



Dynamized  
Technologies s.a.

# FILTRATION EFFICIENCY BIOFILTER + BIODYNAMIZER

A clear glass is being filled with water, with a stream of water pouring from above into it, creating splashes and bubbles. The background is a blurred green, suggesting foliage.

**AND YOU, WHICH WATER DO YOU DRINK?**



# THE FACTS



# MINERAL WATER BOTTLES IN PLASTIC BOTTLES



- The water in most plastic bottles contains an average of between **110,000 and 370,000 micro** (< 5 mm) and **nano** (< 1 µm) **plastic particles per liter of water** (study of 08.01.2024). These particles are endocrine disruptors.
- The ecological footprint of a person who consumes 1.5L/day of mineral water in a plastic bottle is **150 kg of CO<sub>2</sub>/year**.
- 95% of water contained in plastic bottles contains traces of endocrine disruptors (such as **DEHP**, which makes plastic more flexible).
- Every week, we swallow the equivalent of a plastic bank card, or **5 grams**, coming from water, food, and air.
- By 2050, there will be **more plastic than fish in the sea!**
- There are **4,000,000 km<sup>2</sup>** of plastic waste in the oceans (degradable in +/- 500 years!)





# FILTER : THE WATER SOFTENER?

- **Does not filter** pollutants in the water
- **Removes a large portion of valuable minerals** (containing **trace elements**)
- Its operation uses +/- **150 kg/year of salt** (Sodium Chloride:  $\text{Na}+\text{Cl}-$ ) for its regeneration; this produces chlorine dioxide (salt + chlorine from tap water) which is released into the water, corroding galvanized pipes!
- **Rejects a lot of water for regenerations (100 L of water per regeneration** which takes place every 5 days!)
- Alters the taste of the water (**salt taste** due to sodium: = +/- **207 mg/1.5 L!**); Sodium consumption recommendations for individuals = max. 200 mg/L (according to European Drinking Water Directive 2020/2184/UE) because sodium increases blood pressure (bad for people with heart disease or kidney failure).
- Rejection of **brine** (water & salt) into the environment (via sewers).
- Risk of **bacteria and germ growth in chemical ion exchange resins** if not regularly maintained (after 5 years of operation: maintenance every 6 months is mandatory to disinfect the resins! Otherwise, there is a risk of bacteriological contamination of the water by microorganisms!)



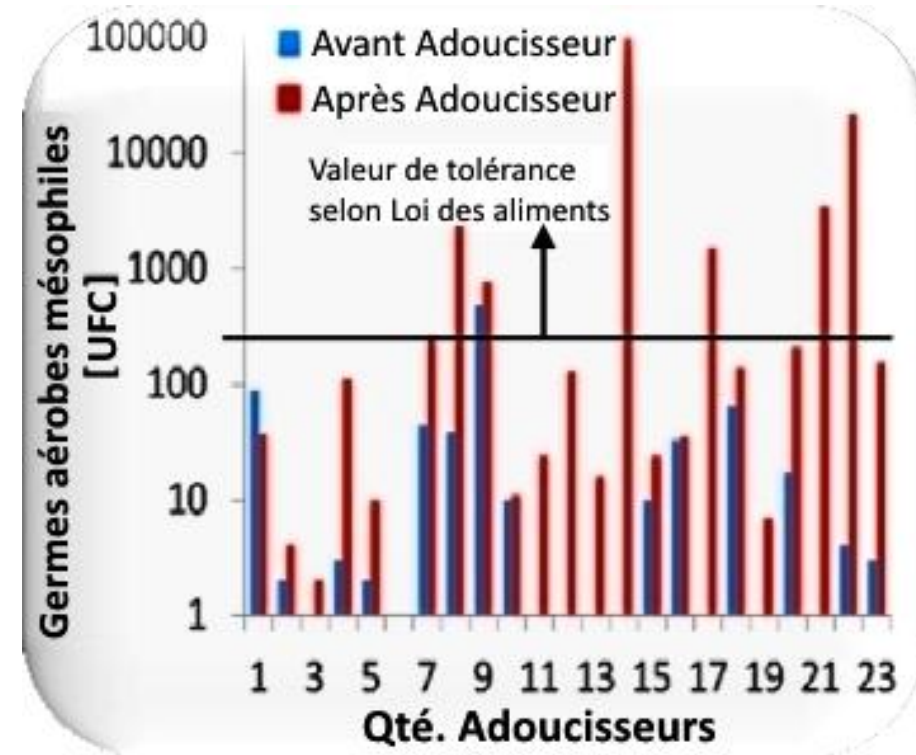




# FILTER: SOFTENED WATER IS FULL OF SALT AND POLLUTANTS



Softened water is **functional water** that protects pipes and household appliances, but not our human pipes!



