Drinking water purification

PURECO

THE PURE ECO

Drinking water purification

Natural drinking water for everyone! There are several ways to protect and conserve existing water resources and to provide potable water. From engineering perspective, this task is primarily about developing sustainable, efficient and environmentally friendly water management designs, technologies and solutions.

Our water purification works (extraction of iron, manganese, heavy metals, arsenic, etc.) are conducted in accordance with international standards. We pay special attention to the expansion, the conversion and reconstruction of existing facilities, we carry out our activities in a sustainable and cost-effective manner.

Among our previous successful projects, in addition to water purification assignments, we also designed and managed the construction of river surface water intake facilities, water treatment structures, and the mechanical engineering of the above.

Here is a list of the applied technological elements of water purification, frequently used by Pureco:

- sedimentation
- flocculation
- membrane technologies
  - ultrafiltration
  - nanofiltration
  - reverse osmosis
- coagulation
- sand filtration
- ion exchange / water softening
- desinfection
  - chlorination
  - UV
  - O_3

Using the latest technological process we are capable to **desalinate** sea water in order to provide drinking water either for human consumption or for agriculture/industrial purposes.

contenarized systems

latest technological developments

We offer different systems and technologies which can be integrated in the above mentioned purification processes. Also we offer the technological and engineering design and installation of the systems.

Pureco provides the following technological solutions for water purificaton

Extraction of manganese, iron, ammonium and arsenic from ground and surface waters

The excessive level of iron and manganese are common problems in different water sources mainly extracted from underground level. These contaminants provide undesirable visual and aesthetic properties such as color, odor and poor taste. The presence of arsenic and ammonium is a more serious problem, since they can lead to cancer and nitrite formation. Therefore, their presence in drinking water flows undesired, moreover prohibited by the authorities.

The most commonly used technologies that can solve these issues:

- oxidation with different kind of chemicals: $KMnO_4$ and Cl_2
- break point chlorination with calculated amount of Cl_2
- multimedia filter columns packed with different media: sand, peat, anthracite or the combination of them
- granular activated carbon (GAC) column for adsorption
- disinfection with chlorine or UV

Drinking water production from treated wastewater

Producing potable water from wastewater is a great challenge from engineering point of view and a blessed technological solution for areas, where drinking water shortage is a daily problem. Although, nowadays there are no technological barriers, producing drinking water from treated wastewater, the operation costs of the different applicable solutions might differ a lot, if the technology is not selected properly.
Pureco offers modular systems, specified for the actual water characteristics.
The applied technological steps are as follows:

- coagulation
- flotation / Sedimentation
- multimedia filter
- BAC filter
- membrane technology (usually UF and RO)
- calcite filter
- disinfection

Desalination

Desalination is the process of removing dissolved salts from water, thus producing potable water from seawater or brackish water. Desalting technologies can be used for many applications. The most relevant use is to produce potable water for human consumption in arid coast areas, supplying drinking water for municipalities. Nevertheless, its use for industrial applications is growing, especially in the oil & gas industry.
The main technological elements of a desalination process:

- membrane technology (UF and 2- or 3-staged RO)
- calcite filter
- disinfection

Filtration systems

Multimedia filters

General introduction

This unit contains a special layered filter media, which removes the non-dissolved contaminations (described by the parameter known as TSS – total suspended solids) from the water efficiently. The filter layers are selected according to the particle size of the contamination, and will be placed in a pressure vessel. The contaminations filtered by the media can be removed periodically by intense countercurrent flow. To improve the efficiency of filtering, peat or hydro-anthracite media can be used.

Advantages

- automatic operation
- long lifetime
- wide performance range
- excellent filtering performance

Fields of application

- potable water treatment
- to fulfill the demands of industrial filtered water
- water supply for hotels, hospitals, settlements
- used as preatreatment unit before other filtration systems - protection of water treatment devices

Activated Carbon Filters

General introduction

The active carbon filters of the unit removes the non-desired contaminations such as free active chlorine, odor and taste deteriorating materials and noxious haloform chemicals, AOX and THM compounds with adsorption from the untreated water. Beside of that the media filter decreases the organic content of the water and the possible fine contaminations. By periodical intense countercurrent flow, the deposited contaminations can be eliminated from the filter and the filter media will be loosened. If the adsorption ability runs out, the media needs to be replaced.
Activated carbon is usually installed in granulated form, filled in media filter systems, in this case the technology is called as Granular Activated Carbon (GAC) filter.

