

Pro-OX Manganese Dioxide™

High Purity Natural Manganese Granules for Removal of Iron, Manganese, Hydrogen Sulfide and Arsenic

Pro-OX Iron Filter Media

Pro-OX is a black, granular, naturally mined filter media composed of high purity manganese dioxide. Unlike coated filter media such as Birm® or manganese greensand, Pro-OX is a solid manganese dioxide offering higher flow rates and faster reaction times. Pro-OX media uses an oxidation-reduction filtration process similar to greensand, but at a far higher level of performance, and lasts many years longer due to its solid form and higher purity.

Pro-OX works by adsorbing the oxidized species of iron, manganese or sulfides on the external as well as the porous internal structures of the media. This is a catalytic process which processes water at a faster flow rate than traditional media. The untreated water is first injected with an oxidizer such as air, chlorine or ozone.

Because of the highly oxidative porous state of the Pro-OX media, aeration alone is usually sufficient to provide the oxidation required. Chlorine is also commonly used as a pre-oxidant which allows the filter media to work at a faster rate and last longer, in a process known as "continuous regeneration".

The media can also be regenerated at the end of its service cycle by rinsing with chlorine in a process known as "batch regeneration" or "intermittent regeneration".

For the removal of hydrogen sulfide, Pro-OX directly oxidizes sulfide and catalyzes the oxidation reaction. Sufficient aeration or chlorine injection prior to the filter media should be used to insure long filter life.

For arsenic removal, chlorine changes arsenite (AsIII) to arsenate (AsV), and iron in the water is converted to ferric hydroxide, which allows the arsenate to form ferric arsenate, which is then removed by the Pro-OX media. For arsenic removal, sufficient iron must be present in the water for arsenic to be removed. A general guideline is 1 mg/L of iron must be present to remove 20 ug/L of arsenic, but this can vary greatly depending on pH and other competing ions in the water.

A strong backwash at the proper flow rate is required to keep the Pro-OX media clean. A rate of 12 to 15 GPM per square foot is recommended @ 60°F, in order to be able to lift and expand the filter media, and wash out the trapped iron and manganese oxides. Since Pro-OX is a solid granule with very high particle strength, frequent backwashing does not harm the media and dramatically extends the life of the media.

Application Data

Active ingredient: > 85% Manganese Dioxide

Mesh size: 20 x 40

Weight: 114 lbs per cubic foot

Packaged in 1/2 cubic foot bags (55 lbs per bag)

Service Flow Rate: 5 to 10 GPM per Square Foot

pH : 6 - 9

Bed depth: 30 " to 48"

Backwash flow rate: 12 to 15 GPM / sq. ft.

Backwash expansion: 15% to 30%

Oxidant types recommended: air, chlorine, potassium permanganate, ozone. Hydrogen peroxide is not recommended.

Oxidant contact time prior to filter: 10 to 30 seconds

Removes up to 28 PPM Iron, 15 PPM manganese, 30 PPM hydrogen sulfide (higher removal rates possible at lower flow rates and increase oxidant levels).

Life expectancy: 15 to 20 years



Certified to
NSF/ANSI 61



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REV 11142014

Pro-OX Specifications

PHYSICAL PROPERTIES

Physical state: Granular

Color: Black

Odor: None

Molecular weight: 86.94

Heaped bulk density (kg/dm³): 1.8

Density at 20°C 5.026 g/cm³

Melting point: ~ 535°C, decomposition

GUARANTEED SPECIFICATION :

Mn : 52 % min

MnO₂ calculated from Mn : 81,0 % min

SiO₂ : 3,5 % max

Al₂O₃ : 6,0 % max

Fe : 3,5 % max

H₂O : 4 % max

PSD :

> 3 mm : 5 % max

< 1 mm : 5 % max

Alternatively

> 1,5 mm : 5 % max

< 0,8 mm : 5 % max

Alternatively

> 1,0 mm : 5 % max

< 0,3 mm : 5 % max

TYPICAL VALUE :

Fe : 2,4 to 2,7 %

P : 0,10 to 0,14 %

Al₂O₃ : 3,0 to 5,0 %

SiO₂ : 2,0 to 3,5 %

Pb : 0,005 to 0,008 %

PACKING :

1,1 MT big bag on pallet.