Tests by the Thurgau Laboratory (Switzerland) in March 2017 on 23 randomly selected softeners. Results? **90% were poorly adjusted and there was microbial proliferation in 87% of cases!**

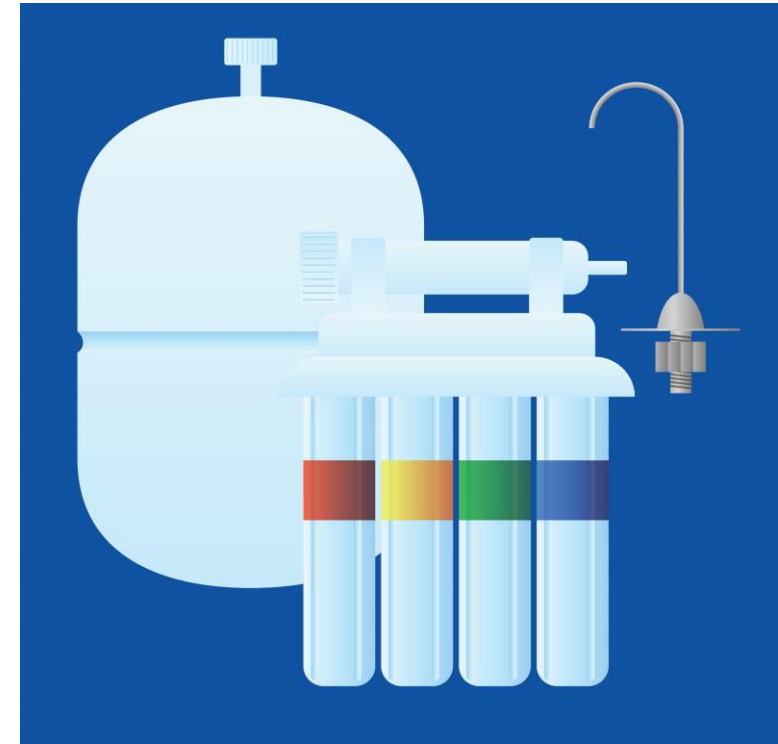




# FILTER : REVERSE OSMOSIS?

The **diameter of the RO membrane is 0.10 nm** (nanometers) which is smaller than the diameter of the **H<sub>2</sub>O molecule** (measured between the ends of the 2 hydrogen atoms) which is +/- **0.30 nm** (30 Ångström). This filtration technology therefore has the following consequences:

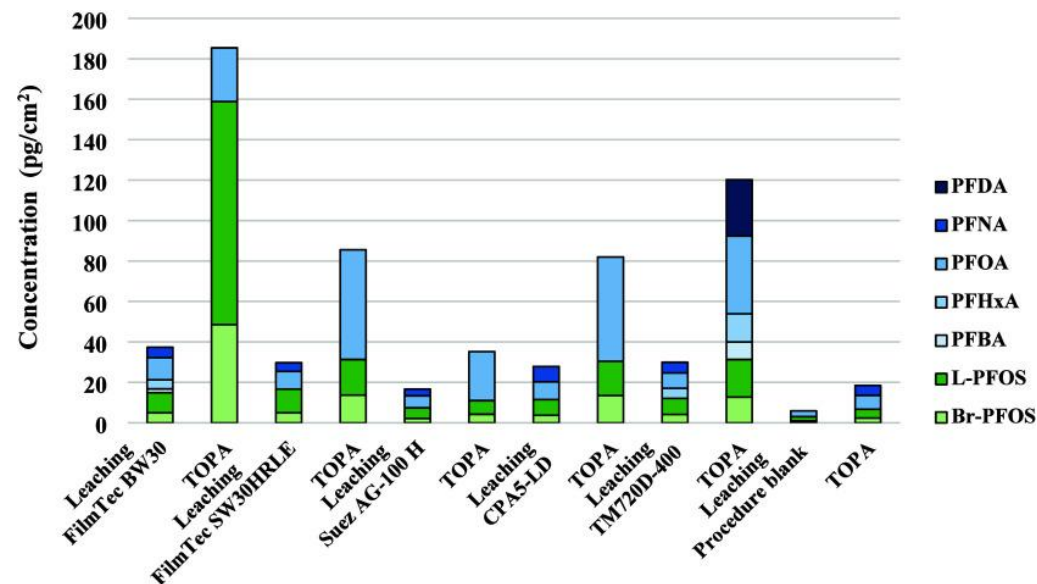
- **Loss of the majority of minerals & trace elements** (there are < **20 mg/L** of minerals remaining in reverse osmosis water versus +/- 450 mg/L in tap water!).
- RO water becomes "**minerophagic**" because, to rebalance itself, it draws minerals from wherever they are found, particularly in the body, which demineralizes it.
- RO water **no longer has any structure or energy**
- RO water causes a significant **loss of water** due to membrane flushing, i.e., 1 L of water lost for every 1 L of reverse osmosis water!
- RO water is only supplied by **only one faucet** in the house (it does not treat baths or showers).
- The membrane of RO devices, which is made of polymers that contain polyamides, is suspected of potentially releasing **PFAS** into the water when it is filtered (see below)!





# SUSPICION OF POTENTIAL RELEASE OF PFAS INTO WATER FROM THE RO MEMBRANE

- **PFAS** (per- and polyfluoroalkyl substances): Synthetic compounds known as eternal pollutants because they are virtually impossible to destroy! They can cause cancer, infertility, cardiovascular problems, etc.
- Reverse osmosis membranes are primarily composed of **synthetic polymers** with aromatic **polyamide** and cellulose acetate. These membranes are **suspected of potentially containing PFAS**. Reverse osmosis membranes are mainly composed of synthetic polymers containing aromatic polyamide and cellulose acetate. There is a suspicion that these membranes potentially contain PFAS based on a scientific analysis dated 03.09.2024 which looked for 45 PFAS after filtration of **5 reverse osmosis membranes and observed releases of 6 PFAS** (Br-/L-PFOS, PFBA, PFHxA, PFNA, PFOA) after the water passed through the membrane.
- The **European Drinking Water Directive** (*Directive 2020/2184*)
  - For **all PFAS**, the limit is  $\leq 500$  ng/L or **0.5  $\mu\text{g/L}$**
  - For the **sum of 20 PFAS**, the limit is  $\leq 100$  nanograms per liter (ng/L) or **0.1  $\mu\text{g/L}$**
  - For the sum of the following **4 PFAS** of greatest concern, PFOA, PFNA, PFHxS, and PFOS, the limit is 4 ng/L or **0.004  $\mu\text{g/L}$**

