



Filtration of water

EUROWATER
A GRUNDFOS COMPANY

Pressure filters for water treatment

For more than 85 years, EUROWATER has developed, manufactured, and marketed complete water treatment plants employing air and water backwashed pressure filters.

Water treatment

No matter if you need drinking water or water for commercial or industrial use, the water must undergo treatment before the water has the required quality. The complexity of the treatment clearly depends on the state of the water source, whether it is groundwater or surface water, and on the final application. The illustration below gives you an idea of the different water treatment steps needed to change the water from groundwater to ultrapure water.

From groundwater to drinking water

One of the most important uses for water is drinking water. The required water quality is obtained in a pressure filter filled with a selection of filter media. The filter media is selected to neutralize water or to target specific substances, such as iron, manganese, ammonium or suspended solids.

In order to dimension a filtration plant, the quality of the inlet water must be known. EUROWATER offers to make the necessary water analysis – free of charge.

From drinking water to "pure water"

Probably every manufactured product uses water during some part of the production process. Industrial water use includes water for such purposes as fabricating, processing, washing, diluting, cooling, heating, or transporting a product, incorporating water into a product, or for sanitation needs within the manufacturing facility.

EUROWATER is in a position to carry out projects within any industry and field of application.

The "impurities" of water

Water naturally contains a number of substances and components, in varying amounts and depending on where it is sourced. These are the most common:

Inorganic salts/common ions

Iron, manganese, ammonium, calcium, magnesium, sodium, bicarbonate, chloride, sulphate, fluoride, and nitrate

Dissolved organic compounds

Naturally occurring: humic acid
Contaminating: pesticides, phenols, solvents, oil, and petrol

