

DRACE *medioambiente*

Activities / Water treatment

Tertiary Treatment at the Benidorm Waste Water Treatment Plant



Our activity
at the service of nature

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Our activity at the service of nature

DRACE *medioambiente* is fully integrated into water treatment in all its variations: the water treatment for human and industrial use, seawater and brackish water desalination, together with urban and industrial wastewater treatment.

Similarly, its activities also include the treatment of solid urban waste, the specific treatment of the biosolids produced in wastewater treatment processes, compost plants and thermal drying operations.

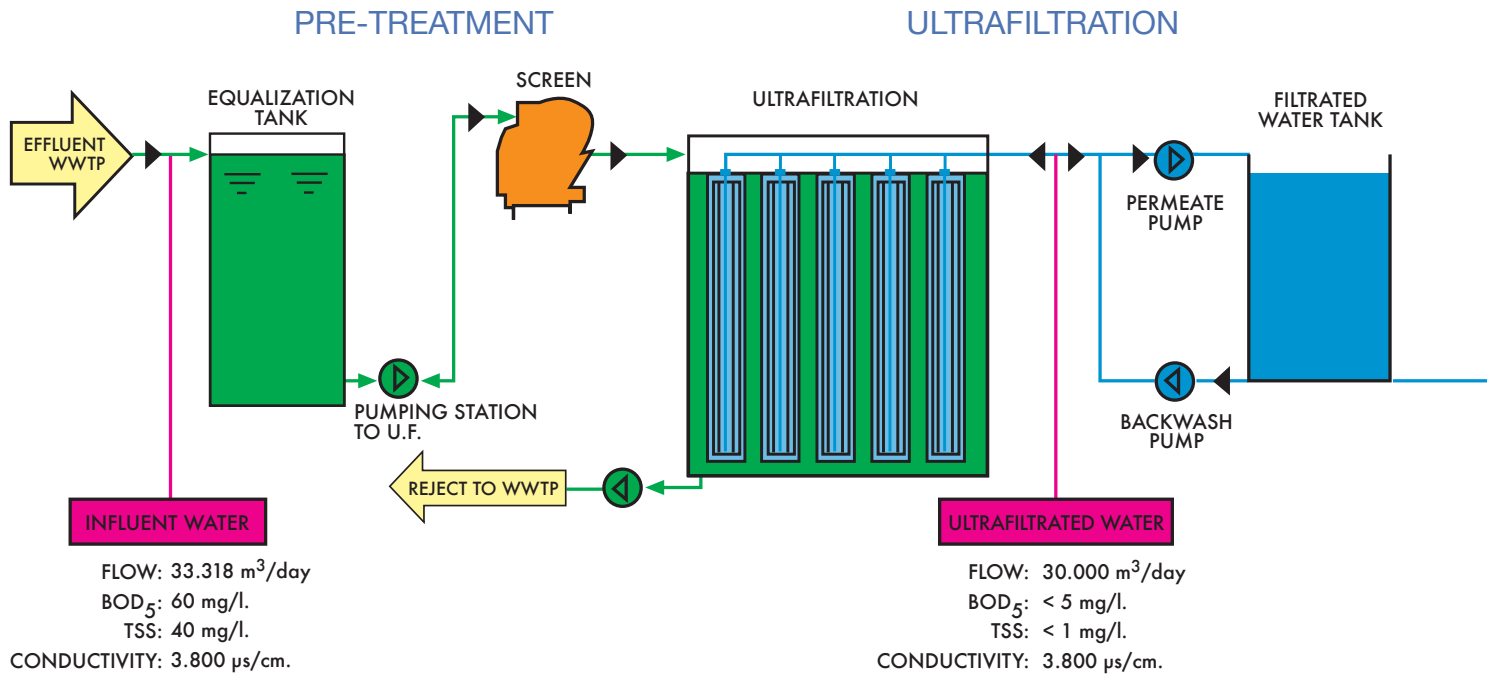
These services are provided in global application, comprising prior studies, project, works, supply and installation, starting up and operation of the plants and treatment systems.



Benidorm

The growth in population, the increase in water consumption per inhabitant, the agricultural and industrial development, the influence of tourism and the Mediterranean climate, with frequent summer droughts, have led to traditional water supplies becoming insufficient to cover current demands. Therefore, regenerated wastewater has become a new alternative source of water supply. The regeneration processes of treated wastewater provide an additional water resource which, by means of a recycling system, can be exploited in order to satisfy various uses that do not require human consumption water quality.