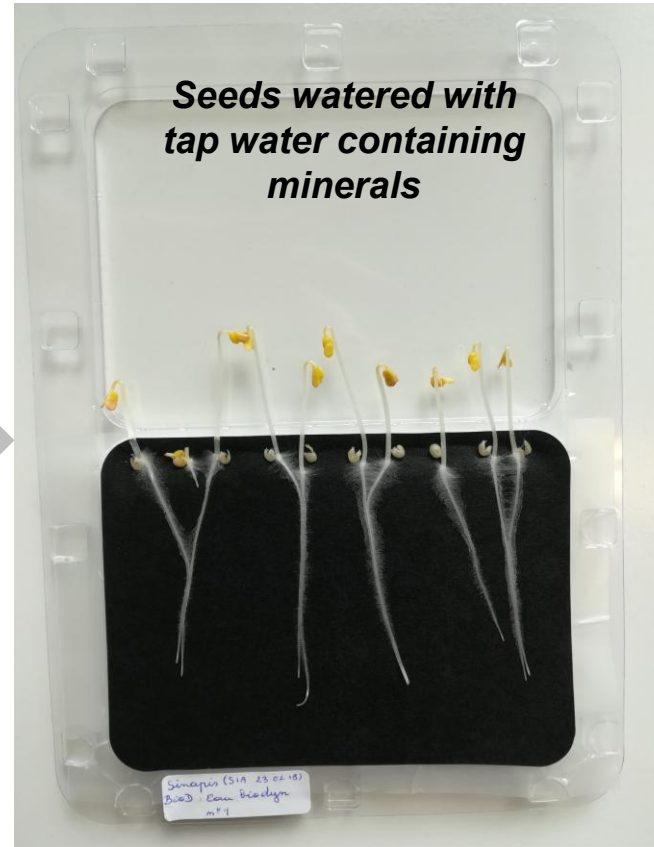
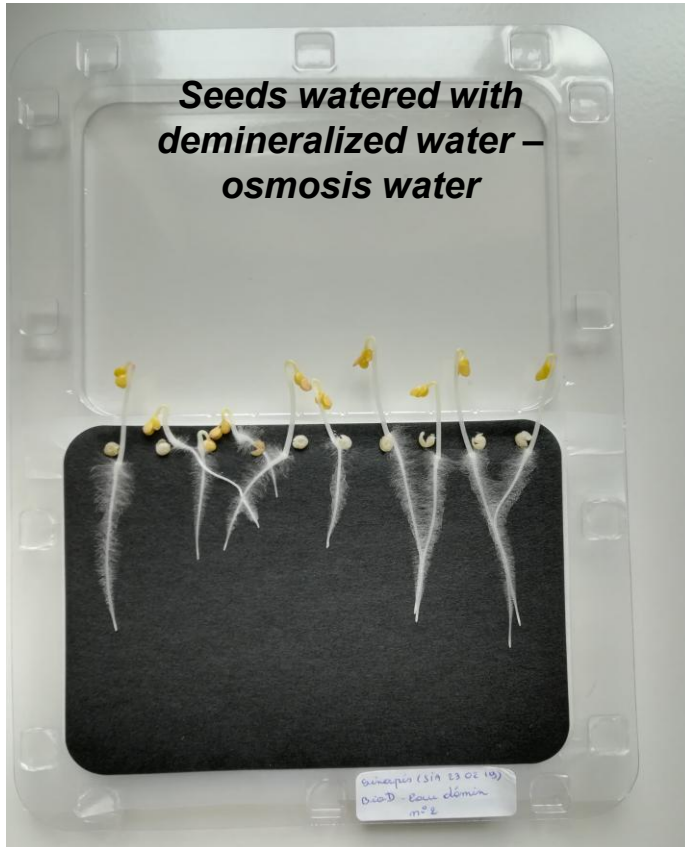






# IMPACT OF OSMOSIS WATER ON LIVING THINGS (GERMINATION): ANALYSIS BY

THE CEBEDEAU LABORATORY / AUGUST 2019



Analysis of sprouted white mustard seeds (30 seeds) watered with **tap water** (containing **minerals**) shows significantly **greater root development** than those watered with **osmosis** (demineralized) water.