50 kg paper bags on 1,1 MT pallet.

25 kg paper bags on 1,1 MT pallet



Iron & Manganese Removal Capacity

Removal rates and amounts are based on the total levels of iron, manganese and hydrogen sulfide, in relation to the oxidant demand. Pro-OX works best with a chlorine feed, although aeration and peroxide can be used as well.

The oxidant demand equals to the total amount of chlorine required to oxidize soluble iron, manganese, and hydrogen sulfide in the untreated water.

Actual conditions will vary based on pH and temperature, but the oxidant demand can be estimated by the following formula:

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

Iron Manganese and Hydrogen Sulfide:

Based on total oxidant demand 10,000 mg/L Chlorine/cu. ft. (28.3 L)

For iron (Fe⁺²) alone 10,000 mg/L Fe/cu. ft. (28.3 L)

For manganese (Mn⁺²) alone 5,000 mg/L Mn/cu. ft. (28.3 L)

For hydrogen sulfide (H₂S) alone 2,000 mg/L H₂S/cu. ft. (28.3 L)

How to Determine Amount of Water That Can Be Filtered per Regeneration:

Example:

Raw Water Contains: 4.0 mg/L Fe x 1.0 = 4.0 mg/L equivalent Chlorine

0.2 mg/L Mn x 2.0 = 0.4 mg/L Chlorine

1.2 mg/L H₂S x 5.0 = 6.0 mg/L Chlorine

Oxidant Demand Total: 10.4 mg/L

$$\frac{\text{Capacity: 10,000 mg/L Chlorine}}{\text{Cubic Foot}} \times \frac{1}{10.4 \text{ mg/L}} = 961 \text{ Gallons/Cubic Foot/Regeneration}$$

Soluble iron and manganese are removed by contact oxidation as the water contacts the Pro-OX granules.

The Pro-OX media can be regenerated intermittently or continually by feeding in oxidant (chlorine) ahead of the Pro-OX media filter.

COMBINED WEIGHT/ ASSAY/SIZE CERTIFICATE.

CUSTOMER :	CLEAN WATER SYSTEMS & STORES INC.	Via Embassy Freight Week 36
PRODUCT:	Manganese dioxide 80% 0,3-1mm	
Your Ref :	24825	
Our Ref :	DT/12/04/63/089	

Lot N°	BAGS	Lot N°		Lot N°		Lot N°	
93252	2400kg						
Chem. Assay	%	Chem. Assay	%	Chem. Assay	%	Chem. Assay	%
MnO ² from Mn	86.33						
Fe	2.22						
H ₂ O	2.67						
SiO ₂	2.09						
Al ₂ O ₃	2.64						
P	0.129						

Sieve cut, RCU %	Sieve cut, RCU %	Sieve cut, RCU %	Sieve cut, RCU %
>1600	>1600	>1600	>1600
>1000	>1000	>1000	>1000
>500	>500	>500	>500
>400	>400	>400	>400
>355	>355	>355	>355
>315	>300	>300	>300
>250	>250	>250	>250
>200	>200	>200	>200
>180	>180	>180	>180
>150	>150	>150	>150
>125	>125	>125	>125
>90	>106	>106	>106
>75	>75	>75	>75
>63	>63	>63	>63
>45	>45	>45	>45
<45	<45	<45	<45

Packing					
Type	Number	NW per unit	Tara per unit	Markings	
		kg	kg	CLEAN WATER SYST.	
Big Bags			3	MnO ₂ 80% 0.3-1mm	
500 Kg drums				DT/12/04/63/089	
250 kg drums				PO 24825	
150 kg drums				Lot 93252	
Bags 25kg	96				
Pallets	2	FUMIGATED	17	1/up	
Total	NW	2400	kg	Total	GW
					2440
					kg