

ADVANCED ADSORPTION TECHNOLOGY

WATCHER
WATCH WATER
a Water Company

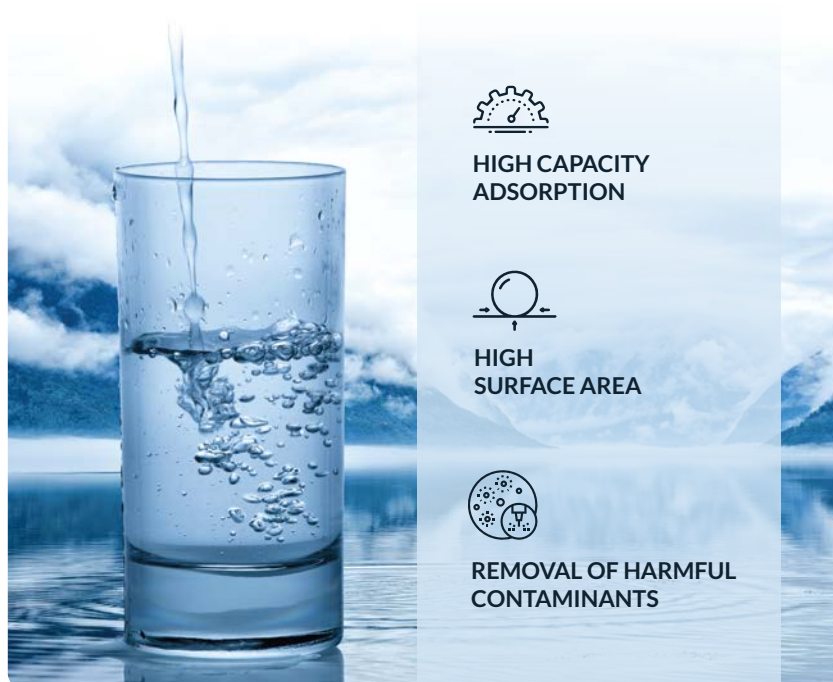
**FILTERSORB
FILTRATION
// ADSORPTION
INSTANT PRODUCTS
OXY TREATMENT
SYSTEMS**

HYDROSORB

METAL ORGANIC FRAMEWORKS BASED ADSORBER

PRODUCT OVERVIEW

HydroSorb, developed by **Watch Water®**, represents the pinnacle of innovation in water management and **Adsorption** technology. This cutting-edge product is designed to effectively capture, retain, and purify water, making it an indispensable solution for industries facing challenges related to water scarcity, pollution, and resource management.



TARGETED CONTAMINANTS

Organic Contaminants

- ❖ Biological Oxygen Demand (BOD)
- ❖ Pesticides (e.g. atrazine)
- ❖ Glyphosate
- ❖ Herbicides
- ❖ Pharmaceuticals
- ❖ Industrial Chemicals
 - Benzene, Toluene, Phenols
- ❖ Polycyclic Aromatic Hydrocarbons (PAHs)
- ❖ Volatile Organic Compounds (VOCs)
- ❖ Detergents

Inorganic Contaminants

- ❖ Fluorides (F^-)
- ❖ Sulfates (SO_4^{2-})
- ❖ Chlorides (Cl^-)
- ❖ Chemical Oxygen Demand (COD)

Taste and Odour Compounds

- ❖ Hydrogen Sulfide (H_2S)
- ❖ Methylisoborneol (MIB)
- ❖ Chlorinated Solvents
 - Trichloroethylene (TCE)
 - Perchloroethylene (PCE)



PREMIUM QUALITY
MADE IN GERMANY

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HEALTHY
WATER

TARGETED CONTAMINANTS

Heavy Metals

- ❖ Lead (Pb)
- ❖ Aluminium (Al)
- ❖ Mercury (Hg)
- ❖ Chromium (Cr)
- ❖ Nickel (Ni)
- ❖ Copper (Cu)
- ❖ Zinc (Zn)

Radioactive Contaminants

- ❖ Radon (Rn)
- ❖ Uranium (U)
- ❖ Radium (Ra)

Nutrients

- ❖ Ammonia (NH₃)
- ❖ Agricultural Wastewater
- ❖ Animal Farming
- ❖ Decomposition of Organic Matter

Microbial Contaminants

- ❖ Bacteria
 - E. Coli
 - Salmonella

Emerging Contaminants

- ❖ Microplastics
- ❖ Personal Care Products
- ❖ Endocrine-Disrupting Chemicals
- ❖ Nanoparticles
- ❖ Forever chemicals

KEY FEATURES & BENEFITS OF HYDROSORB

1> Superior Adsorption Capacity

HydroSorb utilizes advanced Covalent-Organic Frameworks (COFs) and Metal-Organic Frameworks (MOFs) to achieve unparalleled adsorption rates, allowing for efficient water capture and retention.

