



**SOLUTIONS IN A FIELD  
OF WATER TREATMENT**

## TREATMENT VS PURIFICATION...

- **Purification** is a process of restoration water quality that it can be returned to the environment without the degradation of the environment.
- **Treatment** is a process of restoration water quality that it can be consumed or used. The main aim of water treatment is removal of pathogenic organisms and impart the water appropriate flavour quality.



## POLLUTANTS THAT APPEAR IN AQUATIC ENVIRONMENT CAN BE CLASSIFIED IN THREE CATEGORIES:

- Mechanical pollutants- are substances with various size and various degrees of fragmentation, undissolved in Mechanical impurities - these are substances of various sizes and varying degrees of fineness, insoluble;
- Chemical pollutants- are present dissolved in an amount greater than standards;
- Bacteriological pollution- life-threatening bacteria, viruses or protozoas/protocists.



# WATER TREATMENT METHODS

## Mechanical

Sedimentation

Straining

## Physicochemical

Coagulation

Filtration

Iron  
Removing

Disinfection

Demanganization





# COAGULATION

Coagulation is process of adding chemical substance called a coagulant to the water with negatively-charged colloidal particles.

Coagulant is very quickly mixed with the water.

In this way neutralization of electrical charges of colloidal particles is done. It means that mutual repulsion of these particles is eliminated.



# FLOCCULATION

Flocculation is a process that occurs after quick mixing of coagulant with the water, during slow stirring.



Then, it is physical contact of both suspensions. As a result, flocks of joined colloidal particles occur in the water.



Next, they sediment at the bottom of the mixer.



# FILTRATION

The first stage of water treatment, or rather preparing the water to appropriate process of treating water is primary filtration, so called mechanical filtration, during which we use **mechanical filters**.

The aim of mechanical filtration is remove suspensions and solids; what is more, it protects installation and the rest of devices from mechanical damages and siltation.

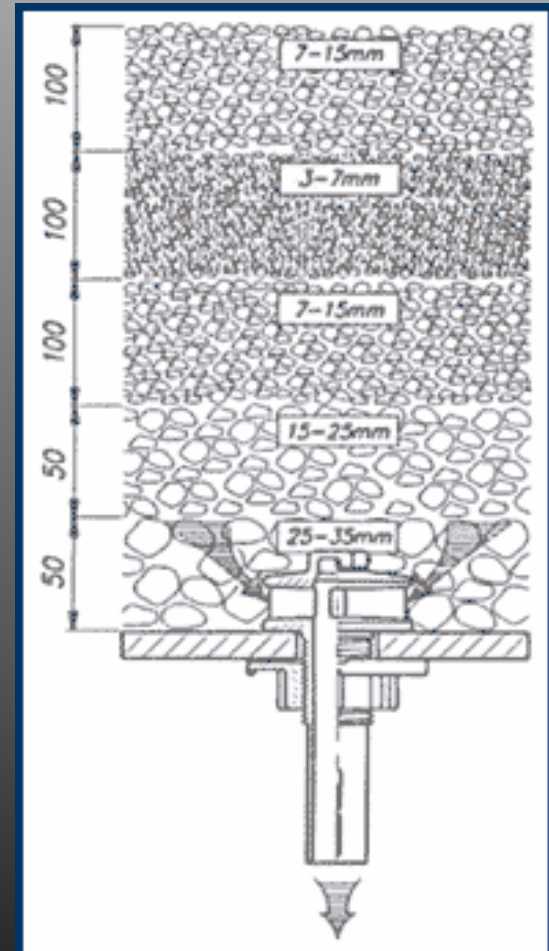
When we want filter to the water more precisely, it could be obligatory to use membrane techniques.





# FILTRATION

- In a case of huge amount of water filtration, gravitational filters are used.
- gravitational filters are chambers with a shape of swimming pool filled with filtration material. At the bottom of filters there is a drainage system (filtration nozzle)
- However, at smaller water treatment plants we use filters that are pressure vessels filled with appropriate filtering materials.



