

Greensand FMH™ for Fe²⁺, Mn²⁺ and H₂S Removal

Three Times More Effective than Conventional Media
For Manganese Greensand and Greensand Plus™ Replacement

Product Information

GREENSAND FMH™ is a granular filter media used for the removal of iron, manganese and hydrogen sulfide from water supplies and was developed as an alternative to Manganese Greensand and Greensand Plus™. GREENSAND FMH™ is a dolomite-based filter media which is coated with manganese dioxide. The excellent removal capacities of the material have been proven in many plants. The GREENSAND FMH™ removal capacity is many times greater than the capacity of Manganese Greensand and Greensand Plus due to the oxidative coating.

Field of Application

GREENSAND FMH™ can be used for potable water as well as for process water treatment. In existing plants GREENSAND FMH™ can replace Manganese Greensand or Greensand Plus. According to DIN 19605 GREENSAND FMH™ is qualified for open and closed fixed bed filters. GREENSAND FMH™ is an inert material which has the NSF approval and does not release any substances into the water.

At the beginning of operation the pH-value may rise slightly. This is required to initialize the removal of manganese. After a few days the pH-value decreases to the initial value. Determining factors for the removal efficiency are pH-value, water hardness and the amount of organic matter in the water. A minimum pH-value of 6.2 is required while it should not exceed 8.8 because non-filterable iron colloids may occur. The water hardness should not be less than 90 ppm CaCO₃. The content of organic matter plays a decisive role for removal efficiency. Organic matter forms chemically soluble complexes with ferric and ferrous compounds. Therefore the water should have drinking water quality concerning the amount of organic matter.

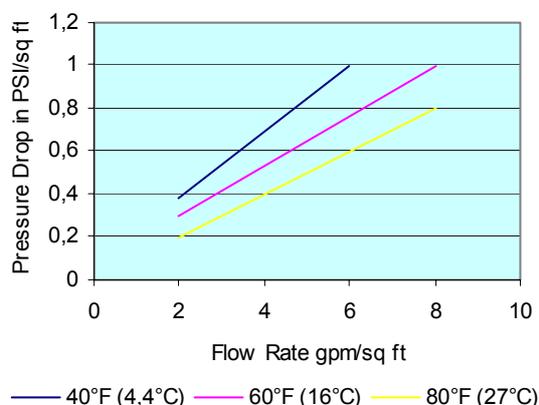
Regeneration

There are two different treatment processes associated with the use of GREENSAND FMH™; the intermittent regeneration (IR) and the continuous regeneration (CR).

During the intermittent process iron, manganese and hydrogen sulfide are removed by catalytic oxidation directly on the GREENSAND FMH™ grains. The oxidized precipitates are then trapped in the filter bed with subsequent removal during backwashing. When the oxidation capacity of the filter bed is exhausted, the filter media can be regenerated with a weak solution of potassium permanganate. The regeneration should take place before total exhaustion and is initiated by backwashing.

The continuous operation is most suitable for water where high iron and manganese concentration are present. The oxidation is achieved through a continuous feed of a solution of potassium permanganate (KMnO₄), chlorine or a combination of both to the GREENSAND FMH™ filter. The oxidized precipitates are then trapped in the filter bed with subsequent removal during backwashing. No additional regeneration is required using this method.

Pressure Drop vs. Flow Rate



Capacities

Fe²⁺ Mn²⁺ H₂S

	Manganese Greensand/ Greensand Plus	GREENSAND FMH™
Capacity on total KMnO ₄ demand*	approx. 38,000 mg/ft ³	approx. 115,000 mg/ft ³
Capacity for Fe ²⁺ alone	approx. 38,000 mg/ft ³	approx. 115,000 mg/ft ³
Capacity for Mn ²⁺ alone	approx. 19,000 mg/ft ³	approx. 47,500 mg/ft ³
Capacity for H ₂ S alone	approx. 7,500 mg/ft ³	approx. 23,000 mg/ft ³

Removal capacities are based on the total combined concentration of iron, manganese, and hydrogen sulphide if present (see example given below). The KMnO₄ demand can be approximated by the following formula:

$$\text{KMnO}_4 \text{ demand} = [1 \times \text{mg/l Fe}] + [2 \times \text{mg/l Mn}] + [5 \times \text{mg/l H}_2\text{S}]$$

Example of determining number of gallons of raw water which can be treated between two regenerations:

Raw Water:	
4.0 mg/L Fe ²⁺ x 1.0 = 4.0 mg/L KMnO ₄ equiv.	
1.0 mg/L Mn ²⁺ x 2.0 = 2.0 mg/L KMnO ₄ equiv.	
0.2 mg/L H ₂ S x 5.0 = 1.0 mg/L KMnO ₄ equiv.	
	7.0 mg KMnO ₄ demand/ L raw water or 26.5 mg KMnO ₄ demand/ gal (US) raw water
Capacity:	
	$\frac{115,000 \text{ mg KMnO}_4 / \text{ft}^3 \text{ GREENSAND FMH}^\text{TM}}{26.5 \text{ mg KMnO}_4 \text{ demand / gal (US) raw water}} = 4,339.6 \frac{\text{gal (US) raw water}}{\text{ft}^3 \text{ GREENSAND FMH}^\text{TM}}$

For Comparison: With one cubic foot of Manganese Greensand or Greensand Plus™ you can treat only approx. 1,434 gallons of the same water between two regenerations. The amount of water you can treat with one cubic foot of GREENSAND FMH™ is more than twice the amount you could treat with the same amount of Manganese Greensand or Greensand Plus™. Also the cost of regeneration is only half due to the excellent capacities of GREENSAND FMH™.

Technical Data

Filtration Rate

Depending on the water quality we consider a filtration rate of 5 to 8 gpm/sq ft for open filters as well as for closed filters. In individual cases filtration rates up to 10 gpm/sq ft are possible. We give advice concerning filtration rate.

Back Wash Rate 12 – 14 gpm/sq ft

Back Wash Time 10 – 15 minutes

Regeneration

Intermittent Regeneration 2 – 4 g KMnO₄ per litre Greensand™ FMH

Continuous Regeneration

per 1 ppm Fe ²⁺	1 ppm KMnO ₄ /Cl
per 1 ppm Mn ²⁺	2 ppm KMnO ₄ /Cl
per 1 ppm H ₂ S	5 ppm KMnO ₄ /Cl

Fe²⁺ Mn²⁺ H₂S REMOVAL

Grain Size: 20 x 40 mesh

Bulk Density: 100 lb/ft³

Packaging: 0.88 ft³ bag

Bags/Pallet: 25 bags