BAC – Biologically Activated Carbon

The combination of aeration and GAC is commonly referred to as biological activated carbon (BAC) process, or biologically enhanced activated carbon process. Aeration provides enhanced biological activity for the process, therefore not only the adsorption feature of the carbon is used, but it acts as a carrier of microbes that can biologically oxidize some of the contaminants. Due to the presence of the biomass, the life time of the carbon bed is prolonged, which leads to lower operatiion cost of this technological element.

Advantages

- automatic operation
- long lifetime
- wide performance range
- excellent filtering performance

Fields of application

- to fulfill the demands of industrial filtered water
- water supply for hotels, hospitals, settlements
- potable water production

Calcite filters

General introduction

Calcite is a naturally occurring calcium carbonate media. One of the advantages of Calcite is its self-limiting property. When properly applied, it corrects pH only enough to reach a non-corrosive equilibrium. Upon contact with calcite, acidic waters slowly dissolve the calcium carbonate to raise the pH which reduces potential leaching of copper, lead and other metals found in typical plumbing systems. Periodic backwashing will prevent packing, reclassify the bed and maintain high service rates. Depending on pH, water chemistry and service flow, the Calcite bed will have to be periodically replaced as the Calcite is depleted. On the other hand, as the calcium carbonate neutralizes the water, it will increase hardness so it can be used for re-mineralization of RO-centrate in potable water purifying systems.

Advantages

- raises pH of water to a non-corrosive equilibrium
- naturally occurring, inexpensive material
- low uniformity coefficient for maximum contact
- slower reacting for controlled pH correction
- automatic backwash feature

Fields of application

- water neutralization
- water filtration for hotels, spas, resorts
- post-treatment after RO
- potable water production

Membrane technologies

Microfiltration

General introduction

Microfiltration (MF) is a physical membrane separation technique, separating suspended materials, algae, and some microorganisms according to their particle size. Particles larger than the pores of the membrane (0.1 – 10 micrometers) are fully removed.

Applied membranes can be flat-sheet, hollow fiber, tubular and spiral wound. The process can be pressurized or vacuum driven (submerged design).

Fields of application

- filtration of fruit juices, wines and beers
- metal recovery in a form of colloids
- waste water treatment
- removal of suspended solids and some microorganisms
- pretreatment of desalination

Ultrafiltration (UF)

General introduction

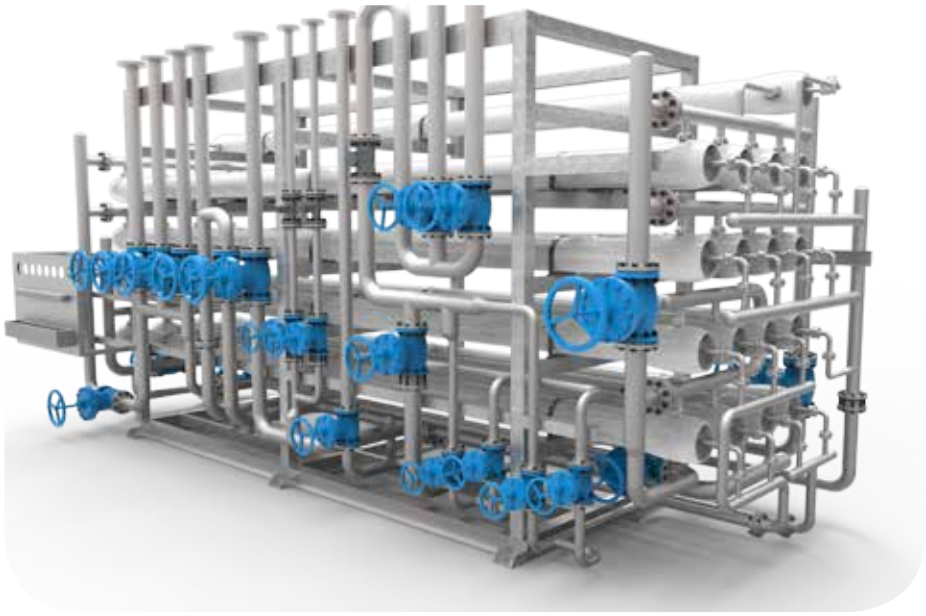
UF is usually used for removal of particles and macromolecules from raw water. As one of its most dominant place within any technologies, it is responsible for the pretreatment phase, followed by a RO installation. In case high suspended solids are present in the flow to be treated, UF is often integrated into the process, but additional pretreatment units (e.g. microfiltration) prior to UF might be required to prevent damage of the membrane units.