2> Innovative Technology

Our proprietary synthesis techniques and state-of-the-art manufacturing processes allow us to create highly porous and tunable frameworks with exceptional stability and functionality.

At **Watch Water**[®], quality is not a benchmark; it is a core value. Our rigorous quality control measures ensure that every product meets the highest standards of performance and reliability. We are committed to sustainable practices, utilizing eco-friendly materials and processes to minimize our environmental footprint. While maximizing the impact of our innovations.

3> Highly Selective

Engineered to selectively adsorb contaminants, **HydroSorb** purifies water by targeting specific pollutants, ensuring cleaner and safer water for various applications.

4> Eco-Friendly Solution

Committed to sustainability, **HydroSorb** is made from environmentally friendly materials and processes, contributing to a greener future while addressing pressing water-related challenges.

5> Versatile Applications

Ideal for use in all **Drinking** water applications, industrial processes, all wastewater applications and environmental remediation, **HydroSorb** adapts to a wide range of settings, helping municipalities maximize water efficiency and minimize waste.

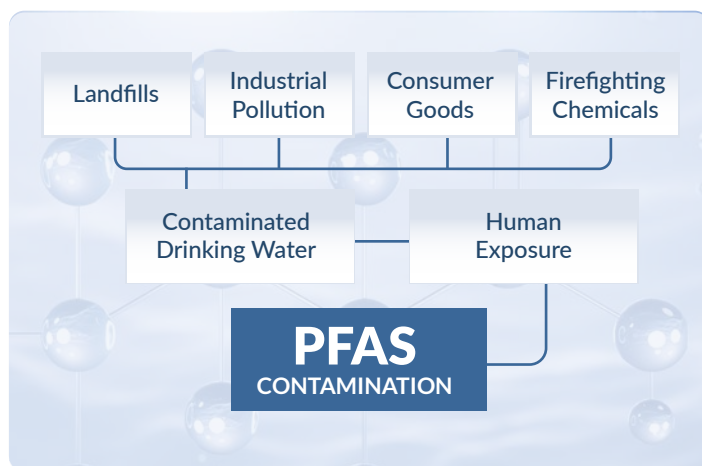
6> Why Choose HydroSorb?

As part of the **Watch Water**[®] family, **HydroSorb** embodies our commitment to innovation, quality, and sustainability. By leveraging our expertise in advanced materials, we provide a solution that not only meets the demand of **"Most Modern Water Management"** but also contributes to a sustainable future.

THE HYDOSORB ADSORPTION CONCEPT

The clean surface of **HydroSorb** is "**Hydrophilic**" or "**Water Loving**". It has a strong attraction for **Organic Compounds** & other **Non-Polar contaminants** and adsorbs them onto the surface of **HydroSorb**, where they are bound by very strong Van der Waals forces. **Adsorption** is the primary strength and mechanism by which HydroSorb works, and the primary reason it is widely used to reduce organic pollutants, inorganic pollutants, taste & odour compounds, heavy metals, radioactive contaminants, nutrients and microbial contaminants.

It is also widely used to improve the safety of drinking water by effectively removing all disinfection byproducts, chlorinated solvents, pesticides, industrial pollutants, and the most dangerous forever contaminants like PFOAs & PFASs. The list of PFASs includes six biggest types of troublemakers in water, i.e. PFOS, PFOA, PFNA, PFBS, PFHxS, and GenX. The latest limits in drinking water make it an absolute necessity to install **HydroSorb** water systems.



HydroSorb is produced with a unique pore structure consisting of **Positive** as well as **Negative** micro-pores, meso-pores, and macro-pores. **HydroSorb** adsorber has 90% **Macro-Pores** making it absolutely unique with a surface area of about 6000-6500 m² to remove large organic pollutants. **HydroSorb** has the capacity to remove so many pollutants, thanks to its extra-large surface area. A single gram of **HydroSorb** has a surface area exceeding 6000 m².