# SAND FILTRATION

- **Filter bed** creates fine sand (0,45- 0,55 mm); relined with gravel (5- 60 mm); fulfills the role of keeping up deposit. It is situated in special tank.



- Low-rate filters-the work of these filters is based on mechanical absorptional and biochemical processes.
- High-rate filters- their work is based only on mechanical filtration and absorption.



# CARBON FILTRATION

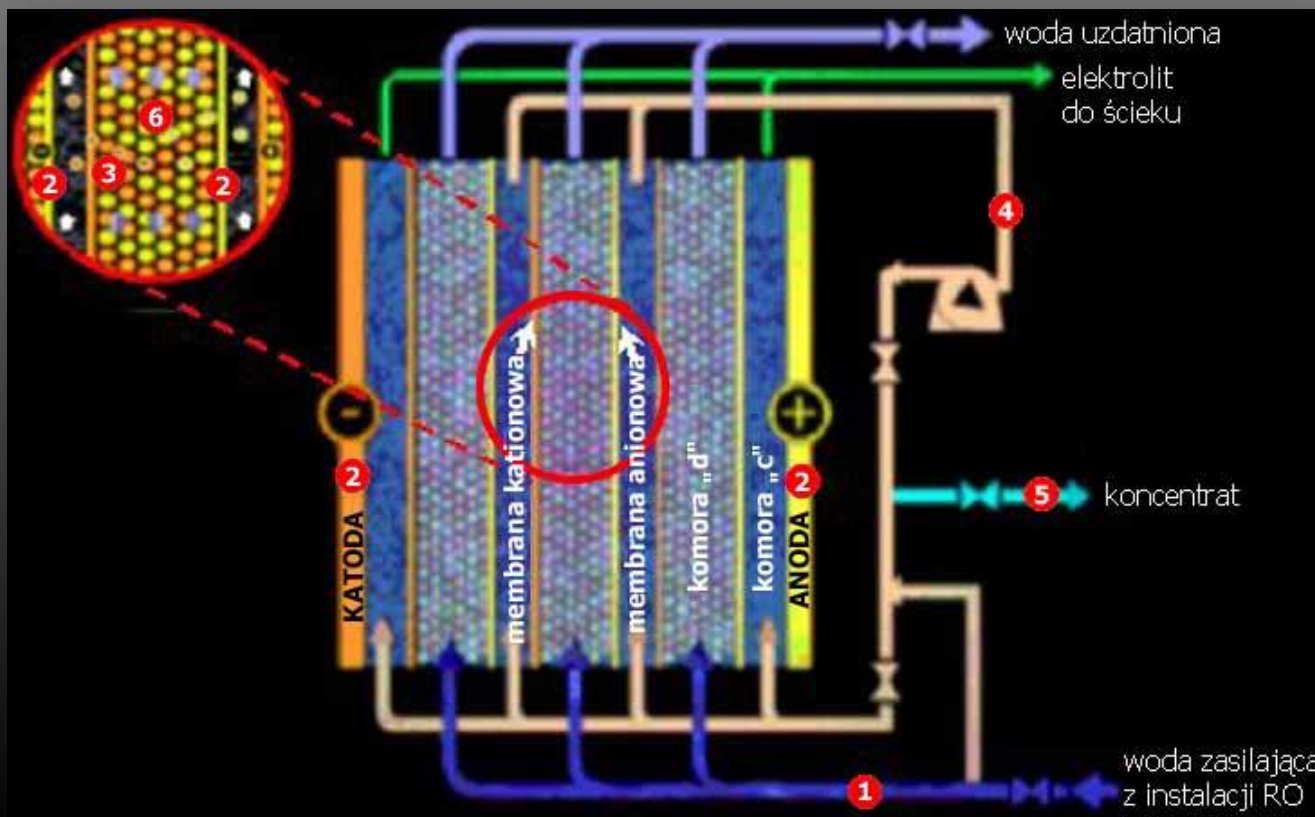
Activated carbon is effective filtration and sorption media. It is especially prepared substance that is characterised by high porosity.

