)	0,7 (3)
56-15-3	2 210 (7)	4 064 (13)	1 829 (6)	12	0.19 (2.0)	0,7 (3)
76-15-3	2 464 (8)	4 115 (14)	1 829 (6)	24	0.43 (4.6)	1,4 (6)
107-15-3	3 073 (10)	5 588 (18)	1 981 (7)	24	0.85 (9.15)	1,4 (6)
152-15-3	**	**	**	28	1.75 (18.84)	1,6 (7)
214-15-3	**	**	**	37	3.42 (36.81)	2,0 (9)

\*38-15-3= 38 (Outer diameter in cm) -15 (matrix height in cm) -3 (field rating in kGauss). Magnetic field available 3,5, 10, 15 and 20 kGauss

\*\* Site specific

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