# THE SOLUTION



# FILTER: THE BIOFILTER



# BIOFILTER : THE PRINCIPLE = ACTIVE CARBON FILTRATION

- **Exclusive Bio Pro filtration cartridge (pale blue tip)!**
- **Filtration by adsorption** : activated carbon, mixed with a fibrous material in which there is ionized silver. This combination will remove most of the pollutants that would still be present in city water (i.e. *chlorine, bad tastes and odours, pipe corrosion, bacteria, organic pesticides, heavy metals...*) while **preserving minerals** (what a reverse osmosis unit does not do!).
- **Minerals** are also essential for our **health**, in particular because they contain **trace elements** (which are fully metabolized), but also **calcium** and **magnesium** which represent between **20% and 50% of the Recommended Nutritional Intake** of these minerals for a person (depending on the mineral content of the water and the age of the people concerned). These minerals have a beneficial role in particular for hypertension, cardiovascular accidents, cancers, fatigue, diabetes, coronary insufficiencies, osteoporosis...
- Inorganic minerals, including **limestone (80% of minerals)**, are therefore not retained by the filter like a softener would do, but it will be **restructured** by the Biodynamizer in order to render them **harmless** (it will transform the crystalline structure of calcite in aragonite, a white pulverized powder which does not become encrusted and is easily evacuated).



# TECHNICAL CHARACTERISTICS OF THE BIOFILTER

- **Connection after the cold water meter (max 38°C)**
- **Filtration capacity: 150m3 (150,000 L)** and max 1 year, i.e. good performance for 1 family, in 1 house, for 1 year
- **Flow rate:** 1.5 m3/hour (or 25 L/min)
- **Max pressure:** 6.5 bars
- **Housing:** Polypropylene reinforced with glass Fiber (PP GF 10)
- **Legal guarantee (2 years)**
- **Connections:** 3/4 inch
- **Dimensions:**
  - Height: 606 mm x Diameter: 225 mm
  - Weight: Housing: 3.4 Kg + Bio Pro Cartridge: 3.5 Kg = 6.9 kg
- **Sanitary Compliance Certificate awarded by the Carso laboratory: n° 21 ACC LY 990**
- **Material conformity certifications according to European regulations:**  
(EC) 1935/2004 & (EC) 1907/2006 (REACH) & (EC) 2023/2006 & (EC) 10/2011





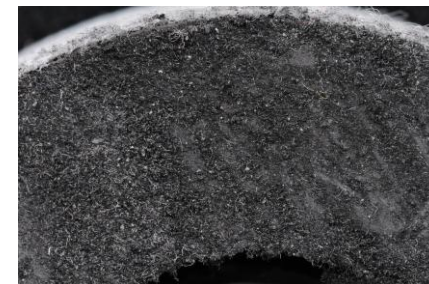
# BIOFILTER : HIGH PERFORMANCE TRIPLE FILTRATION TECHNOLOGY



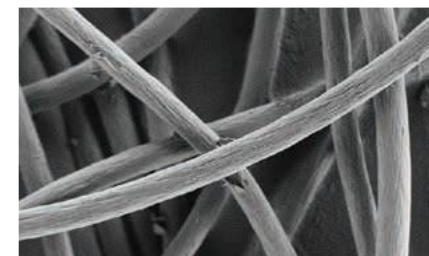
- **PreFiltration 1: Pre-filtration: *Spunbond*** (polypropylene tissue whose filaments are thermally welded) **mixed with a fiber**. Sediment filter which retains particles of iron, sand, mud, neutralizes the development of germs, bacteria etc ... and protects the activated carbon block



- **Filtration 2: the Carbon Fiber Block** (patent no. 2282494) is composed of **activated carbon in sintered granules** (compressed at high temperature which allows a **porosity of 20 µm**) **mixed with Aqualen fiber**. Activated carbon is obtained after calcination of **coconut shells** (increases the number of micropores) by injection of pressurized hot water vapor (activation of the carbon by different temperature levels of 900°C-1,000°C for several hours; activated carbon is regenerated by **oxidation**. Chemical filtration of chlorine, nitrates, nitrites, organic pesticides and herbicides, tastes and odors
  - **physically retains pollutants (µg/L) in its porous structure** up to diameters of **5 µm microns** (physical filtration of heavy metals: lead, aluminum, bacteria, arsenic and parasites) ; (patent n° 2429067)



- **Filtration 3: Aqualen fiber** (patents n° 20704036 & US n° 6514413) ; fiber with a fiber diameter of **10 µm**, mixed with activated carbon. This fiber resembles the roots of a tree which bind the granules of activated carbon into a dense structure. Its function is threefold, it:
  - allows for **good distribution of water over the entire surface of the activated carbon** (this avoids preferential water channels) which **increases its adsorption surface**
  - incorporates in its structure **ionized silver** which is **bactericidal** (neutralizes microorganisms, antibiotics, drugs etc...), the silver is therefore not mixed with the activated carbon but retained in the microfiber ; (patent n° 2172720)