Particles

Sand, rust, and colloids

Microorganisms

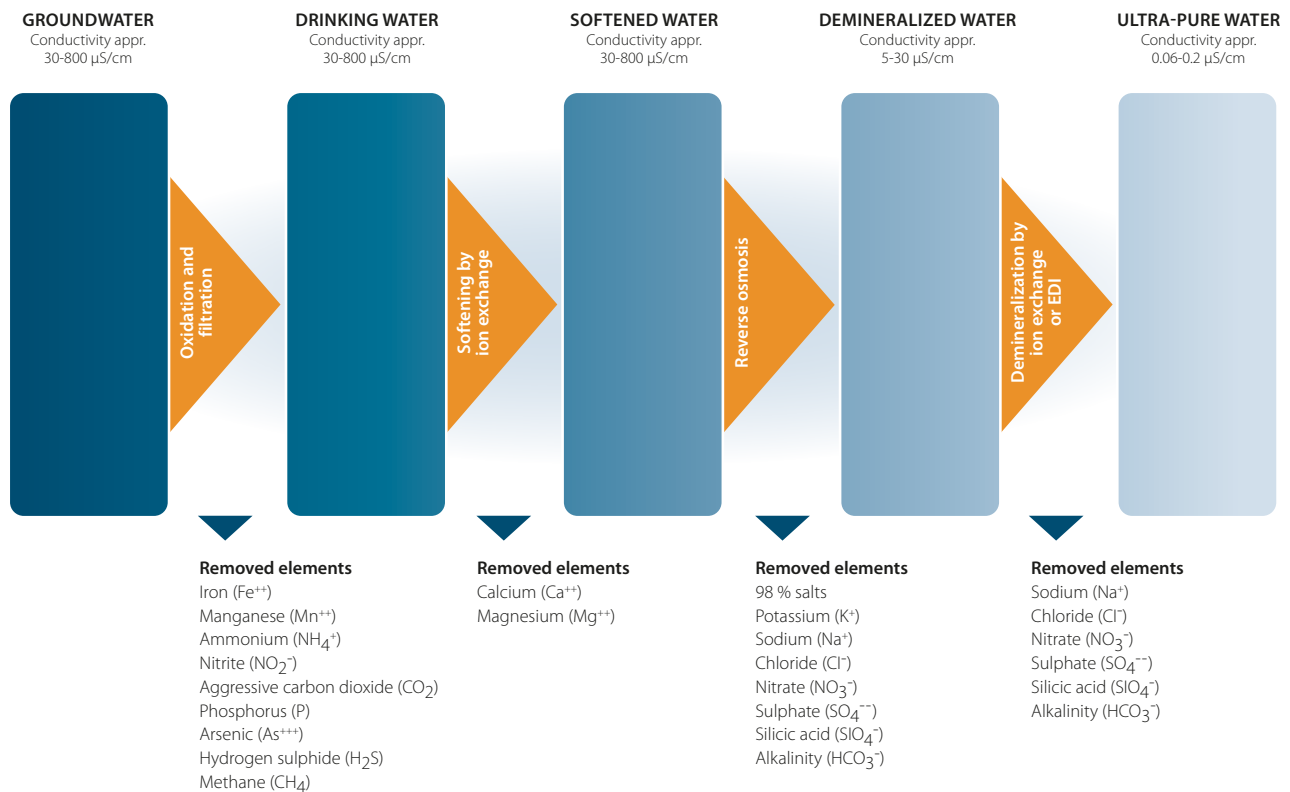
Bacteria, viruses, algae, and fungi

Gases

Carbon dioxide, oxygen, methane, and hydrogen sulphide

In the table to the right you can see how filtration can be used to target removal of specific substances. Other substances, illustrated below, can be removed using other methods, such as ion-exchange or membrane filtration.



From groundwater to pure water



What can be filtered—and how?

The below table gives a survey of problems caused by selected impurities in the water, proven solutions, and the type of filter medium known to best solve the problem.

The table does not illustrate the complexity of the real world. If you encounter problems with the water, you are welcome to contact us for advice and guidance. EUROWATER has the know-how to design a tailored water treatment solution, with a guarantee for quality and performance.

Impurities	Problems	Solutions	Filter media
Aggressive CO₂	Aggressive carbon dioxide corrodes concrete, piping, and hot-water tanks of black steel. The corrosion products make the water turbid and the water becomes red with rust and ochre. The carbon dioxide is often present in raw water in earth strata deficient in calcium.	Aggressive carbon dioxide can be neutralized in a pressure filter employing a calcium-containing filter medium. In special cases, aggressive carbon dioxide can be removed by degassing.	Magno-Dol 
Iron and manganese	Often, the worst problems waterworks face are iron and manganese—because of discolouration of washing and sanitary appliances in buildings. Typical signs of elevated contents of iron and manganese in the water are that the water becomes ochre-coloured or black with a metallic taste.	After oxidation, iron and manganese can be filtered in a pressure filter. The filter medium can be quartz sand, Nevtraco®, or Hydrolit-MN.	Gravel 
Manganese	In some cases, the natural manganese removal processes can take a long time to start and mature, or won't even start at all. In those cases Demantex® can be a powerful catalyst, when used the proper way.	The filter media Demantex® has proven to be a very efficient material for manganese removal – even under difficult conditions with low pH values where many other types of filter media are insufficient.	Demantex® 
Ammonium and nitrite	The presence of ammonium indicates microbiological activity in the water, possibly resulting from fertilization, contamination, or from geology. Nitrite in raw water is often present as a residual product of an incomplete ammonium conversion. Nitrite also indicates contamination and microbiological activity.	Ammonium is converted into nitrite and afterwards nitrate through biological nitrification. Nitrification requires much oxygen and sufficient filter medium.	Nevtraco® 
Pesticides and chlorine	Pesticides can pollute the groundwater. It is vital to ensure that these pesticides or their decomposition residues do not end up in the drinking water. But they sometimes do. In many countries drinking water is also disinfected by adding chlorine. Any free chlorine must be removed before further water treatment, such as softening or membrane filtration.	Activated carbon is a natural product made from hard coal, wood or coconut shells. An active carbon filter can remove free chlorine, pesticides and organic solvents. Some tasks do require individual treatment plans and pilot studies.	Activated carbon 
Arsenic	Arsenic is a natural element and related to certain geochemical environments. Arsenic is found in two forms, As(III) and As(V) of which As(III) is more poisonous and harder to remove from the water. According to WHO, arsenic poses serious health hazards when ingested and has been associated with skin cancer and various organ diseases.	Arsenic combines with iron and can be removed through co-precipitation with iron. If insufficient iron is available in the raw water for this process, the iron content in the water can be increased by addition of iron chloride. Another approach is to remove arsenic by adsorption in a pressure filter with a special filter medium containing iron hydroxide.	Iron granulate 
Adjustment of hardness	Calcium and magnesium mainly determine the total hardness in the water. A large content results in hard water, a small content in soft water. The hardness of the water is measured in German degrees of Hardness (°GH).	A recarbonation filter with various calcium-containing filter media is employed for hardening of the water hardness, for example minerals have to be added to demineralized water before use.	Hydrolit CA 
Suspended solids	If the water contains much suspended matter (high turbidity) such as surface water, there will be an increased need for frequent filter washing when traditional sand filters are employed.	A depth filter is also known as a multimedia filter because the solution combines surface and depth filtration in one pressure filter. The advantage is that a large volume of suspended matter and particles can be removed in one filter. The filter media quartz sand and hydro-anthracite are used for this purpose.	Hydro-anthracite 