In filtration systems the active carbon is usually one of it's component. Carbon is highly effective. Therefore, As it is with the sand beds that it has to be washed cyclically, the active carbon has to be reactivated through calcination of gathered organic substances in it.



# ELECTRODEIONIZATION

**Electrodeionization** – the process that uses traditional ion-exchange resins, but their regeneration follows after using electric current. The process is economical, stable and infallible.



# IRON REMOVING AND DEMANGANIZATION

Removing iron from water is a technology dependant on the form of iron occurence and it could be:

- coagulation- colloidal iron,
- decarbonization using calcium- iron mainly in a form of sulfate
- ion exchange- low iron content in ionic form
- aeration – high content of ionic iron

Typical iron removing system contains aerator and ordinary pressure filter.



# IRON REMOVING AND DEMANGANIZATION

Demanganization is identical to the iron removing process and often both of these processes are carried out in one device.

When water pH is alkaline, then both iron removing and demanganization can be carried out in single-step filtering and aeration installations.

Manganese oxidation process is considerably slower process than iron oxidation.



# WATER DEMINERALIZATION



Demineralization process is based on removing all cations and anions of dissolved salts in the water- this can be realised with: distillation, ion exchange or reverse osmosis.

The most spread and known method of water demineralization is reverse osmosis method. In this approach the pre-treated water under high pressure is directed on **semi-permeable membrane**, which main aim is separating substances with different concentrations.

Molecules of pure water, under high pressure transfer through the membrane, which collects impurities on the side of crude water. The impurities are concentrated and removed.



# DISINFECTION

Disinfection is a process of pathogenic organisms elimination (pahogens). It is the last step of water treatment process.

- Chlorination
- Ozonation
- UV irradiation





# TECHNOLOGY SUMMARY

- Water treatment is a process of restoration water quality that it can be consumed or used. The main aim of water treatment is removal of pathogenic organisms and impart the water appropriate flavour quality.
- Construction of water points and construction of public water supplies requires careful choose of water source, establishing the range and the method of water treating and protecting treated water against recontamination.
- Basic processes of water treatment are : filtration, sedimentation of suspensions and disinfection.



# SUGGESTED TECHNOLOGY

- Proprietary treatment technology- treated water does not contain more than 10% of the permissible impurities

## **The technology employed has the following properties:**

- High-pressure initial ferrum removal process in an aerator, using an integrated stand for initial precipitation of iron compounds
- Innovative absorption system and removal of iron oxides
- Work with a constant work pressure
- Development of proprietary filter technology
- Employment of innovative filter beds manufactured by us
- Innovative water aeration system



# THE TECHNOLOGY EMPLOYED HAS THE FOLLOWING PROPERTIES:

- Filter structure
- Analysed backwash water recovery system
- Significant reduction of chemical additives in water filtration process
- Autonomous, dedicated control system
- The filter has an innovative reverse flow system to rinse the bed
- Increased efficiency (speed and effectiveness) of aeration



# SELECTION THE APPROPRIATE WATER TREATMENT TECHNOLOGY TO ALMOST ANY INTAKE OF BOTH DRINKING AND INDUSTRIAL WATER

Other technologies offered:

- Advanced pervaporation processes
- Mechanical filtration (in-line filters and cylinder filters)
- Active carbon filtration (in-line filters and cylinder filters)
- Ferrum and manganese removal (quartz beds and catalytic beds)
- Iron exchange (softening, removal of nitrogen compounds)
- Demineralization (ion exchange, reversed osmosis systems)
- Chemical water composition correction (dosing systems; chemicals)
- Disinfection with UV lamps



# EXEMPLARY SCHEME OF WATER TREATMENT FOR BIG CITY

