



Watch® GmbH  
A Water Company

# WATCH®

# FERROLOX

OLD NAME FILTERSORB HSR®

## General Information FERROLOX®

Using a patented process, ferric hydroxide can now be produced in a granular form. Various bead diameters can be made by combination of crushing and sieving procedures. This gives access to a great variety of new applications of ferric (III) hydroxide.

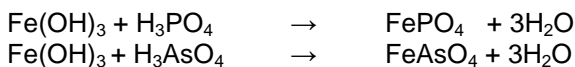
The Filter media, containing iron hydroxide  $\text{Fe}(\text{OH})_3$  has an amorphous structure. The ferric ions content in the filtering media is about 40% by weigh.

Because of its chemical activity, ferric (III) hydroxide is quite appropriate to bind arsenate, phosphate or sulfide ions in aqueous media.

## Operation Principles

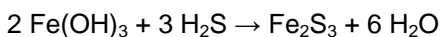
### Arsenic and Phosphate removal

In the first step arsenate or phosphate ions in aqueous solutions were bounded to the surface of **FERROLOX®** by adsorption. Second step is a chemical conversion to stable ferric arsenate or ferric phosphate to the surface of **FERROLOX®**.



### Hydrogen Sulfide removal

Sulfide ions formed from hydrogen sulfide in water are removed in a similar way under precipitation of hardly soluble ferric sulfide.



In this particular case the Adsorber can be regenerated by backwashing. ([click here for more information](#))

## Application:

• **Water treatment:** **FERROLOX®** media is applicable in a wide range of water treatment processes, from large-scale municipal systems to small-scale residential treatment units. Regardless of the system size, there are operational design parameters that must be considered to ensure effective, trouble free performance of the **FERROLOX®** media.

Groundwater or surface water is simply pumped in up flow mode through a single or multiple up-flow pressure vessel containing the **FERROLOX®** media, but it can be also successfully used in down flow filtration. In down flow filtration is recommended to use oxygen dosing for better oxidation. It is also being used in systems to remove Chromium, Copper, Selenium.

The multiple pressure vessel design is either assembled in "Parallel Flow" or "Series flow". Flow to each vessel is measured and totalized to record the volume of water treated. Pressure differential through each vessel is also monitored. Periodic backwashing is typically performed at start-up and after each pressure drop of 0.5-1.0 Bar thereafter depending on usage and water quality.

## Removal of

- Arsenic
- Phosphates
- Copper
- Chromium
- Hydrogen Sulfide
- Selenium (IV & VI)



- Drinking water
- Well water
- Surface water
- Sea water
- Waste water
- Aquariums
- Reverse Osmosis concentrate

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[www.watchwater.de](http://www.watchwater.de)



# WATCH® NEWS

- **Arsenic pollution, a global problem**  
...See the BBC News →

- **Phosphates**  
Dosing Sodium Phosphate in drinking water has caused very serious problems and damages to people. Kidney damages through phosphate dosing is permanent. People get affected, have to be treated with dialysis. Some people develop kidney problem within a few days if city water is dosed with phosphate to protect pipes from scaling and corrosion. Check immediately with your city-water, if they are dosing phosphate. [Read More](#) or contact your doctor and the laboratory. Your doctor may order certain tests to check your body response to sodium phosphate.  
**Danger:** De-install your dosing equipment of Sodium Phosphate **IMMEDIATELY**. Talk to your Doctor if you had Sodium Phosphate dosing. You can also visit the Food and Drug Administration (FDA) website [www.fda.gov/Drugs](http://www.fda.gov/Drugs)

- **Copper**  
Long term exposure to copper can cause irritation of the nose, mouth and eyes and it causes headaches, stomachaches, dizziness, vomiting and diarrhea. Intentionally high intakes of copper may cause liver and kidney damages and even death. There are scientific articles that indicates a link between long-term exposure to high concentrations of copper and a decline in intelligence with young adolescents.  
Chronic copper poisoning results in Wilson's Disease, characterized by a hepatic cirrhosis, brain damage, demyelization, renal disease and copper deposition in the cornea.