One plant – many applications

EUROWATER has great expertise in developing reliable pressure filters with a long life and minimum need of maintenance – and the applications are many.

Drinking water

Waterworks and companies/households with own water boring needing drinking water quality use filtration in pressure filters to reduce contents of aggressive carbon dioxide, iron, manganese, ammonium, pesticides, and arsenic.

Test samples are taken at the waterworks and at the consumers to check the water quality. The water must be clear and without colour, smell, or taste. If the water does not comply with the drinking water standards, filtration will often be the solution.

Process water

Industries are large consumers of clean water. Pressure filtration is often used as pretreatment before other water treatment, such as softening and demineralization. Reuse of process water is another example of application within industrial water treatment.

Other applications

Our filters are also applied to solve other problems such as:

- dechlorination
- filtration of seawater
- particle filtration
- recarbonation of demineralized water
- percolate filtration
- final filtration of wastewater



Arsenic removal by means of adsorption in waterworks. The solution comprises an automatic pressure filter type NSB 170 installed after open filters. Flow rate: 12 m³/h.



Removal of iron, manganese, and ammonium in waterworks. Flow rate: 2 x 30 m³/h.

Solution:

- Pressure filters 4 x TFB 30 (primary and secondary filter)
- Oxidation equipment comprising compressor and aeration and control air system
- Blower and rinse pump for backwash
- Frequency-controlled discharge
- Complete industrial control system (ICS) with a selection of external connections for maintenance personnel and monitoring staff via the internet
- Likewise alarming via SMS and generation of daily, weekly, monthly, quarterly, and yearly reports

The optimum solution

Selection of pressure filters depends on application, water quality, and water consumption. We are at your disposal for information and know-how about the right solution.

Our dimensioning of an individual plant is based on a water analysis combined with several other parameters that all influence the right solution: water quality, operational requirements, flow rate, filtration rate, and rinse frequency. Add to this: choice of materials, surface coating, and individually composed filter media.

Flow rates up to 100 m³/h

In our standard programme, the flow rates of pressure filters range between 1-100 m³/h per filter. These plants can solve filtration problems even in water with extreme pH-values and temperatures. The product programme covers a wide range of plant sizes making it possible to adapt the solution and thus your investment to the individual requirements for filtered water. If the pressure filter is used as a two-media filter or as a sand filter, the flow rate can be increased to 200 m³/h.

Own production

We manufacture our own filters and that gives us the unique advantage of being able to control the entire production

process – from selection of supplier and welding of vessels and pipe system to assembly, pressure testing, and dispatch of the plant from our factory in Denmark. In this way, the plant complies with the high performance criteria of the industry.

Pressure filter configuration

The composition of the filter is individual based on the problem to be solved. The three most frequent configurations are:

- Single filter
- Parallel filter
- Primary and secondary filters.

In single and parallel filters, the raw water is oxidized and filtered once. The advantages of parallel filters are enlarged capacity and the possibility of backwashing one filter while the other is in operation.

In primary and secondary filters, the water is oxidized twice and also filtered twice. This method is used when single filtration is insufficient to reach the required water quality.



Many consumers are situated so that connection to a large, municipal waterworks is not practical or desirable. The technical solution will of course be based on the same principles as the large water supplies. A pressure filter type NSB is ideal for small and medium drinking water supplies.



