

UV Systems supplementing Membranes

Drinking water disinfection in Barcelona

The state of catalonia is located in the northwest of Spain and has a rather dry climate. The river Llobregat rises in the mountains which surround Barcelona and opens out into the Mediterranean Sea.

Most of the drinking water of the city of Barcelona is drawn from the river Llobregat, the water of which is brackish with differing parameters. The turbidity of the water varies due to sea level and amount of precipitation in the mountains.

In the case of too high turbidity, the water of the river is not used, but the drinking water is then obtained from various wells for further treatment.

The Waterworks Sant Joan Despi (operating company is Sociedad General Aguas de Barcelona AGBAR S.A.) was built in 1954 and expanded in 1992 in cooperation with the consultancy firm Aquaplant. This Public Water System (PWS) supplies 50 % of the whole population of Barcelona, i.e. 2.5 million habitants.

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Description of the treatment steps at the plant:

The primary water treatment steps are used for desalination and the secondary treatment for removal of the precursors of Trihalomethane (THM).



KEY DATA AND PARAMETERS OF THE PWS SANT JOAN DESPI

Flow rate in total:	5.3 m ³ /s (19,080 m ³ /h)
Turbidity:	up to max. 1,000 NTU
Conductivity:	approx. 2,000 μS/cm
Seawater conductivity:	approx. 50,000 μS/cm



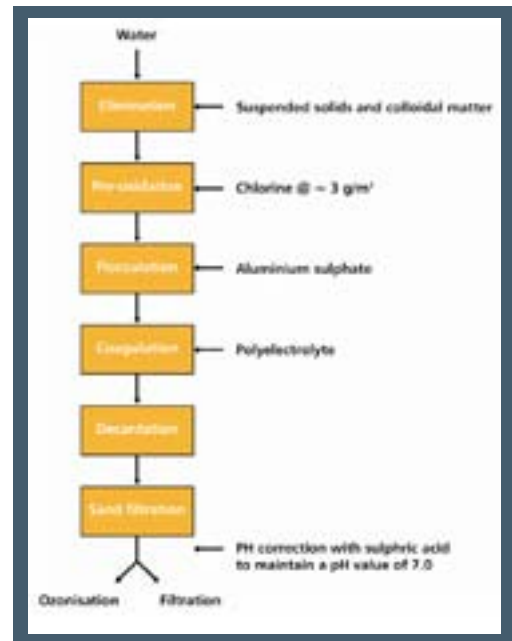
- » Elimination of suspended solids and colloidal matter
- » Pre-oxidation with chlorine @ $\sim 3\text{g/m}^3$
- » Flocculation with aluminium sulphate
- » Coagulation with Polyelectrolyte
- » Decantation
- » Sand filtration
- » pH correction with sulphuric acid to maintain a pH value of 7.0.

Afterwards the flow is divided into two equal streams of $9,540\text{ m}^3/\text{h}$. The split-up proportion can be varied from 30 to 70 % each stream due to several requirements. Both streams are used for elimination of THM precursors and extended diminution of the salt concentration.

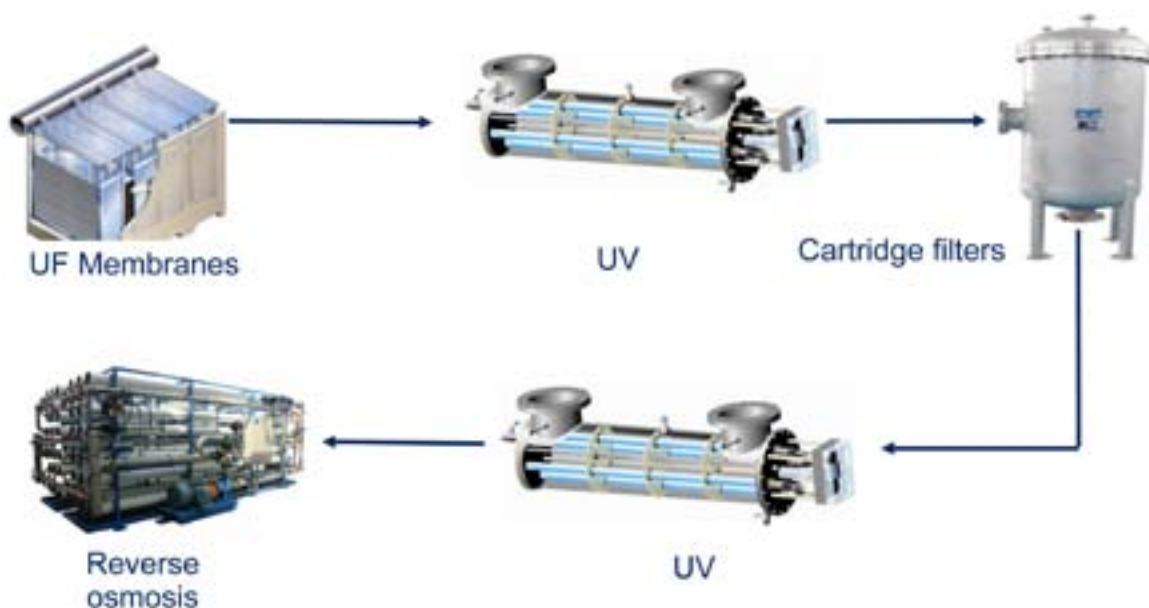
Secondary treatment types are:

- » Ozonation and filtration with activated carbon ($9,540\text{ m}^3/\text{h}$)
- » Filtration treatment ($9,540\text{ m}^3/\text{h}$):
- » Ultra filtration. ($0.01\text{ }\mu\text{m}$)
- » pH correction with sulphuric acid
- » Disinfection step with UV system BX3200 w against biofouling
- » Filtration with cartridge filters. ($5\text{ }\mu\text{m}$)
- » Disinfection step with UV system BX3200 against biofouling
- » Addition of sodium bisulphate as safety step to avoid any chlorine residual infiltration in the reverse osmosis membranes
- » Reverse osmosis
- » Remineralisation with calcium carbonate

After these treatment steps the two divided water streams are mixed again and finally disinfected with chlorine (1ppm) for 1 hour (contact time) before distribution.



The primary water treatment steps are used for desalination



Advantages of using UV disinfection

Before the UV systems were installed, several pilot trials had been carried out on site.

The advantage of applying the disinfection steps between the filtration steps is the reduction of biofouling of membranes and as an additional aspect the lifecycle. The number of cleaning cycles could be reduced drastically.

Without using the UV disinfection step the cartridge filters had to be cleaned on a weekly basis. Including the UV treatment steps, the cleaning intervals could be extended up to once in a month. During the pilot trial the cleaning intervals were prolonged up to three months. In addition the cartridge filters have to be replaced from time to time (twice a year). In pilot trial it was shown that the exchange intervals can be extended, estimated every two years.

The use of disinfection steps between filtration systems like membrane filtration or others improves the lifetime considerably and reduces the maintenance intervals. UV Disinfection is an excellent treatment method against any biofouling process during filtration processes.

This method can be applied to all membrane filtrations like RO, UF, MF, and others.

Advantages for using UV Disinfection:

- » Preventing biofouling on membranes
- » Extended lifetime of membranes or any filter using membranes
- » No chance for blocked RO membranes due to bacteria
- » Longer maintenance intervals
- » Lower maintenance cost due to longer lifetime of membranes

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