

# 2018

## Water Treatment



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Eagle Space Group provides Water Treatment combining technical-technological knowledge with the local market specifics and its wide international experience. All this creates a solid base for wide and extensive range of the project design and consulting services, production and engineering services for our clients:

Design of the technological solutions

Plant installation

Equipment

Maintenance

Equipment service

Equipment and chemicals supply

Education

## **TURNKEY WATER TREATMENT PLANTS**

- Filtration (gravity or pressure) at different fractions of the quartz sand or activated carbon
- Coagulation, flocculation and sedimentation (decantation)
- Dimerization and manganese removal
- Softening and demineralization (water softeners)
- Ultra filtration
- RO Systems (reverse osmosis)
- Ozone plants (ozone dosage)
- UV Sterilization
- Dosing systems
- Required chemical metering systems in the treatment process (control of pH, coagulants, oxidants, disinfection, chlorination, etc.)

### **PRO SYSTEMS :**

Compact systems **PRO-80** and **PRO-100** are designed for the purification of the well water, whereas the main task is iron and manganese removal. Additional units for the water purification such as UV sterilization and activated carbon filters can be added to the system if the analysis proves it necessary. The capacity of **PRO-80** is 80 m<sup>3</sup>/h and is sufficient for the 12,800 inhabitants settlement (according to European standard, consumption is 150 L per inhabitant). Whereas, the capacity of **PRO-100** is 100 m<sup>3</sup>/h. It is sufficient for the 16,000 inhabitants settlement (according to European standard, consumption is 150 L per inhabitant).

**PRO SYSTEM** can be built in two basic versions: manual and full automatic operation. In systems with manual operation, all process valves are hand operated by operator, which is necessary to perform periodical filter backwashing. Full automatic operation for **PRO-80** and **PRO-100** rely on pneumatic operated valves and system can be operator free, just periodical check for consumption chemicals on alarm calls.

## Filters Systems :

Filtration is a crucial process in water treatment systems. Filtration units are of different designs and purposes. They are used in all parts of water systems for filtration of unprocessed water and water in the final procedure of refining. Sand filters and filter cartridges are used to remove suspended and colloid particles from unprocessed water.

**Filters for deferrization:** Iron dissolved in the water usually is in the form of iron-bicarbonate, due to the excessive level of free carbon dioxide. Removing iron is an important procedure in water purification since indissoluble hydroxides can be produced and they affect vital parts of purification systems, block particles of ion-changing resin, form deposits on RO membrane, etc. The device that removes iron is a filter, which is filled with catalysis filling (Greensand or FMH) that converts iron into the form of sediment iron hydroxide in the presence of dissolved oxygen. In the process of periodical reverse rinsing, this colloidal deposit is removed from catalyst layer. No chemicals are used during the operation of the filter. Catalytic material MnO<sub>2</sub> has an extremely long period of duration.

**Multimedia filters:** These filters are used to remove various materials in smaller concentrations in the same device. Besides removing suspended and colloidal particles; iron, manganese, etc. can also be removed by multimedia filters. Multimedia filters are not different in construction from the standard ones.

**Microfiltration (pre-filter):** This process is used to block the penetration of mechanical and suspended particles most often to the surface of RO membrane. Cartridges with the porosity of 25, 10 or 5 mm are made of cross-rolled PP fiber. Depending on the capacity, it may be conducted with one or more cartridges with a suitable length (250, 500, 750 and 1000 mm). Depending on cleaning requirements, filter cartridges are periodically replaced with the new ones.

**Sand filters:** Fast sand filters or filters under pressure are used to separate all suspended material and particles of 30 – 60 µm, or so-called mechanical impurities. Filtration under pressure can be performed in one or more parallel filters. The construction of filters consists of vertical and horizontal steel container cylindrical in shape with shallow bottoms, suitable supports and handles, and all the necessary connections as well. Working pressure in the filter, depending on the type of installation, can range from optimal 2 bars up to maximum 10 bars.

Upon the request of the client, we make filters made of carbon (S235JRG2) or stainless (AISI 304, 316) steel. Depending on the capacity, we produce filters in various forms.

