WATCH® WATER
The pioneer in water treatment chemicals and systems

FILTERSORB® FMH

ADVANCED CATALYTIC FILTRATION MEDIA

Fe^{2+}(ferrous) **Fe**$^{3+}$(ferric) **FeO** (ferrous oxide) **Fe**$_2$**O**$_3$ (ferric oxide)
Mn^{2+}(divalent) **Mn**$^{4+}$(tetravalent)
H$_2$**S**(hydrogen sulfide) **S** (elemental sulfur)
As^{3+}(arsenite) **As**$^{5+}$(arsenate)

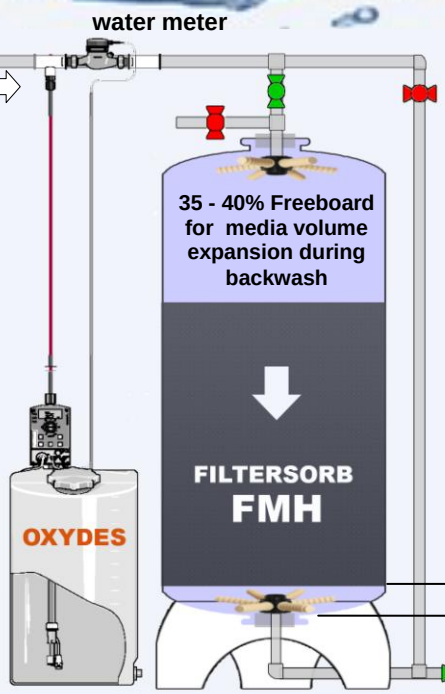
MADE BY WATCH®

Fe^{2+}, Mn^{2+}, H$_2$S, As, NH$_4$ and Radio nuclides

System Operating Conditions:

pH		6.2 - 8.5
Freeboard		35 - 40%
Service flow		24 m/h
Backwash flow		30 m/h
Backwash time	min	10 minutes
Temperature	max	30 °C
Pressure	min	2 bar
	max	6 bar
FMH Packaging	25 lit bag (39 kg)	
	25 bags/palette	

EcoDos: Proportionate dosing unit for OXYDES®
(Optional)
100 liters made from a 5 kg bag of **INSTANT OXYDES®** powder



The Best Alternative to any conventional manganese dioxide coated filter media in the industry for effective removal of iron, manganese, hydrogen sulfide, arsenic, ammonium, radium, uranium and other radio nuclides from water.

FILTERSORB® FMH System in Continuous Regeneration (CR) mode

General

FILTERSORB® FMH is a brand new catalytic filter media that's produced from 82% of Magnesium Oxide and **15% Manganese Dioxide**. The granulated form makes it ideal for applications demanding uniformity and less pressure drop. **FILTERSORB® FMH** is very effective at higher differential pressures than any media in the industry. Less pressure drops can provide longer runtime and that means less backwashes and less wastewater that sums up in great savings.

REVOLUTION:

Watch® has developed an **INSTANT OXYDES®** to kill microorganisms, bacteria and viruses which cause serious illness and deaths. Stabilized **OXYDES®** should be fed at least 5 - 20 seconds upstream of FMH Filter. H_2O_2 generated from mixing **INSTANT OXYDES®** in water will destroy all bacteria and viruses and degrade in seconds on FMH catalyst and the filtered water will have **ZERO Disinfection byproducts (DBP)**.