Manual pressure filter type NS
Flow rates from 1 to 12 m³/h

Automatic pressure filter type NSB
Flow rates from 1 to 12 m³/h

Manual/automatic pressure filter type TF/TFB
Flow rates up to 100 m³/h

Efficient and reliable plants

Pressure filters are long-term investments and the requirements of EUROWATER for the best possible materials are a matter of course. Our time horizon will often be 25 years. Our filters have some significant advantages: easy to use, completely safe operation, and low backwash water consumption.

Oxidation and aeration

In our standard programme, the raw water is oxidized with atmospheric air to aid the precipitation processes and to oxidize the water to the regulations in force. The water is oxidized inside the pressure filter so that precipitations are not formed in the inlet piping. An integrated aeration and spraying system ensures optimum oxidation at the right place in the filtration process. External aeration can be supplied on request.

Nozzle plate - optimum operation

In the lower part of our pressure filters, there is a nozzle plate which brings some significant advantages. First of all, it ensures even distribution of load for optimum utilization of the filter medium. Furthermore, stagnant water is avoided - both during operation and during backwash, which is important in order to limit bacterial growth.

Efficient backwash with air and water

The special design with the nozzle plate also results in an efficient and even backwashing. The filter media is cleaned through backwashing at even intervals dependent on the quality of the raw water and the water consumption. To clean the filter, a strong air flow is blown upward through the filter to loosen embedded particles that afterwards are removed through backwashing with water. In special cases, it is necessary to use a combination washing with air and water. After backwash, the filter is again ready for use.