Filters can be installed separately or in series

Piping system can be made of steel (with epoxy protection or rubberized), PVC or various inox alloys.

**Activated carbon filter:** The good quality, activated carbon filter material applied, removes free chlorine and organic matters present in water, while water is flowing through the activated carbon filter bed. Impurities retained on the filter bed can be removed by backwash, the filter material loosened, and the charge be used further on. After some time, the charge becomes saturated and incapable of absorption, and the activated carbon needs to be replaced (every 1-2 years).

**Iron and manganese removal filter:** A high iron and manganese content causes discoloration of water. The transparent color of clean water turns reddish, but sediments may also be formed on the surfaces in contact with air. The equipment we offer prevents these adverse effects. For this undertaking, we use catalytic filter material, which can convert dissolved iron and manganese ions to substances insoluble in water. These compounds are easy to filter out from water. The precipitated flocks can be removed by means of backwash cycle.

**Softener systems:** Softening is very often necessary in order to remove calcium and magnesium salts from raw water. The most common way is the use of a strong action ion exchange resin, which is regenerated with diluted commercial rock salt. We can offer a complete production program for water softening, starting from small capacities for household purposes to heavy duty industrial softeners. The operation of each installation could be manual or automatic. The regeneration could be time or quantity controlled. The filter vessel could be either GRP, carbon steel polyethylene coated or carbon steel epoxy painted. Filter vessel from stainless steel is available on request.

**Duplex volume controlled water softener:** The device is of continuous operation, so it is capable of providing soft water during regeneration, too. Therefore is suggested in the case of fluctuating water withdrawal. The device starts regeneration cycle depending on water quantity having passed through, it means the system is volume controlled. (Regeneration starts automatically after the exhaustion of the resin column).

**Industrial water softeners :** Completely automatic modular water softeners that can be installed in configurations of up to four units, capable of operating under every possible mode. Main features are: Electronic control for optimal operating cycle management, Counter-current regenerating for reducing salt and water consumption to a minimum, all operating parameters adjustable on-site by means of a user-friendly interactive programming system Up to 60 m<sup>3</sup> /h in the four-unit configuration, "Peak Flow" patent for adjusting the number of units in operation depending on the flow when compensating wide variations in flow-rate (hotel applications, batch operations).

## **MEMBRANE FILTRATION SYSTEMS**

In the water treatment, membrane filtration is the technique with lowest operation costs used to remove particles and salts in the water. For this area we offer multiple and high quality systems. Membrane filtration is a physical procedure for particle separation by means of semi-permeable membranes. There are 4 types of technologies, depending on the size of the particles/ molecules that are to be removed:

Microfiltration

Ultrafiltration

Nano filtration

Reverse osmosis

From these technologies, we are specialized in plants for Nano filtration and Reverse osmosis. Our specialists with their detailed branch knowledge have not only the capacity to design the optimal plant for the particular application but also to provide the complete water treatment solutions.

**Reverse osmosis systems:**

Reverse Osmosis is the reversal of the natural osmosis process. This process is used to desalinate aqueous solutions. Using suitable high-performance membranes it is possible to remove more than 99% of all salts from an aqueous solution. Reversible osmosis (RO) uses semi-permeable membranes (permeates). Reversible osmosis is used in systems where a high quality of purified water is necessary to be obtained (pharmacy, electro-technology, chemo-dialysis, etc.) or e.g. when seawater is processed in order to produce potable water. In recent times, RO systems are widely used in purifying water from wells due to a more common contamination of ground and underground waters. The material membranes are made of mostly influences the quality of the water purified in the process of reversible osmosis. Breaking and clogging of permeates cause water contamination.