Introduction
Two in one process

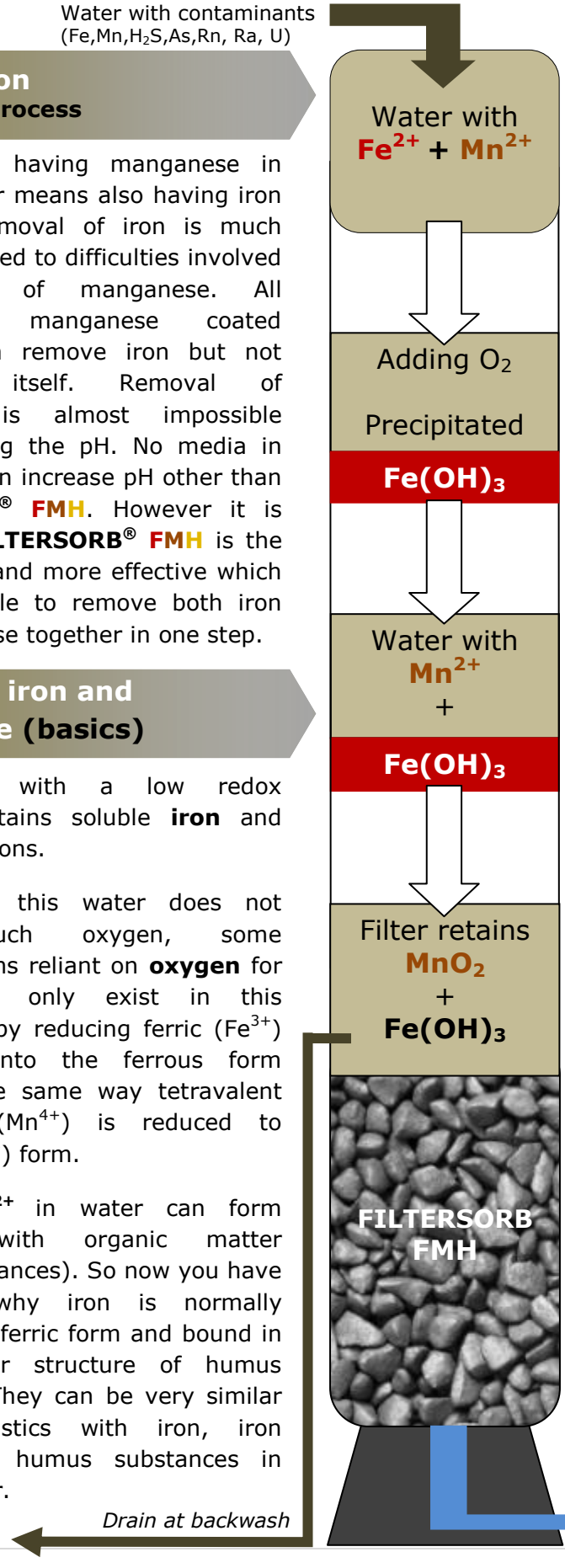
It is known having manganese in drinking water means also having iron in water. Removal of iron is much easier compared to difficulties involved in removal of manganese. All conventional manganese coated materials can remove iron but not manganese itself. Removal of manganese is almost impossible without raising the pH. No media in the market can increase pH other than **FILTERSORB® FMH**. However it is clear that **FILTERSORB® FMH** is the only process and more effective which makes possible to remove both iron and manganese together in one step.

Sources of iron and manganese (basics)

Groundwater with a low redox potential contains soluble **iron** and **manganese** ions.

Oxygen: As this water does not contain much oxygen, some microorganisms reliant on **oxygen** for survival can only exist in this environment by reducing ferric (Fe^{3+}) compounds into the ferrous form (Fe^{2+}). In the same way tetravalent manganese (Mn^{4+}) is reduced to divalent (Mn^{2+}) form.

Fe^{2+} + Mn^{2+} in water can form complexes with organic matter (Humus substances). So now you have understood why iron is normally present in its ferric form and bound in the molecular structure of humus compounds. They can be very similar in characteristics with iron, iron bacteria and humus substances in drinking water.



Purest filtration process ever

A combined process for simultaneous removal of iron and manganese is summarized as follows.

- *Addition of oxygen*
  - *No Chlorine*
  - *No $KMnO_4$*
  - *No Disinfection byproducts*

The addition of Oxygen into the water rapidly kills bacteria and viruses, reducing COD and BOD.

This process also eliminates the hydrogen sulfide completely.

The presence of humus substances, tannin and lignin may also affect the efficiency of filter medias. Chlorine can be used to treat iron and iron bacteria but chlorine added to water containing humus substances will contribute to the formation of trihalomethanes (THM). THMs occur when chlorine reacts with organic matter in the water and for this reason it's very important to make water analysis before using Chlorine.

IMPORTANT: THMs are absorbed through skin during shower or bathing. The easiest way to reduce or eliminate THMs in water that's used either for drinking or bathing is to dose stabilizes **OXYDES®** before iron, manganese, hydrogen sulfide or any metal removal system.

Hydrogen Sulfide (H_2S)

Hydrogen sulfide is a big problem in the drinking water due to its offensive odor (rotten eggs), toxicity and potential corrosion factor. Even at very low concentration as low as 4 ppb (µg/l) the odor can be detected. Hydrogen sulfide is a strong toxic agent which can cause unconsciousness and even death. Sulfates in the water is transformed into hydrogen sulfide by bacteria.

H_2S Removal: As in the case of manganese and iron they become particulate material in its oxidized form, from soluble non-reduced form. Oxidized iron reacts spontaneously with both MnO_2 and O_2 to form FeOOH (constituent of **FERROLOX®** media). By reaction of Fe^{2+} with H_2S a precipitate of particulate iron sulfide (FeS) is formed which turns the sediment black. Hence if the backwash water is black, hydrogen sulfide removal system is working perfectly.