EMPTY BED CONTACT TIME (EBCT)

HydroSorb will reduce or remove all of the above-mentioned contaminants, with some contaminants requiring longer contact time with HydroSorb surface to safely reduce or be removed.

Please Note- To ensure a successful outcome, calculate the correct EBCT prior to installation.

- Some applications such as in case of PFASs, PFCs, etc., might require multiple tanks configurations (known as **lead-lag**), worker-polisher, or worker-guard to effectively treat these contaminants.
- A sample point should be placed between these tanks for periodic testing of contaminant breakthrough.
- A totalizing water meter is also recommended after the HydroSorb tanks used in critical applications to monitor the adsorber's life.

Empty Bed Contact Time is equal to the volume of the empty bed divided by the **flow rate**. It is a measure of the time water is in contact with HydroSorb, assuming all water passes through the bed at the same velocity.

Empty Bed Contact Time (in minutes)	SI	$\frac{\text{Bed Volume (m}^3\text{)} \times 60}{\text{Flow Rate (m}^3\text{/h)}}$
	US	$\frac{\text{Bed Volume (ft}^3\text{)} \times 7.48 \text{ Gallons/ft}^3}{\text{Flow Rate (gpm)}}$

Bed Volume (in m ³)	SI	$\text{Tank Area (m}^2\text{)} \times \text{Depth (m)}$
		$\frac{\text{Contact Time (min)} \times \text{Flow Rate (m}^3\text{/h)}}{60}$

Bed Volume (in ft ³)	US	$\text{Tank Area (sq.ft.)} \times \text{Depth (ft.)}$
		$\frac{\text{Contact Time (min)} \times \text{Flow Rate (gpm)}}{7.48 \text{ gallons / ft}^3}$



PRODUCT DATA SHEET (PDS)

Product Name	HydroSorb
Product Type	FerroPhos Coated Activated Carbon
Technology	COF (Covalent Organic Framework) and MOF (Metal Organic Framework)

PRODUCT DESCRIPTION

HydroSorb is a high-performance adsorber engineered with a unique **Ferrophos** coating, utilizing advanced **COF** and **MOF** technologies. It is designed for superior adsorption capabilities, making it ideal for adsorbing various contaminants which are dangerous for environment and human health including **Air Purification**.

APPLICATIONS

- Drinking Water (POU & POE)
- Drinking Water (Commercial)
- Drinking Water (Municipalities)
- Wastewater Treatment
- Industrial Processes
- Air Filtration



KEY FEATURES

Highest Surface Area	6000 - 6500 m ² /g
Enhanced Adsorption	Effective removal of organic pollutants, inorganic pollutants, heavy metals, radioactive pollutants, nutrients, microbial pollutants including emerging contaminants
Customizable Properties	Tailored for specific applications through surface modification
Eco-Friendly	Sustainable production process and materials