**Advantages:**

The process is continual (24/7)

The process is isothermal, there are no phase changes of the fluid which is treated It has an extreme selectivity for certain elements, compounds and solutions

Energy balance is very satisfactory especially in comparison with distillation procedure It is environmentally-friendly

Maintenance costs are low

The construction of the device is modular which enables expanding of the facilities

**Desalination Reverse Osmosis Plant for the Potable Water**

We offer two standard series of reverse osmosis plants especially for the desalination of potable water for industrial purposes:

Series eco PRO: Best price-performance ratio due to a high degree of standardization

Series TW: Highest flexibility due to customer-specific execution

**Reverse Osmosis Plants for the Desalination of Brackish Water**

We have designed the series BW especially for the desalination of brackish water for potable water supply as well as for industrial applications.

**Reverse Osmosis Plants for Seawater Desalination**

We have designed the SW Series especially for the desalination of seawater for potable water supply.

## PUMP STATIONS

Booster pumps are designed to smooth out water pressure in areas where the flows are highly variable. This type of pumps is essential in water management systems and is used in a wide range of public and private settings. The booster pump itself is installed at the connection point between the water supply pipe and the primary building.

The vast majority of booster pumps are installed in rural properties.

There are two types of booster pumps: single stage and multiple stages. A single stage pump is attached to the end of the water supply pipe and can be repaired without affecting any other water delivery pipes. The entire process to install a single stage pump takes between three to five days, depending on the location and overall condition of the water pipes.

With an eye on the growing market for various types of pumps for different Industrial applications, has developed a wide range of Rugged, Reliable and Efficient Pumps for different applications. The range is continuously growing with additions to the product portfolio at regular intervals. Industrial Pumps from find applications not only in handling water but different types of fluids in Paper, Process and Pulp industries, Paint, Dyes and Chemical Industries, Mining and Metal Manufacturing Industries, Food & Beverage Industries, Textile industries, Power Industry, Machine Tool Industry apart from General Water supply.

## OZONE PLANTS

Ozone has an extraordinarily large efficiency on killing microbes. Applied correctly, it has a very quick and efficient effect on almost all known bacteria, viruses and other microorganisms. Moreover, Ozone degrades to Oxygen and does not leave any by-products. Thus, it is a highly efficient and environmentally friendly mean of water disinfection, as well as for removing Iron or Manganese traces from potable water.

**Typical application areas are:** Water treatment in swimming pools, potable water or cooling water treatment, water treatment in beverage industries, Zoo pools and aquaria

**Ozone Plant:** The ozone generating system guarantees maximum operational safety and reliability at minimum operating costs. Depending on the version, the system produces ozone from compressed air or oxygen at a rate of 70 to 735 g per hour. Electronic power circuitry ensures a reproducible ozone quantity independent of power supply and pressure fluctuations. The electronics additionally provides full protection for all electrical components. The new design of the ozone generator and the use of dielectric with high thermal conductivity guarantees low energy and cooling water consumption in a compact unit.

### Advantages:

Low compressed air consumption, due to dynamic variable pressure drying with low primary pressure (air systems)

Minimum energy and cooling water consumption ensured by new, maintenance free generator concept

Automatic ozone generation largely independent of voltage and pressure - fluctuations



High tolerance to influences from installation environment

Simple installation thanks to compact design

## **UV SYSTEMS**

Disinfection of water is most commonly conducted by using various chemical compounds with a chlorine base (NaOCl, CaOCl<sub>2</sub>, gas chlorination) when oxidation of organic and other materials in the water is done. Post-chlorination is a mandatory procedure in all communal systems for the production of drinking water. Ultraviolet (UV) water sterilization is based on a high sensitivity of microorganisms (bacteria, viruses, algae and their spores) to UV radiation with the wavelength of 254 nm. If it is used with sufficient intensity, UV light can ensure an excellent sterilization of water as it affects the DNA of microorganisms. This bio-structural disorder results in the incapability to reproduce which makes microorganisms harmless. With UV Plants, it is possible to have reliable and chemical-free water treatment for disinfection purposes and degradation of unwanted components. Easy installation, low maintenance and a variety of types, result in most economical projects for multiple applications.

**UV-system:** UV Plants of thin layer construction type with high-flux radiators can be used for flow rates of up to 33 m<sup>3</sup>/h - depending on the type of transmission.

