



Performance Media for Water Filtration

GreensandPlus™ is a black, granular filter medium used in pressure-type filtration systems. GreensandPlus will remove iron, manganese, hydrogen sulfide, arsenic and radium to required levels.

Removal Capacities

Based on total oxidant demand*	10,000 mg/L Cl ₂ /cu. ft. (28.3 L)
Iron (Fe +2) <u>alone</u>	10,000 mg/L Fe/cu. ft. (28.3 L)
Manganese (Mn +2) <u>alone</u>	5,000 mg/L Mn/cu. ft. (28.3 L)
*Hydrogen Sulfide (H ₂ S) <u>alone</u>	2,000 mg/L H ₂ S/cu. ft. (28.3 L)
**Arsenic	10,000 mg/L As/cu. ft. (28.3 L)
***Radium	5,000 mg/L Ra/cu. ft. (28.3 L)

Note: Removal capacities are based on the total combined concentration of iron, manganese, and hydrogen sulfide if present. (See example)

Hydrogen Sulfide Removal *

GreensandPlus directly oxidizes sulfide and catalyzes the oxidation reaction. Increased run length and service life of GreensandPlus may be realized by pre-feeding a solution of chlorine-containing compounds.

Regeneration with chlorine should be initiated before the complete exhaustion and sulfide is detected in the treated water to prevent damage to the media.

Arsenic Removal **

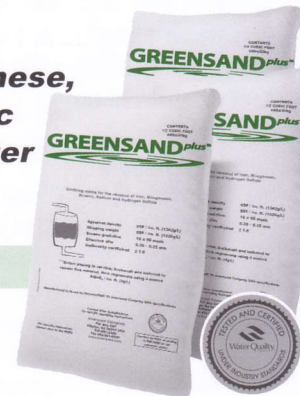
GreensandPlus can be used to remove arsenic from ground water in the presence of iron. Chlorine must be pre-injected to oxidize the iron and convert arsenite to arsenate and keep the media regenerated.

Arsenic combines with oxidized iron and is filtered out in the media. If there is not a sufficient amount of iron present in the raw water, then an iron salt such as ferric chloride can be pre-injected.

A general guideline is 1 mg/L of iron to remove 20 µg/L of arsenic. This can vary greatly depending on pH, silica, and other competing ions in the water.

Point-Of-Use/Point-Of-Entry

Removal of Iron, Manganese, Hydrogen Sulfide, Arsenic and Radium from Well Water



Example for determining oxidant demand:

$$\begin{array}{llll} \text{Raw Water:} & 3.0 \text{ mg/L Fe} & \times 1.0 & = 3.0 \text{ mg/L Cl}_2 \text{ equiv.} \\ & 0.3 \text{ mg/L Mn} & \times 2.0 & = 0.6 \text{ mg/L Cl}_2 \text{ equiv.} \\ & 0.2 \text{ mg/L H}_2\text{S} & \times 5.0 & = 1.0 \text{ mg/L Cl}_2 \text{ equiv.} \\ & & & 4.6 \text{ mg/L oxidant demand} \end{array}$$

Example for determining capacity in gallons between regenerations:

Capacity:

$$\frac{10,000 \text{ mg/L Cl}_2}{\text{ft}^3} \times \frac{1}{4.6 \text{ mg/L}} = 2,175 \text{ gal./regeneration/cu. ft.}$$

Radium Removal ***

GreensandPlus can be used to remove radium from ground water in the presence of manganese, in a similar manner to arsenic removal. In the case of radium, manganese in the raw water is necessary.

If there is not a sufficient amount of manganese present, then manganese sources, such as manganous sulfate can be pre-injected.

Initial Conditioning of GreensandPlus

GreensandPlus media must be backwashed prior to adding additional media types. The GreensandPlus backwash rate must be a minimum of 12 gpm/sq. ft. @ 55°F (30 m/h @ 13°C).