PHYSICAL PROPERTIES

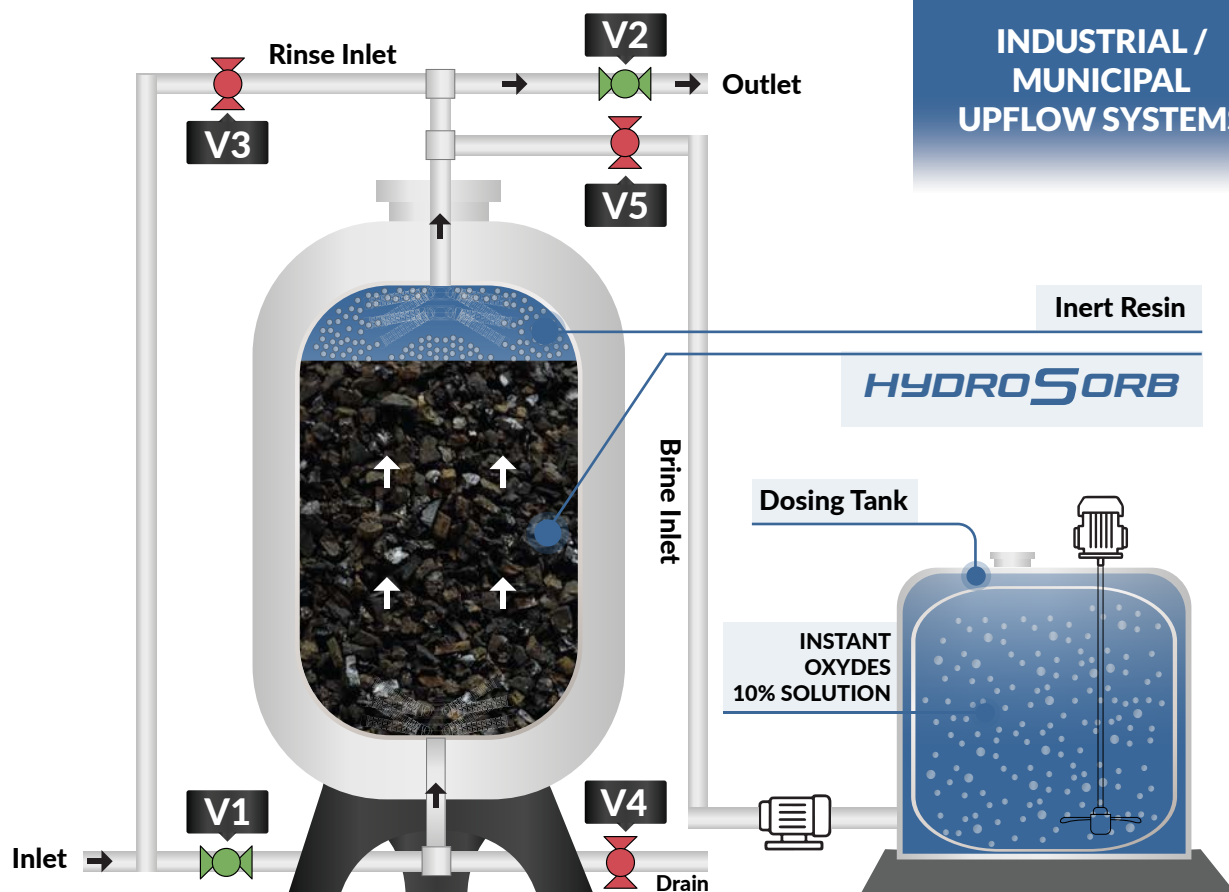
Appearance	Black Granules	
Bulk Density	SI	730 - 750 kg/m ³
	US	45.5 - 47 lb/ft ³
Moisture Content	5 % (max.)	
pH	6 - 7	
Particle Size	0.6-2.4 mm	
Mesh size	8 x 30	



UPFLOW HYDROSORB SYSTEM

Upflow systems of **HydroSorb Adsorber** have several advantages over downflow systems. While you can design both **upflow** and **downflow** systems, they each have their applications and benefits. Upflow systems are mostly designed for **residential** and **small applications**.

The biggest advantage of upflow systems is their low maintenance and effectiveness in treating water contaminants. **HydroSorb** systems should be installed in every home because they need no valves or electricity.



OPERATIONAL MODES

SERVICE (UPFLOW)

OPEN : V1, V2
CLOSE : V3, V4, V5

REGENERATION (DOWNFLOW)

OPEN : V4, V5
CLOSE : V1, V2, V3

RINSE (DOWNFLOW)

OPEN : V3, V4
CLOSE : V1, V2, V5

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Here are some of the key benefits:

1. Improved Contact Time

In upflow systems, the water flows upward through the **HydroSorb**, allowing for potentially longer contact times between the water and the Adsorber. This can enhance the adsorption of contaminants.

2. Reduced Channelling

Upflow systems can help minimize channelling, which is the preferential flow of water through certain pathways in the media. This uniform flow can lead to more effective treatment of contaminants.

3. Easier Regeneration (once a year)

Upflow systems often facilitate easier regeneration and low maintenance. The regeneration can help dislodge trapped contaminants and keep the adsorber to run effortlessly and functional for years, extending the lifespan of **HydroSorb** media.

4. Better Distribution of Flow

The upflow design can provide a more uniform distribution of flow across the entire media bed, leading to more consistent treatment performance and reduced dead zones.

5. Higher Loading Rates

Upflow systems can often handle higher loading rates of water and contaminants, making them suitable for applications with larger volumes of water or higher concentration of pollutants.

6. Enhanced Adsorption Capacity

The upward flow can lead to improved adsorption efficiency, as the larger of contaminants are more likely to be captured as they rise/flow through the Adsorber and additionally works also as a polisher.

7. Reduction of HydroSorb Loss

Upflow systems can reduce the loss of **HydroSorb** granules due to flow direction, which can be a concern in downflow systems.