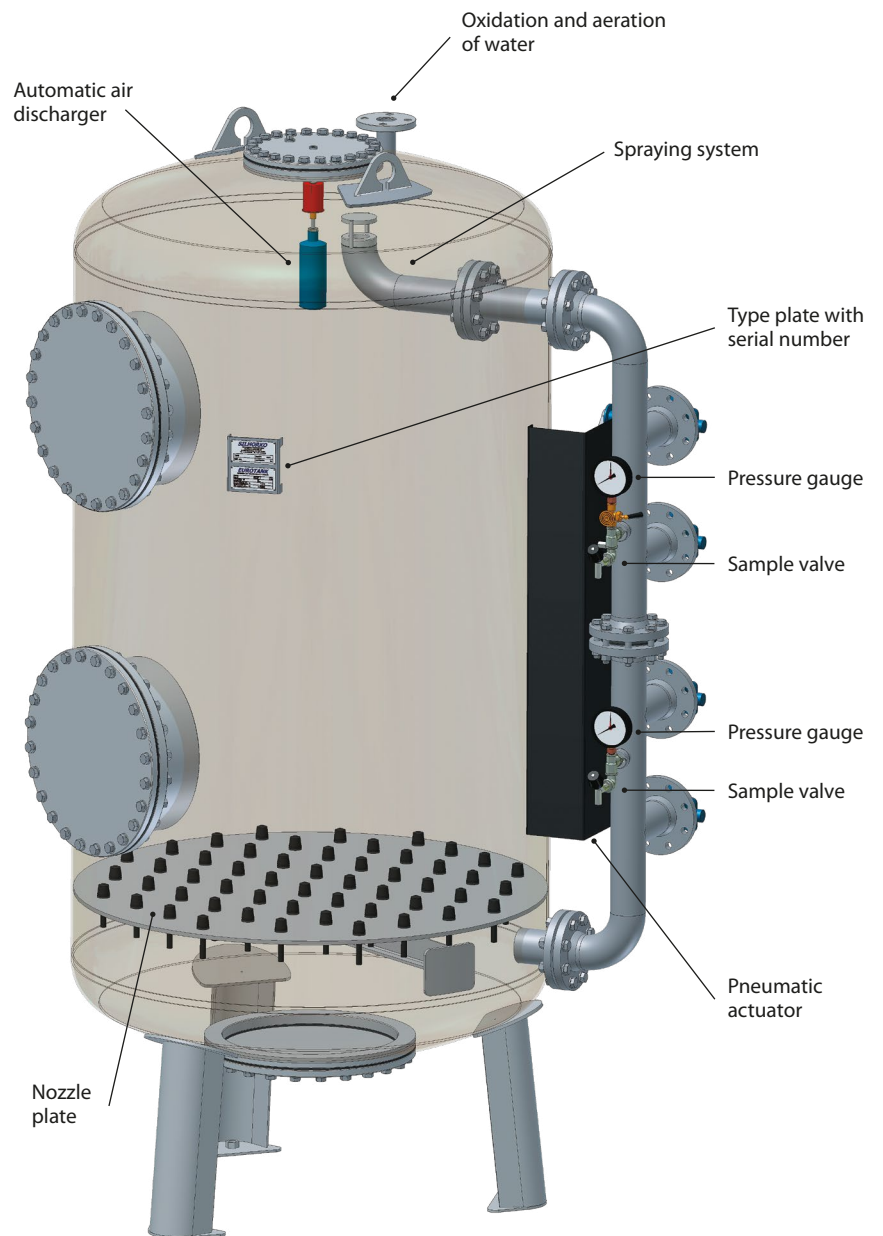
Reuse of rinse water

To save water, the rinse water can often be reused as raw water after filtration and UV disinfection.

Compact pipe system

The pipe system for manual and automatic pressure filters is either surface coated, hot-dip galvanized, of black steel, or alternatively of stainless steel or PE (polyethylene). The result from the water analysis is decisive for the selection of corrosion-resistant materials.

Our automatic pipe systems are constructed with one actuator for four valves, thereby minimizing the risk of incorrect valve positioning. Pressure filters with monitoring of operation and backwash have a pipe system equipped with monitoring of the valve positioning.





Complete water treatment solution comprising a stainless steel pressure filter and technical equipment for oxidation and backwashing.



Degassing of dissolved gases such as aggressive carbon dioxide, methane, and hydrogen sulphide is a precondition of optimum filtration. Photo: Degassing and surface coated pressure filter in brewery.

Surface coating

The filter vessels are of steel and therefore extremely robust and less sensitive to changes in pressure. The composition of the water and the temperature determine the selection of surface coating. We offer a wide range of options with which we have great experience. Surface coating is classified as inside and outside surface coating.

Normally, outside surface coating will be sand blasting and efficient priming followed by synthetic enamel in an optional RAL colour. Inside, the filter vessels can either be without coating

or with coatings suitable for different applications. Specific requirements for hygiene and drinking water approval can often be met. In most countries, such an approval is indispensable in order that the pressure filter can be used within water supply and food production.

Several of the filter vessels are surface treated with polyethylene (PPA) both inside and outside. Thus, the filter vessels acquire the strength of steel combined with the strong corrosion resistance of a synthetic material. Hot-dip galvanizing or stainless steel are other options.

Stainless steel has a very high resistance to corrosion and flexibility in operations. For example by allowing heat disinfection of the filter media.

The Pressure Equipment Directive (PED)

All our pressure filter plants comply with the pressure equipment directive of the EU. This directive sets out common standards for the design and manufacture of pressure equipment.



Control cabinet

User-friendly control

All controls are customized to fit the needs of the waterworks or production company.

We offer a selection of controls ranging from simple solutions to PLC-controls, ICS-solutions to web and mobile based systems.



SE10 and SE20 controls



B-240E-LUK4

Reduction of iron and manganese at a waterworks in Denmark. The cutting edge technologies used for online measurements, oxygenation and pressure filtration helps secure the supply and drinking water safety. The solution comprises 4 x TFB 100 units with a shell height of three meters arranged in two parallel production lines. The flow rate is up to 270 m³/h.

After sales service

EUROWATER has an international sales and service organization. Our service cars are equipped with a wide selection of spare parts, often enabling us to solve problems at site – and in this way ensuring reliable operation of your water treatment plant. We offer service contracts and around-the-clock service.

Pure water treatment since 1936

EUROWATER is an international group with subsidiary companies in 14 countries servicing our customers through 23 local offices. Moreover, we are represented in most of the other European countries through dealers that all are water treatment specialists.

SILHORKO-EUROWATER A/S

DK-8660 Skanderborg

Phone: +45 86 57 12 22

info.dk@eurowater.com

www.eurowater.com

EUROWATER
A GRUNDFOS COMPANY