- **Chromium (Hexavalent Chromium - "it's a slow poison")**  
A recently-released report by the Environmental Working Group has found that the water supplies of almost all major cities and small communities are contaminated with hexavalent chromium, an industrial chemical toxin that does not get filtered out by ordinary consumer filter except from Granulated Ferric hydroxide (**FERROLOX®**). According to the National Toxicology Program, hexavalent chromium is linked with gastrointestinal tumors and other forms of cancer. International governing bodies have stated that it is toxic when inhaled.

- **Hydrogen Sulfide**  
Brief exposure to high concentration of hydrogen sulfide (>500 ppm) can cause loss of consciousness and possibly death. In most cases, the person appears to regain consciousness without any other effects. However, in many individuals, there may be permanent or long term effects such as headaches, poor attention span, poor memory and poor motor function. Exposure to low concentration may cause irritation to the eyes, nose or throat and fatigue. It may also cause difficulty in breathing for some asthmatics.

- **Selenium (IV) and (VI)** ..[Please visit our website for more info](#)

## BBC NEWS

### World facing 'arsenic time-bomb'

About 140 million people, mainly in developing countries, are being poisoned by arsenic in their drinking water, researchers believe.

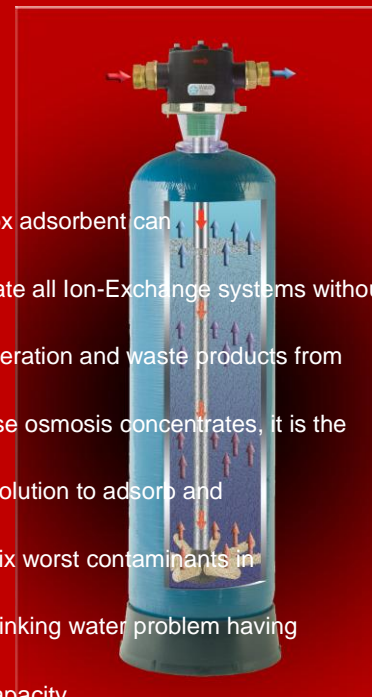
Speaking at the Royal Geographical Society (RGS) annual meeting in London, scientists said this will lead to higher rates of cancer in the future.

South and East Asia account for more than half of the known cases globally.

Eating large amount of rice grown in affected areas could also be health risk, scientists said.

"It's a global problem, present in 70 countries, probably more," said Peter Ravenscroft, a research associate in geography with Cambridge University.

"If you work on drinking water standards used in Europe and North America, then you see that about 140 million people around the world are above those levels and at risk."



**F**errolox adsorbent can  
**E**liminate all Ion-Exchange systems without any  
**R**egeneration and waste products from  
**R**everse osmosis concentrates, it is the  
**O**nly solution to adsorb and  
**L**oad six worst contaminants in  
**O**ur drinking water problem having  
**X**XL capacity

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## UP FLOW FERROLOX® SYSTEM



### Description

The **Watch® UP FLOW** Adsorption system is an advanced design that uses Watch innovation and Watch extensive Adsorption experience to deliver a very compact design. When compared to all conventional filter systems, this up-flow system provides the following advantages:

### Very Compact Design

The construction of **Watch® UP-FLOW** Adsorber systems permit a very smooth flow rates up to 2000 liters per minute in a single pressure vessels (1200 m<sup>3</sup>/hr). The result? Very few pressure vessels can accommodate your flow requirements. In fact, the **Watch® UP-FLOW** Adsorbers require **50% less** number of tanks. Using less pressure vessels enables a reduction in the size of building required for conventional down flow systems. The result is lower capital investment costs.

### IMPORTANT:

Concentration of Arsenic & other contaminants can be expressed as Micrograms per liter, abbreviated as µg/L, milligram per liter (mg/L), parts per billion (ppb) or parts per million (ppm).