8. Flexibility in System Design

Upflow systems can be designed to accommodate various configurations and Adsorber types, allowing for customization based on specific treatment needs and requirements.





QUICK EXCHANGE SYSTEM (QES)

Quick Exchange System (QES) for easy exchange of Point of Use (POU) Filters.

Convenient to handle within seconds!

Contact Us for more information on QES

UPFLOW - OPERATIONAL PARAMETER

Bed depth	Up Flow	120 cm
Freeboard	Up Flow	10%
Flow Rate	Service	20 BV/h
Slow Rinse Velocity		10 m/h (15 minutes)
Fast Rinse Velocity		20 m/h (5 minutes)



DOWNFLOW REGENERATION

Regeneration of **FerroPhos Adsorber** or **HydroSorb** is vital for several reasons. Regenerating **HydroSorb** is more economical than replacing it, especially in large-scale applications. Regeneration reduces waste and the demand for new Adsorber, promoting a **circular economy** with sustainable way of approach. Regular regeneration helps maintain the absorption efficiency of the **HydroSorb** media, ensuring optimal performance in treating **Organic contaminants, Inorganic contaminants, Taste and Odor contaminants, Heavy metals, Radioactive contaminants, Nutrients, Microbial contaminants**, and very important **emerging contaminants**.

The Regeneration process of **HydroSorb** Adsorber using a **10% Instant Oxydes** solution involves several steps. Below is a detailed explanation of the **HydroSorb Regeneration Process Materials Required**.

1. Instant Oxydes

A solid oxidizing agent that releases hydrogen peroxide when dissolved in water, and releases hydroxyl radicals in contact with **HydroSorb**.

2. Water

For preparing the **Instant Oxydes** solution and rinsing the HydroSorb.

3. Mixing

Mixing tank and pump for circulation

4. Safety Equipment

Shoes, goggles, etc.



Regeneration of HYDROSORB with INSTANT OXYDES is the advanced method due to its oxidative properties.

Step-by-Step Regeneration Process

1> Concentration

To prepare a **10% Instant Oxydes** solution, dissolve 1000 grams of **Instant Oxydes** in 10 kg of water. For larger batches, you can scale this proportionally (e.g., 100 grams in 1 liter of water).

Mixing (manually or using an agitator pump/mixer)
Stir the solution until the **Instant Oxydes** is completely dissolved. This may take a few minutes, as it can take time to fully solubilize.

2> Initial Rinsing of HydroSorb Adsorber

Rinse with water (downflow). Before applying the **Instant Oxydes** solution, rinse the **HydroSorb** Adsorber with clean water to remove any loosely attached contaminants or dirt particles. This step helps to prepare the Adsorber for an effective regeneration process.

3> Contact Time

Introduce the **10% Instant Oxydes** solution to the **HydroSorb** with a pump over the **HydroSorb**. Ensure that the solution is in contact with the Adsorber for one complete hour. (Two hours is recommended if Adsorber is used for removing **emerging contaminants**.) One or two hours allow for effective **oxidation** of the adsorbed contaminants.

Flow Direction

In a pressure vessel, the flow of regenerant can be upflow or downflow but opposite (Countercurrent) of water flow which can help minimize channeling.

4> Advanced Oxidation of Contaminants Catalytic Reactions:

The **Instant Oxydes** decomposes catalytically to release **hydroxyl radicals**, which can oxidize all adsorbed compounds on the **HydroSorb** surface. This process breaks down complex molecules, making them easier to remove and destroy them.

5> Rinsing the HydroSorb Adsorber

Rinse with water again. Rinse the **HydroSorb** thoroughly with clean water to remove any residual regenerate (**Instant Oxydes**) and all degradation by products. This is crucial to prevent any adverse effects in subsequent applications of HydroSorb Adsorber.

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pH Adjustment

If necessary, adjust the pH of the rinsed Adsorber to neutral before going to service, especially if the regeneration process has significantly altered the pH.

Final Considerations

When handling the **Instant Oxydes** and during the regeneration process, it is essential to wear appropriate personal protective equipments including gloves and goggles to ensure safety.

Frequency of Regeneration

The frequency of the regeneration process will depend on the specific applications, the type of contaminants being treated, and the performance of the HydroSorb over time.

Simplicity of Use

Ease of application: **Instant Oxydes** is relatively easy to handle and apply, allowing for straight forward integration into existing regeneration systems.