This initial backwash could last for up to 60 minutes to thoroughly remove the fine dust. After backwashing is complete the GreensandPlus must be conditioned. Mix 0.5 gal (1.9 L) of 6% household bleach or 0.2 gal (0.75 L) of 12% sodium hypochlorite for every 1 cu. ft. (28.3 L cu. m) of GreensandPlus into 10 gallons (38 L) of water.

Drain the filter enough to add the diluted chlorine mix. Apply the diluted chlorine to the filter being sure to allow the solution to contact the GreensandPlus media. Let soak for 4 hours, then rinse to waste until the "free" chlorine residual is less than 0.2 mg/L. The GreensandPlus is now ready for service.

Intermittent Regeneration Process

Soluble iron and manganese are removed by contact oxidation directly on the GreensandPlus grains. Hydrogen sulfide utilizes the oxidizing capacity of GreensandPlus with the resultant precipitates removed by filtration.

At the end of a service cycle, determined by the number of gallons treated, the unit is backwashed and then regenerated down flow (in a manner similar to regenerating a softener with salt brine) with a chlorine solution. This will restore the oxidative capacity of GreensandPlus.

It is recommended that regeneration be initiated prior to complete exhaustion of the GreensandPlus. This is important to extend the service life.

Recommended Operating Guidelines Intermittently Regeneration (IR)

Raw Water pH:	6.2-8.8 Raw water with low pH must not be pre-corrected above 7.0 pH
Minimum Bed Depth:	30" (0.762 m) single media or 15" – 18" (0.38 – 0.45 m) each for dual media beds
Service Flow Rate:	5-12 gpm/sq. ft. (12-29 m/h)
Pressure Drop:	10-18 psi (70-125 Pa)
Backwash Rate:	12 gpm/sq. ft. @ 55°F (30 m/h @ 13°C)
Backwash Duration:	10 minutes (or until water is clear)
Regenerant Dosage 6.5% Bleach:	0.5 gal./cu. ft. diluted in approx. 6.5 gal. of water over 30-40 minutes
Regenerant Dosage 12% Bleach:	0.2 gal./cu. ft. diluted in approx. 6.5 gal. of water injected over 30-40 minutes

Continuous Regeneration Process

In some installations, better performance may be achieved by oxidizing soluble iron, manganese, hydrogen sulfide and arsenic prior to GreensandPlus filter. This is accomplished by the continual pre-feed of a solution of chlorine, with a "free" chlorine residual of 0.3 – 0.5 mg/L in the filter effluent.

The oxidized precipitates are then filtered out in the GreensandPlus bed with subsequent removal during backwashing. The GreensandPlus allows the chemical reactions to go rapidly to completion and reduces iron and manganese to the required levels.

Recommended Operating Guidelines Continuous Regeneration (CR)

Raw Water pH:	6.2-8.8 Raw water with low pH must not be pre-corrected above 7.0 pH
Minimum Bed Depth:	20"-24" (0.5-0.6 m) GreensandPlus and 15" (0.38 m) of Anthracite
Service Flow Rate:	5-12 gpm/sq. ft. (12-29 m/h) of media surface area
Pressure Drop:	10-18 psi (70 – 125 K Pa)
Backwash Rate:	12 gpm/sq. ft. at 55°F (30 m/hr at 13°C)
Backwash Duration:	10 minutes (or until water is clear)

Physical Characteristics

Black nodular granules of manganese dioxide
- coated natural silica sand

Apparent Density:
Shipping Weight:
Screen Grading:
Effective Size:
Uniformity Coefficient:
Specific Gravity:
Packaging:

88 lbs. / cu. ft. net (1410 kg/m³ net)
89 lb. / cu. ft. gross (1426 kg/m³ net)
18 x 60 mesh
0.30-0.35 mm
Less than 1.60
Approx. 2.4
Shipping 1/2 cu. ft. 44 lbs. (20 kgs) bags

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