### **Advantages:**

Low, maintenance work, due to few but powerful radiators in amalgam technology with high lifetime

Constant capacity also with instable temperature conditions thanks to special radiators

Economy of spare radiators thanks to sparing ignition and exact adjustment of the optimal radiator operational current

Easy cleaning, thanks to complete cleaning system as accessory

Special separation of control gear from control drive over long distances no longer a problem thanks to BUS technology

Easy and individual adaptation to operational conditions and circumstances by freely programmable control drive

Secure disinfection by monitoring via long-time-stable UVC probe

## **CHLORINE DIOXIDE IN WATER TREATMENT**

Chlorine dioxide is an extremely reactive gas, which – because of its instability – cannot be stored, and must only be produced in the required quantities in special plants on the site where it is to be used. Chlorine dioxide offers a number of advantages for water disinfection compared with chlorine, the disinfectant mainly used.

With its Chlorine Dioxide Plants, we are setting new safety standards in the production of chlorine dioxide using the chlorite-acid method. In the new process version, the safety

standard of dilute precursor chemicals is combined with the economy of concentrated chemicals, in that concentrated hydrochloric acid is pre-diluted in an intrinsically safe dilution.

**Chlorine Dioxide Plants MW:** The chlorine dioxide system uses the chlorite/acid process. Up to 120 g/h chlorine-free chlorine dioxide is generated from a sodium chlorite solution using hydrochloric acid in a batch process. The innovative reactor design ensures a reliable process control and achieves an outstanding efficiency well over 90 percent.

Chlorine dioxide system type M with a generation capacity of up to 6 resp. 12 g/h of chlorine dioxide is especially designed for the extermination of legionella in smaller and mid-sized public buildings, such as hospitals, hotels or sports complexes. This guarantees cost-efficient, environmentally friendly operation with minimal use of chemicals.

**Advantages:**

- Reliable process control Minimal investment costs
- Several points of injection can be operated
- Economical operation due to minimal use of chemicals
- High operational safety due to intrinsically safe process control No ClO<sub>2</sub> loss due to closed gas supply
- High degree of stability in the ClO<sub>2</sub> solution

**ELECTROLYSIS SYSTEMS**

Electrolysis is an economically sensible and technically perfected alternative to the dosing of sodium hypochlorite or other disinfectants. Chlorine, hydrogen and sodium hydroxide can be generated on site from harmless sodium chloride. The chlorine generated can either be dosed directly into the water as hypochlorous acid (HOCl) or temporarily stored with the sodium hydroxide generated as sodium hypochlorite (NaOCl).

**Advantages**

- Robust, simple technology
- Compact, space-saving design
- Safe plant control with remote diagnosis via modem
- Economic operation thanks to the inexpensive raw material sodium chloride and less chemical consumption for pH value adjustment Robust technology
- Compact, space-saving design Safe vacuum plant technology
- Simultaneous production and metering of ultrapure hypo chloric acid and sodium hypochlorite
- Chlorination and pH value adjustment with one single plant



Economic operation thanks to the inexpensive raw material sodium chloride and less chemical consumption for pH value adjustment

**Application areas:** Specifically suitable for applications where a robust and clearly arranged technology is required, and where an entrainment of sodium chloride into the water to be treated has no influence specifically economic alternative for all applications which require metering of hypo chloric acid with simultaneous pH value correction

## **DOSING SYSTEMS**

By the use of dosing systems, the dosing task becomes increasingly easier. Pre-mounted complete solutions are immediately available and ready for the use in important applications of dosage. Sensor technology, controllers and metering pumps form a unit with the necessary tanks and are ready for operation without installation work.

### **Advantages:**

Only one supplier and contact partner

No interface problems between single components

No own mounting works necessary. On demand, the whole system will be supplied as pre-mounted and ready for operation or our technicians at the spot will commission it.

Our customers are provided with a final solution that has only to be connected to hydraulic and electrical supply lines. All dosing systems are produced in our own factories, i.e. not only the main components such as metering pumps, controllers, sensor technology and tanks but also the mounting of the systems.