Environmental Benefits

Sustainable Approach: The use of an oxidizing agent like **Instant Oxydes** with sustainable practices prolongs the life of activated carbon and reducing waste.

All Adsorbers

The regeneration of any available Adsorber or any activated carbon using **Instant Oxydes** is an excellent and sophisticated approach that leverages oxidative chemistry and **hydroxyl radicals** to enhance the removal of contaminants.

Restore Adsorbers & Activated Carbons

Performance and contribute to more sustainable water treatment practices. Its effectiveness in breaking down **all pollutants** makes it a valuable method.

DOWNFLOW SYSTEMS

HydroSorb as an adsorption process utilizes **Covalent Organic Frameworks (COFs)**, **Metal-Organic Frameworks (MOFs)**, and a coating of Ferrous compounds. Given this context, here are the advantages of Downflow operation specifically related to such a system.

1> Enhanced Adsorption Efficiency

Downflow operation can promote a uniform flow of the liquid through the Adsorbent materials (**COFs**, **MOFs**, **HydroSorb**), allowing for better contact between the adsorbates and the adsorbent surfaces. This can enhance the Overall adsorption efficiency

2> HydroSorb Adsorber Characteristics

Ferro (ZVI Coating) - The ferrous (ZVI) can enhance the adsorption properties of HydroSorb by providing additional sites for Adsorption and facilitating redox reactions which can facilitate the degradation of contaminants.

The incorporation of ferrous ions into **HydroSorb** is a unique process developed by Watch Water. **ZVI-Coated HydroSorb** is unique and used in "Water" as well as "Wastewater" treatment processes for the following:

APPLICATIONS

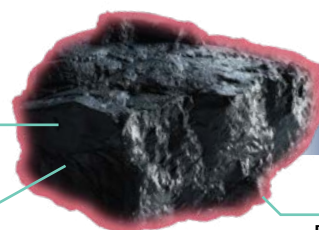
Degradation of BOD

Removal of Pesticides, Herbicides

Removal of Heavy metals

Treatment of wastewater containing reactive species

Activated Carbon



Covalent Organic Frameworks

Ferro (ZVI) Phos Coating

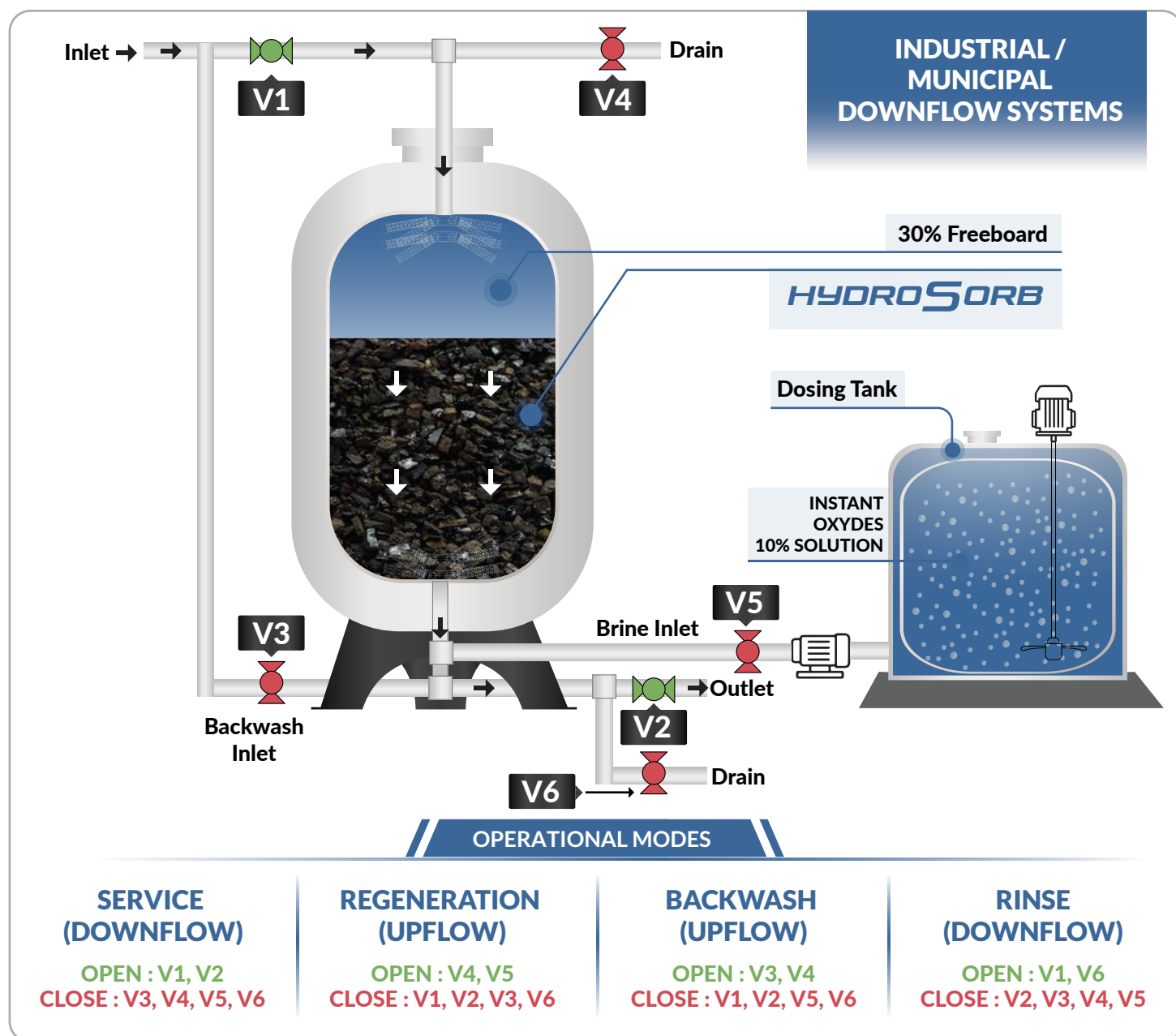


Adsorption Mechanism

HydroSorb serves as a substrate for ferrous ions. Pollutants, such as **heavy metals**, **organic compounds**, and **inorganic contaminants**, can adsorb onto the surface of the activated carbon. The presence of ferrous ions can enhance this adsorption process through various interactions, including electrostatic attraction and complexation.

3> Phosphor-Coated Hydro-Sorb Adsorber

The coating of Phosphor on the surface of carbon potentially improves its efficiency in capturing radioactive contaminants, nutrients, microbial contaminants, including the emerging contaminants and also generates other important chemical reactions. The novel adsorber carbon, with phosphor coating, has a very useful **catalytic support**.



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It works both as a Catalyst, as well as supports Hydroprocessing. **HydroSorb** composition can be utilized as an adsorbent in any application but especially- Removal of hydrocarbons/other solvents, ammonia/other alkaline compounds, toxic chemicals such as phosgene, pollutants such as sulfur & nitrogen oxides and halogenated compounds. This is the best invention in Water treatment industry, **Phosphorus- treated Adsorber Catalyst**

PHOSPHOR-ADSORBER FRAMEWORK



GRAVITY-DRIVEN (DOWNFLOW)

HydroSorb downflow process refers to the movement of fluid through an **adsorber** medium, such as a packed bed of adsorbent material, primarily influenced by gravitational forces. As the fluid enters the packed bed of adsorbent under the influence of gravity, it flows downwards through the pores.

OPERATING CONDITIONS (DOWNFLOW)

Temperature	15 - 80°C
Pressure	2 - 8 bars
Flow Rate	0.1 m³/h - unlimited
Bed depth	100-120 cm
Freeboard	30%
Backwash	15 min every month
Backwash Velocity	10-20 m/h (15 minutes)
Rinse Velocity	20 m/h (5 minutes)

FIRST-TIME INSTALLATION INITIAL BACKWASH & PREPARATION

To maximize the product's **macroporous surface area** and ensure optimal long-term performance, it is essential to thoroughly clean the micropores during the initial backwash. This process may release a significant amount of fine particles, which should be fully removed before operation.

Therefore, during the first-time installation, it is recommended to **pre-soak the product for a minimum of 2 hours** in a vessel filled with water. Following this, a **thorough backwash of at least 1 hour** is required to ensure the media bed is properly conditioned and free from residual fine particles. This initial preparation enhances the efficiency and longevity of the **HydroSorb** system.



Standard Packaging

Packaging	Weight of product	Quantity/ pallet	Gross Wt./ pallet
Bag (30 L)	22 kg	40	905 kg
Big Bag (1000 L)	735 kg	1	760 kg

★ Other packaging can be considered on request