# ACTIVATED CARBON FILTRATION PRINCIPLE = ADSORPTION SURFACE

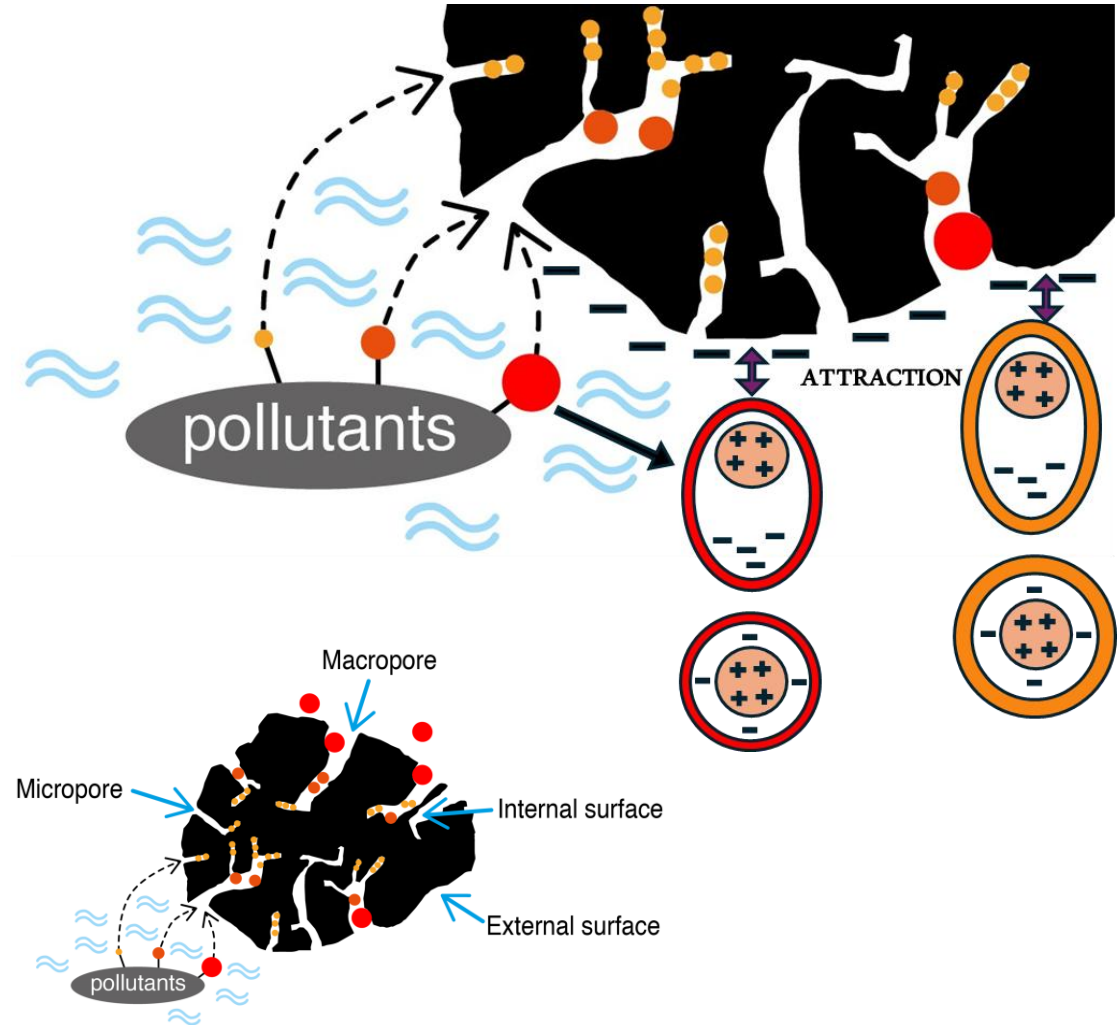
## Activated carbon, the principle

- Electro-adsorption

- The pollutants (their electropositive parts) will be "**Attracted**", by **potential difference**, towards the electronegative surface of the activated carbon (the carbon has available electrons on its surface which will attract the electropositive parts of the polluting molecules = **Van Der Waals forces**: intermolecular bond forces due to low intensity electrical interactions = **electrostatic attraction forces**)

- Physical adsorption

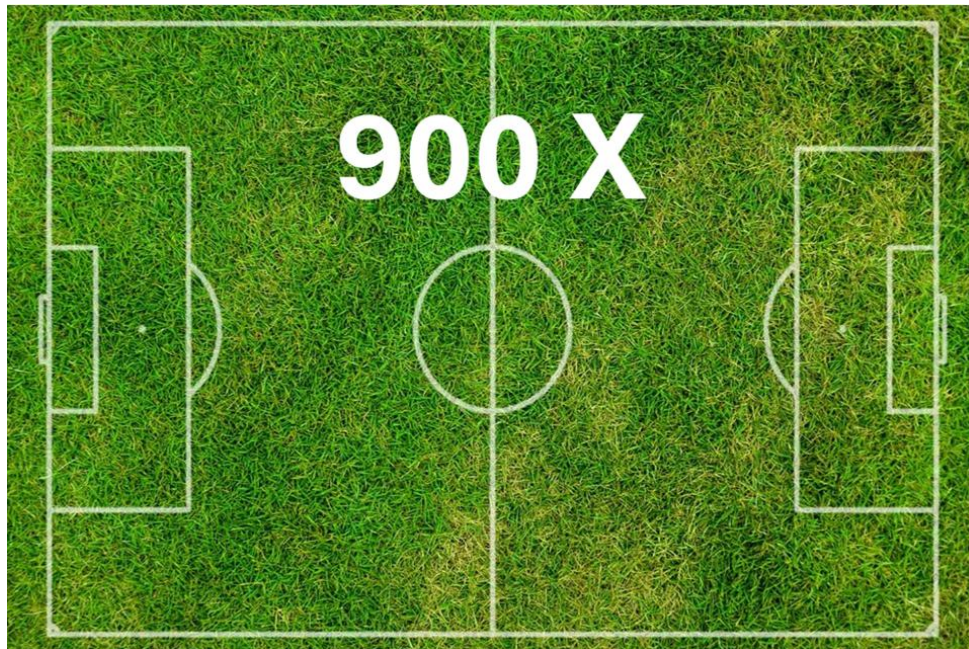
- Activated carbon will also "**Retain**" **non-soluble pollutants** (hydrophobic), i.e. non-polarized or weakly polarized pollutants, in its **porous structure (external and internal)**. This is made up of micropores (millions of empty microscopic alveoli) whose size is between **2 nm and 50 nm** in diameter. **The more micropores there are, the more empty spaces there are that can fix pollutants and the greater the adsorption surface.**