Advantages

- constantly high product quality
- high TSS removal efficiency
- compact plant size
- 90-100% pathogen removal efficiency

Fields of application

- microbiological pollutants removal from water
- industrial process water production
- laundry waste water recirculation
- waste water treatment in membrane bio reactors



Reverse Osmosis (RO)

General introduction

Reverse osmosis (RO) is a water purification technology, uses semipermeable membranes to remove dissolved particles, bacteria and viruses, positioned after an appropriate pretreatment stage. In reverse osmosis technique, the applied pressure of the system is slightly higher than the osmotic one, in order to make the process occurring. Due to the relatively high pressure conditions, the majority of dissolved materials are retained on the pressurized side of the membrane, while the pure solvent passes through, providing high quality

It is widely used for sea water and brackish water desalination because of its high removal efficiency of dissolved solids (Na^+, Mg^{2+}, Ca^{2+}, Cl^-, etc.).

The efficiency of the systems differs according to the applications, however the 70% of the feed can be usually considered as product.

Advantages

- very high quality of produced water
- small footprint
- minimal chemical consumption
- automatized operation

Fields of application

- sea and brackish water desalination
- potable water production
- process water production
- leachate treatment

Disinfection

On the field of potable water purification, it is necessary to reduce the microorganism activity to zero. For this purpose, strongly oxidizing chlorine-based and chlorine-containing compounds are the best and widely used options all over the world, because their installation and application are simple and safe.

Chlorine Dioxide Dosing Stations

General introduction

Application of chlorine dioxide as disinfection or oxidation material gaining more and more importance as an alternative to chlorine (drinking water treatment) or per-acetic acid (food and beverage industry).

Advantages

- enhanced disinfection potential
- disinfection effect is independent of pH
- not reacting with ammonium and dissolved organic materials of the water
- no odor or taste changes in treated water
- budget friendly operation costs
- high process safety

Fields of application

- disinfection of drinking water
- disinfection in food and beverage industry
- disinfection of swimming pools
- algae removal from the water of cooling towers

Hypo Dosing System

General introduction

Due to its wide range of applicability, simple installation this technique is one of the most popular disinfection technology.

Advantages

- low investment cost
- easy to install
- ideal for small and medium size water treatment systems
- no special security measures are required

Fields of application

- drinking water treatment
- process water treatment
- swimming pool treatment
- treatment in chemical industry
- wastewater treatment

Chlorine Gas Dosing Stations

General introduction

Most feasible technique in case disinfection of big quantities of water. We offer complete management for safe dosing and chemical storage.

Advantages

- vacuum dosing system,
- no leakage even at damaged chlorine pipeline
- continuous supply and disinfection is ensured
- more injector can be integrated in one system

Fields of application

- drinking water disinfection
- process water treatment
- swimming pool treatment
- treatment in chemical industry
- wastewater treatment

Ultraviolet Disinfection System

General introduction

Wide range of the microorganisms can be inhibited and/or destroyed by UV disinfection. UV technique uses short wavelength radiation, which is harmful for most microorganisms. At the wavelengths of 254 nm, UV breaks the molecular bonds within the DNA of microorganism, making them inactive. However, due to the chance of any remaining organic substances, present in the treated water or due to bio accumulation in the pipeline, the chance of reinfection is a danger. Therefore, it is important to install the UV disinfection closest to the point of use, or to dose chlorine in any forms if the network is long between the disinfection point and the end-users.

Advantages

- chemical-free application
- no changes in physical and chemical properties of treated water
- no change in odor and taste

Fields of application

- disinfection of water in households
- disinfection of water for pensions, hotels hospitals
- disinfection in food industry
- disinfection of drinking water with the combination of chlorine addition

Ion exchange technologies

General introduction

Ion exchange is a chemical reaction occurring between a positively or negatively charged ion and an oppositely charged resin. On the field of water treatment it is usually used for water softening, in case the water is considered to be hard. For water softening an anionic resin is used to lower the Ca^{2+} and Mg^{2+} content of the feed flow.
In case the feed flow has high concentration of anions like Cl^{-}, HCO^{3-} an cationic resin must be used.
Pureco has different type of ion exchangers, with single or twin columns, providing the opportunity to regenerate the resin of the column on site.

Advantages

- automatic regeneration
- continuous operation (in case of twin columns)
- reliable control mechanism
- long lifespan
- wide range of capacity

Fields of application

- periodic supply of softened water for industries
- supply of softened water for heating devices
- supply of softened water for hospitals, hotels