The reaction is as follow:
$2Fe^{2+} + MnO_2 + 2H_2O \rightarrow 2FeOOH + Mn^{2+} + 2H^+$

And when Mn^{2+} is formed, it encounters further oxidation with the oxygen and oxidized to MnO_2, once again as follow:

$2Mn^{2+} + O_2 + 2H_2O \rightarrow 2MnO_2 + 4H^+$

pH Correction
$pH = -\log_{10}[H_3O^+]$

Driving all the carbon dioxide (CO_2) in water without using chemicals? How about using **FILTERSORB® FMH**. The pH scale is a logarithmic scale. In other words a pH of 6.0 is 10 times more acidic than a pH of 7.0 and a pH of 5.0 is 100 times more acidic than a pH of 7.0. As a water expert you should know and be aware that it is not a difference of ONE when you go from 6.0 to 7.0. **FILTERSORB® FMH** adsorbs CO_2 and no chemicals are needed. Any Manganese coated products available in the market can't increase the pH and HOW should they do it with sand when sand cannot hold the coating of MnO_2?

continues on the right column...

continues from the left column...

If any oxygen or oxidizer is dosed it destroys the coating but **FILTERSORB® FMH** is made in a unique process, where MgO + MnO_2 are mixed together and formed into uniform granules. This is a brand new technology and is available since January 2013. The only media in the market with **15% MnO_2 and not coated**.

Adsorption of Arsenic, Phosphate and other contaminants:

The adsorption capacity for Mn^{2+} + Fe^{2+} is changed only because of the pH of water being > 7.8 - 8. As we have changed the chemistry of water the Mn^{2+} + Fe^{2+} are now settled on the filter bed in their oxidized form as MnO_2 and FeOOH, which has high adsorption capacity for Arsenic, Phosphates, Chromium, Copper, Radium and other radio-nuclides. Capacity of Adsorption on freshly prepared ferric hydroxide is same as of Granular Ferric Hydroxide. The iron is changed from Fe^{2+}+ OH (high pH) to FeOOH and works perfect and successfully in the pH range of 7 to 9. Ferric Hydroxide can remove huge amount of arsenic from ground water. It depends on iron concentration of inlet water.

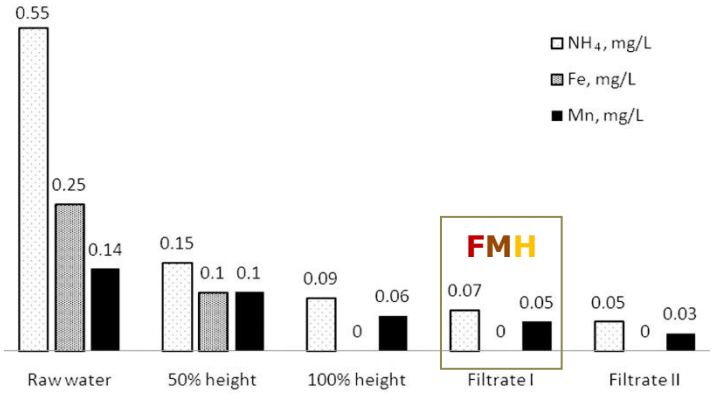
Several arsenic and iron and manganese removal plants with **FILTERSORB® FMH** are successfully operated in Russia, Germany, UK, USA and Canada and other countries in EU. **FILTERSORB® FMH** filters are fixed bed and operate in downward water flow. This technology is not only advanced and economical but also the most effective as far as the efficiency is concerned in removing all these contaminants:

IRON, MANGANESE, HYDROGEN SULPHIDE, ARSENIC, PHOSPHATES, AMMONIUM, RADIUM, URANIUM and other RADIO NUCLIDES,

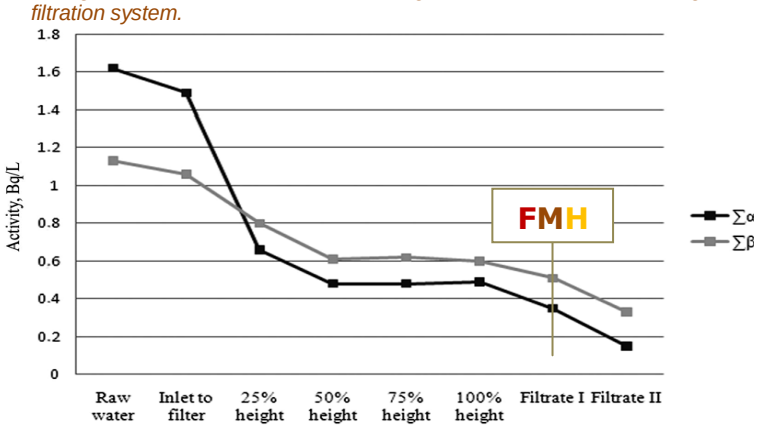
from ground water. It can be used for Residential, Industrial, Commercial and Municipal applications.