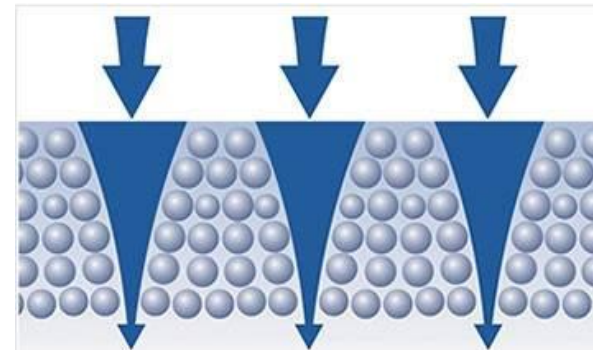


# ACTIVATED CARBON FILTRATION PRINCIPLE = ADSORPTION SURFACE

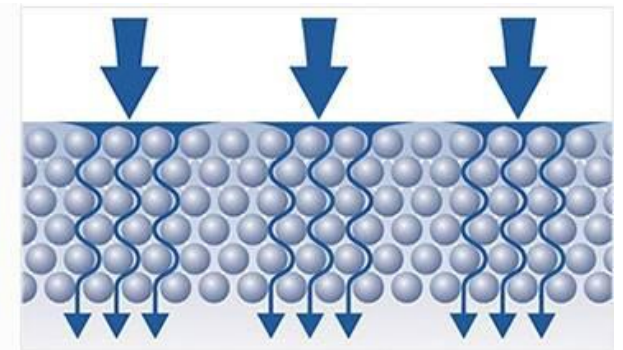
The activated carbon from coconuts in the Biofilter, mixed with the hollow fiber, provide an **adsorption surface equivalent to 900 football fields of 1 hectare !!!** ( $3,000 \text{ m}^2/\text{g}$  of activated carbon  $\times$  3 Kg)



Better distribution of water over the entire adsorption surface of the Biofilter, which allows an adsorption surface 33 times larger than that of conventional filters (and therefore better efficiency)!



Classical filters



Biofilter





# A GLOBAL SOLUTION: DRINKS & BATHS & SHOWERS



- **Delicious drinking water, a pure, smooth, and rounded taste that makes you want to drink.**
- **Water is not directly hydrating for the skin!** Indeed, the **epidermis constitutes a barrier protected by the famous "hydrolipidic film" that prevents water from entering your body.** However, **when tap water is not filtered, it contains pollutants that can then enter the body via percutaneous absorption** (passive diffusion of pollutants through the skin into the blood; Guy & Hadgraft, 1985; Jamoule J.C. 1988; Marty J.P. 1993)! Thus, **there is a potential of 500 potentially toxic molecules**, due to the reactions of chlorine and organic matter present in tap water (Prof. UCL Alfred Bernard), **which can be absorbed during baths or showers via the skin!** Filtered water protects you by significantly reducing this type of insidious pollution!



# THE BIOFILTER RETAINS THE POLLUTANTS, NOT THE MINERALS!

- Most people confuse **filtration**, and therefore the **purity** of water, with its **mineral content** (i.e. the quantity of dry residue it contains after evaporation at 180°C)!
- **Filtered** tap water is water from which the **pollutants** that remain despite their passage through a treatment plant and which are measured in micrograms/L = **µg/L** (i.e. 1 millionth of a gram) have been removed. These pollutants must be removed from the water because they are harmful to our health, **but their infinitesimal quantity cannot be measured by a TDS** (Total Dissolved Solids) device which is an indirect indication measure of the **minerals** present in the water in terms of **mg/L** (i.e. 1 thousandth of a gram or **1 ppm**) and which are **beneficial for our health**.
- **The Biofilter filters (retains) pollutants present in micrograms = µg/L, but not minerals present in milligrams per liter of water (mg/l or ppm), and which are NOT pollutants, but which are good for our health !** It is therefore normal that the minerality of filtered water does not change when measured with a TDS device. This minerality also gives this more rounded, soft and velvety taste to the dynamized water.
- The TDS device by measuring the electrical conductivity of water gives an **indication of the quantity of dry residues** present in the water, i.e. its ion content (inorganic and organic compounds) which are mainly made up, **at 80%, of calcium and magnesium**. The National Sanitary Foundation (NSF) in the United States does not certify the use of TDS measuring devices..
- **Filtered water therefore has nothing to do with softened or reverse osmosis water.**



# **ANALYSIS OF THE FILTRATION EFFICIENCY OF THE BIOFILTER WITH THE BIO PRO CARTRIDGE + THE BIODYNAMIZER**

**REALISED BY DYNAMIZED TECHNOLOGIES ANALYSIS DECEMBER 2022**

# BELGIAN TAP WATER SITUATION

- In December 2022, Dynamized Technologies therefore had a Belgian independent accredited laboratory (Euraceta - Eurofins) **research of 310 pollutants** (heavy metals, pesticides, drugs, plasticizers, phthalates, chlorine etc.) in **legally drinkable tap water in Belgium**, i.e. significantly more than the number of parameters on which city water distribution companies provide information! This analysis confirms that **tap water nevertheless contains several tens of residual pollutants whose concentration rates are higher than the legal limits !** (according to the European Directive 2020/2184 on the Water Intended for Human Consumption) **or exceed the accepted precautionary thresholds (maximum health values)** due to the sanitary caution that makes us consider pesticide metabolites as relevant. These pollutants have therefore not been filtered by the city water treatment plants! This is worrying given that some of them are endocrine disruptors that may eventually cause (through chronic consumption) **a sanitary risk.**