1 microgram per liter (µg/L) = 1 parts per billion (ppb)  
1 milligram per liter (mg/L) = 1 parts per million (ppm)

10 microgram per liter (µg/L or ppb) is same as 0.01 milligram per liter (mg/L or ppm)

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## EASE OF USE

The **Watch® UP-FLOW** Adsorber systems is designed with ease of use in mind. **NO valves, NO electricity, NO backwash, NO chemicals** it absolutely user friendly that makes Adsorber installation and removal to exchange Adsorber material easier without the use of special tools or labor. Open the tank on top let the media flow out and fill it back with new media, it's so easy. **UP-Flow** Adsorbers minimizes, labor, operator and maintenance costs. Reproduce NO effluent, while no backwash. **UP-FLOW** pressure vessels are 50% smaller than down-flow system.

## DISPOSAL OF SPENT MEDIA

The exhausted or spent **FERROLOX®** media is a non-toxic solid waste. Its disposal is not problematic at all. Under normal environmental conditions no leaching of Arsenic takes place out of the spent media. All other technologies like ion-exchange or Reverse osmosis, the regenerated effluents on concentrate are of big concern worldwide. After the expiration of capacity, **FERROLOX®** can be advantageously utilized as a very useful component for manufacturing bricks. So **FERROLOX®** is supposed to be the safest technology to remove arsenic, copper, chromium, phosphates and hydrogen sulfide from water and waste water. As the **FERROLOX®** technology is applied in **UP-FLOW** adsorption, the adsorbent is utilized 100% of its capacity. This technology is not only the most economical but also the most effective. It can be used in **POE** Residential applications in rural areas with hand tube-wells, as well as for large scale applications in towns with community water works. Several arsenic, chromium or phosphates elimination plants with **FERROLOX®** in **UP-FLOW** systems are operational in Argentina, Vietnam, Portugal, India, Bangladesh and are in service very successfully.

## Loading Instruction of FERROLOX® Adsorber

- 1<sup>st</sup>:** **Watch® Water** recommends to fill the pressure vessel with water up to  $\frac{1}{3}$  of its height to avoid any damage on bottom distributor and the media itself. Keep water level all the times minimum 15 cm above the media. It should never be dry.
- 2<sup>nd</sup>:** it's recommended to use good quality quartz sand for under-bed. It should just cover the bottom distributor and should be 3 cm over it.
- 3<sup>rd</sup>:** **FERROLOX®** should be filled from top of the vessel leaving 30 cm of freeboard that the media can expand and fluidized easily.
- 4<sup>th</sup>:** Inert Resin on the Top of the media should be maximum 20 cm in height, covering the top distributor to avoid clogging.
- 5<sup>th</sup>:** Chose the top of the tank with distributor and fill the water from bottom till top and leave it soaked for at least 4 hours before doing any backwash. Begin backwashing at very slow-rate for 15 minutes. *Note the valve at the outlet is closed and the drain is open.*

## Material Properties

**Chemical formula and composition:**

**Amorphous Fe(OH)<sub>3</sub>**

**Mineralogical composition:**

**Up to 40% of Ferric Ions from its weight.**

### Physical Properties:

<b>Bulk weight</b>	<b>640 kg/m<sup>3</sup></b>
<b>Porosity</b>	<b>min. 70%</b>
<b>Humidity</b>	<b>~ 10%</b>
<b>Fe(OH)<sub>3</sub></b>	<b>min. 75%</b>
<b>Specific surface</b>	<b>270 m<sup>2</sup>/gram</b>
<b>Color</b>	<b>Dark brown</b>
<b>Mesh size</b>	<b>0.5-2.0 mm x 2.0-4.0 mm</b>

## Physical Data

### Operation conditions and exchange capacity

<b>Bed depth up flow</b>	<b>70 - 75%</b>
<b>Freeboard up flow</b>	<b>10 - 20%</b>
<b>Bed depth down flow</b>	<b>450 - 1500 mm</b>
<b>Freeboard down flow</b>	<b>50 - 75%</b>
<b>Service flow rate</b>	<b>10 - 20 m/h</b>
<b>Back wash flow rate</b>	<b>25 - 30 m/h</b>
<b>Total adsorption capacity for P<sup>5+</sup></b>	<b>15 g/kg</b>
<b>Total adsorption capacity for As<sup>5+</sup></b>	<b>12 g/kg</b>
<b>Oxidation capacity for H<sub>2</sub>S</b>	<b>Up to 20% of its dry weight</b>
<b>pH</b>	<b>5 - 9</b>

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