NOTE: Arsenic removal requires iron to be present in water. Research shows fresh oxidized iron content in inlet water shows higher adsorption capacity compared to iron based removal media.

Case Study (click here to see the research article)

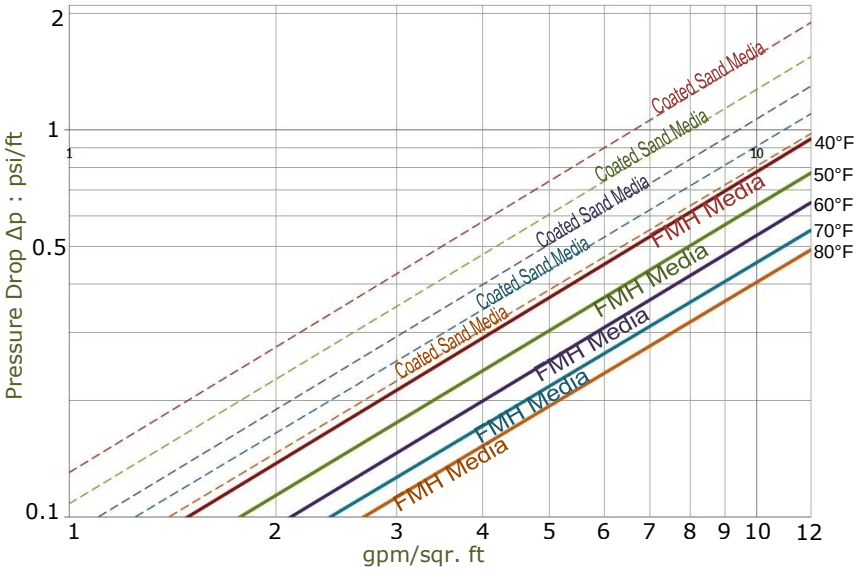


Changes in ammonia, total iron, and manganese content in the two-stage filtration system.



Changes in the radioactivity of water treated with FMH

Pressure Drop



The higher uniformity and smooth grains assures a lesser pressure drop during the operation that is about 50% lesser than any other sand based media. The logarithmic graph shows the pressure difference between MnO_2 coated sand media (dashed lines) with **FILTERSORB® FMH** (thick lines with corresponding colors) in different water temperature.

(Please visit our website for more information)

Technical Data

Composition of FILTERSORB® FMH:

Compounds	Typical value	Specifications
MgO	82%	>80%
MnO_2	15%	>14.5%
CaO	3%	<4%

Physical Properties:

Appearance		Black uniform beads
Odor		none
Mesh size	US	14 x 20
	SI	0.8 - 1.4 mm
Uniformity Coefficient		≤ 1.5
Bulk weight	US	97.4 lb/ft^3
	SI	1.56 ton/m^3
Moister Content		<0.5% as shipped
Removal Capacity	for Fe^{2+} alone	3000 mg/l 85000 mg/ft^3 (aprx)
	for Mn^{2+} alone	1500 mg/l 42500 mg/ft^3 (aprx)
	for H_2S alone	500 mg/l 14000 mg/ft^3 (aprx)

Recommended System Operating Conditions:

Inlet water pH		6.2 - 8.5
Freeboard		35 - 40%
Min. Bed Depth	US	31.5 inches
	SI	80 cm
Optimal Bed. Depth	US	47 - 59 inches
	SI	120 - 150 cm
Service flow	US	5 - 9.8 gpm/ ft^2
	SI	12 - 24 m/h
Backwash flow (min.)	US	10 - 12 gpm/ ft^2
	SI	25 - 30 m/h
Backwash time (minimum)		10 minutes

Regeneration/Dosing

Continuous regeneration			
OXYDES®	for 1.0 mg/l of	Fe^{2+}	0.9 mg/l
	for 1.0 mg/l of	Mn^{2+}	1.8 mg/l
	for 1.0 mg/l of	H_2S	4.5 mg/l
$KMnO_4$/Cl	for 1.0 mg/l of	Fe^{2+}	1.0 mg/l
	for 1.0 mg/l of	Mn^{2+}	2.0 mg/l
	for 1.0 mg/l of	H_2S	5.0 mg/l
Intermittent regeneration			
OXYDES®	for each liter of FMH media		1.8 - 3.6 g
	for each ft^3 of FMH media		1.8 - 3.6 oz
$KMnO_4$	for each liter of FMH media		2 - 4 g
	for each ft^3 of FMH media		2 - 4 oz