# CONCLUSIONS BELGIAN TAP WATER ANALYSIS AFTER TREATMENT



- After the filtration & dynamization of the water by the **Biofilter and Biodynamizer**, **several residual pollutants are neutralized** (their concentration decreases below the legal concentration thresholds of the EU Drinking Water Directive or the health caution thresholds for these pollutants which can be considered relevant) which allows city water **to become again**, for parameters in excess, **legally drinkable water**!
- This analysis confirms that the combination of the **Biofilter** (filtration) + **Biodynamizer** (dynamization) clearly leads to a **very broad spectrum of water filtration**.

# RESULTS OF THE BELGIAN TAP WATER AFTER TREATMENT

20 Pollutants in µg/L	% of filtration of the Biofilter & Biodynamizer
	< (until) > (beyond)
Desethyl-atrazine (herbicide)	> 93%
2,6-Dichlorobenzamide (fungicide & herbicide)	> 93%
Atrazine-desethyl-deisopropyl (herbicide)	> 93%
Chlorthalonil M 12 (foliar fungicide)	> 93%
Dimethachlor CGA 369873 (herbicide)	> 93%
Metolachlor ethanesulfonic acid (herbicide)	> 93%
Chloridazone-desphenyl (herbicide)	> 93%
Chloridazone-methyl-desphenyl (herbicide)	> 93%
Metazachlore ethanesulfonic acid (herbicide)	> 93%
Metolachlor NOA 413173 (herbicide)	> 93%
Copper (heavy metal)	90%
Nickel (heavy metal)	> 84 %
Lead (heavy metal)	83%
PFAS (eternal pollutants)	> 80%
Aluminium (heavy metal)	79%
Iron (heavy metal)	76%
Aphtiria (parasiticide)	73%
Chlorine	62%
Perchlorates (chlorination residues)	> 55%
Chloroform	51%





# RESULTS OF THE BELGIAN TAP WATER AFTER TREATMENT

Summary of comparative analyses of tap water in Belgium before and after treatment by the Biofilter (activated carbon filter) + Biodynamizer (water dynamizer) dated 06.02.2023 and 24.05.2022 carried out by Euraceta-Eurofins (independent laboratory for environmental, toxicological & agri-food analyses and controls) based on the ISO 17025 standard (management of measuring instruments, analysis standards, calibration... essential elements to guarantee the reliability of analysis results) with an accreditation certificate n°092-TEST issued by BELAC (Belgian accreditation body); Search for 310 & 75 pollutants, collected under accreditation, including heavy metals, medicines, phthalates, plasticizers, microplastics, hormones and organic pesticides

EURACETA analysis of the % filtration achieved by the Biofilter + Biodynamizer on heavy metals + chlorates + organic pesticides and metabolites of organic pesticides (active substances of pesticides) considered relevant by certain health authorities (ISO 17294-2, ISO 15923-1, ISO 15061, ISO 7393/2, ISO 10304-1 standards)					
Pollutants µg/l	minimum % of filtration < (until) > (beyond)	average % of filtration (pesticides)	Before treatment (µg/l)	After treatment (µg/l)	Legal limits (µg/l) (Dir EU 2020/2184) or Precautionary thresholds allowed
Nickel (heavy metal)	> 84%		11,7	< 2	20
Lead (heavy metal)	= 83%		9,3	1,6	5
Chlorates (herbicide, inorganic pesticide)	= 14%		140	120	250
Perchlorates (chlorination residues)	> 55%		1,1	< 0,5	15
Desethyl-atrazine (herbicide)	> 21%	93%	0,062	< 0,05	Filtration by the Biofilter allows you to stay : 1) Below the legal concentration thresholds allowed by European Directive 2020/2184 on the quality of water intended for human consumption of 16.12.2020 (from 0.03 to 0.1 µg/l per individual molecule & 0.5 µg/l for the sum of metabolites organic pesticides (= pesticide degradation products)) 2) Below the health precaution thresholds : Indeed, health caution makes us consider all these metabolites as relevant (an evolving criterion and often subject, to a legal vacuum, to regulatory inconsistencies at the moment), within the EU or to scientific ignorance!)
2,6-Dichlorobenzamide (fungicide & herbicide)	> 46 %		0,035	< 0,02	
Atrazine-desethyl-deisopropyl (herbicide)	> 23 %		0,064	< 0,05	
Chlorthalonil M 12 (foliar fungicide)	> 86 %		0,14	< 0,02	
Dimethachlor CGA 369873 (herbicide)	> 27 %		0,026	< 0,02	
Metolachlore acide ethanesulfonique (herbicide)	> 94 %		0,34	< 0,02	
Chloridazone-desphenyl (herbicide)	> 99 %		2	< 0,02	
Chloridazone-methyl-desphenyl (herbicide)	> 96 %		0,23	< 0,01	
Metazachlore ethanesulfonic acid (herbicide)	> 17 %		0,023	< 0,02	
Metolachlor NOA 413173 (herbicide)	> 95 %		0,38	< 0,02	
Polyethylene Terephthalate 100-500 µm	100%		1	0	There are no standards for plastics in tap water
Polypropylene 100-500 µm	100%		1	0	
Polypropylene ≥ 500 µm	100%		1	0	
Polyethylene (PE) 100-500 µm	50%		2	1	
Polystyrene (PS) 100-500 µm	100%		1	0	
Polyamide (PA) ≥ 500 µm	100%		1	0	

In addition, the analysis did not find the drugs, glyphosate, hormones or phthalates sought in the tap water

	AQUAPHOR analysis of the % filtration achieved by the Biofilter on several pollutants consisting of heavy metals + organic pesticides at concentrations 10 times higher than in drinking water (European Directive 2020/2184 of 16.12.2020 on EDCH) carried out by the Manufacturer Aquaphor 03.06.2022 (ONORM EN 14898 standard)		
	minimum % of filtration*	Before treatment (mg/l ; mcg/l)	After treatment (mg/l ; mcg/l)
Chlorine	62%	average % calculation	
Chloroform (chlorine)	51%	average % calculation	
Copper (Cu)	90%	43133,5	4405,9
Aluminium (Al)	79%	3289,7	694
Iron (Fe)	76%	average % calculation	
Aptinia (parasiticide)	73%	average % calculation	

\*function of the flow rate and the capacity used: for the test the flow rate used was 20L/min for the average calculations and 10L/min for the others (cartridge capacity = 150,000 L)

Furthermore, international scientific analyses confirm that activated carbon retains PFAS at > 80%



**Biodynamizer®**  
Enjoy the natural movement of life





# WHAT ABOUT PFAS FILTRATION?

## The Biofilter retains PFAS:

- **Activated carbon** is considered the **best media for filtering PFAS (> 80% efficiency)** due to the specific properties of activated carbon: electrostatic & hydrophobic interactions and then adsorption (retention/capture) in its porous surface of PFAS (depending on the size of its micropores) . The adsorption surface of the Biofilter is 3,000 m<sup>2</sup>/g of activated carbon x 3 kg, i.e. an **adsorption surface 33 times larger** than that of standard filters, so it will be even more effective in filtering PFAS!
- **Several international scientific analyzes confirm the superior effectiveness of activated carbon in retaining PFAS in water:**
  - ✓ *[Activated carbon versus metal-organic frameworks: A review of their PFAS adsorption performance Paola S. Pauletto a,b, Teresa J. Bandoz a,\* a Department of Chemistry and Biochemistry, The City College of the City University of New York, 160 Convent Avenue, New York, NY 10031, United States b Chemical Engineering Department, Universidade Federal de Santa Maria, 1000, Roraima Avenue, 97105-900 Santa Maria, RS, Brazil] & [Adsorption behavior and mechanism of perfluorinated compounds on various adsorbents*
  - ✓ *A review Ziwen Dua,b, Shubo Deng a,b,\*, Yue Beia,b, Qian Huang a,b, Bin Wang a,b, Jun Huang a,b, Gang Yu] Adsorption of perfluoroalkyl and polyfluoroalkyl substances (PFASs) from aqueous solution - A review D.Q. Zhang a, W.L. Zhang b, Y.N. Liang b,\* a College of Environmental Science and Engineering, Guangdong University of Petrochemical Technology, Maoming, 525000, China]*
- **The European Drinking Water Directive** *(Directive 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption)* **sets the limit for PFAS in water at 100 nanograms per liter (ng/l) for the sum of the concentrations of 20 PFAS and 500 ng/L for all PFAS.**





# PRESS ARTICLES REGARDING THE EFFECTIVENESS OF ACTIVATED CARBON >< PFAS

## 1. Belgian Newspaper “Le Soir” 13.11.2023

- Activated carbon systems capture a large portion of Pfas and other undesirable elements that would be present in distribution water
- Pr Patricia Luis Alconero, professor of chemical engineering at the Ecole polytechnique de Louvain (UCLouvain). ***“activated carbon is very effective in combating PFAS... its adsorption surface makes it possible to capture (retain) a whole series of pollutants: PFAS but also microplastics, pesticides, antibiotics”***.
- Professor Alfred Bernard, professor emeritus of toxicology at UCLouvain, **mentions a barrier of 70 to 80% of Pfas and under-chlorination products**: “If there is an excess of the standard, you will therefore find yourself below of the standard thanks to activated carbon. »

## 2. Belgian Newspaper “Le Soir” 2023.11.17

- Professor Fabrizio Bucella (Physicist, professor at ULB): ***“Activated carbon removes 70 to 80% of PFAS. In short, they don't all disappear, but we will clearly be below the standard. If we were already below the standard, we would be even healthier.”***

## 3. Belgian Newspaper “Le Soir” 01/28/2025







































- Belgian Federal Minister of Health Yves Coppieters indicated that regarding PFAS, ***“reverse osmosis filtration is not more effective than activated carbon filtration”***



# CONCLUSION



# COMPARATIVE TABLE OF DIFFERENT WATER TREATMENTS

Comparative types of water		Chlorine	Pollutants	Minerals	Sodium	Limescale treatment	Heavy metals	Structure (molecules)	Energy (photons)
	Filtered & Dynamized water 								
	Bottled water								
	Tap water								
	Softened water								
	Osmosis water	