Complete Plant Description



Technical Sheet

Customer:
 Consellería de Infraestructuras y Transporte
 de la Generalitat Valenciana

Contractor:



Budgets:

Construction: 13,909,994.74 €
 O&M 1: 3,666,647.46 €
 O&M 2: 6,254,487.33 €

Execution period: 1 year

O&M period 1: 2 years
 O&M period 2: 5 years

Engineer responsible for supervision:
 Mr Jesús Ayllón Pérez

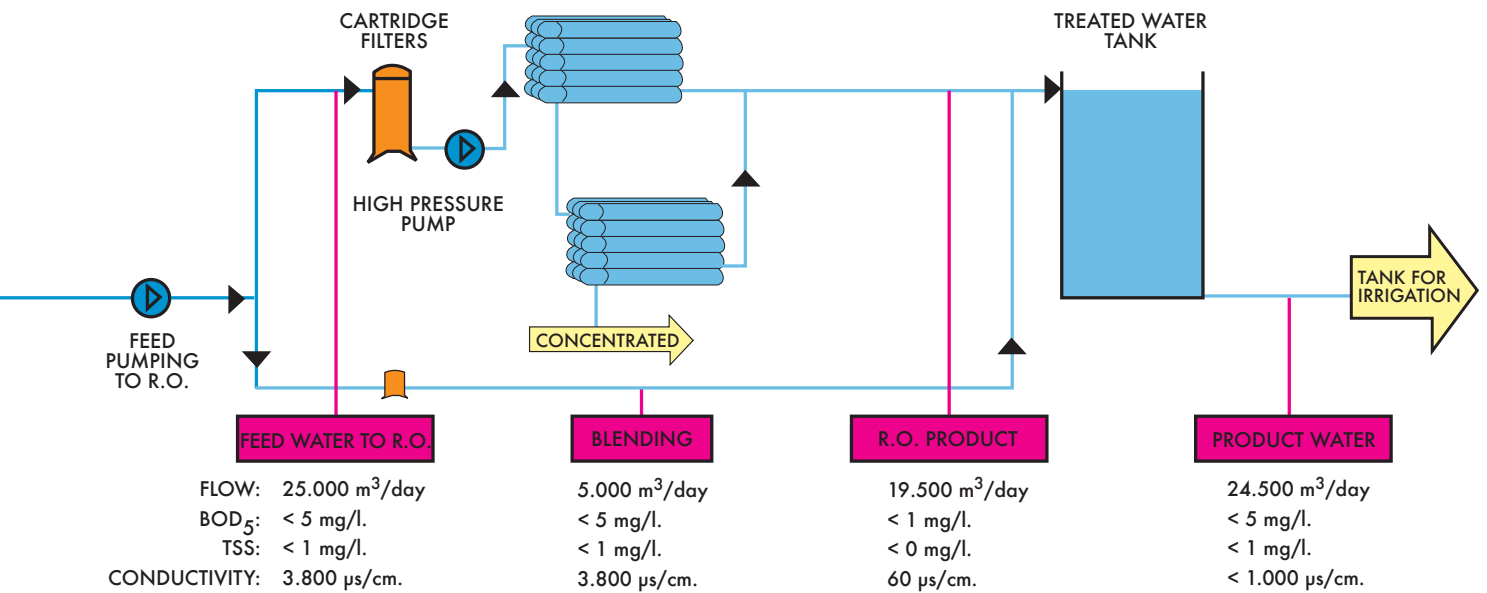
Project Manager:
 Mr Jaime Zúñiga Encinas

O&M Manager:
 Mr Oscar Rodríguez García

Benidorm tertiary treatment is designed and built for the regeneration of treated wastewater from the existing WWTP and its reuse in indiscriminate agricultural irrigation in order to encourage maximum water exploitation by the Valencia Administration. Owing to the saline character of Benidorm wastewater, the regeneration of water that is suitable for irrigation involves desalination treatment, that enables conductivity to be reduced to values of less than 1,000 µs/cm. The process chosen for re-use involves pre-treatment with ultrafiltration technology followed by desalination with reverse osmosis membranes, that generates product water with high physical, chemical and health qualities.



REVERSE OSMOSIS



Water properties

	Feed water	Product water
BOD ₅	30 mg/l	≤ 10 mg/l
TSS	40 mg/l	≤ 5 mg/l
pH	7.2	6.5 - 7.5
Faecal Coliforms	100,000 c.f.u./ 100 ml	< 200 c.f.u./ 100 ml
Conductivity	3,800 µs/cm	1,000 µs/cm
Helmint eggs		< 1 egg/l

The water to be treated in the Tertiary Treatment comes from a secondary treatment carried out at Benidorm WWTP.

The initial tertiary treatment for Benidorm WWTP was designed with the following facilities:

- Connection work with existing plant.
- Measurement and regulation of flow to tertiary treatment.
- Double equalization tank.
- Pumping to tertiary treatment.
- Screen of wastewater through self-cleaning screens with 500 µ pass.
- Ultrafiltration system with submerged hollow fibre membranes as pre-treatment prior to reverse osmosis.
- Double equalization regulation tank of ultrafiltrated water.
- Flow regulation system to reverse osmosis to perform the blending of 5,000 m³/d of ultrafiltrated water and 19,500 m³/d of permeated water.
- Safety filtration with cartridge filters.
- Three lines of two stages reverse osmosis desalination.
- Remineralization by calcium hydroxide dosing.
- Flow measurement and storage of the effluent for further irrigation.





Ultrafiltration

In order to select the best pretreatment for the reverse osmosis, before designing Benidorm WWTP tertiary treatment, an in situ pilot study was performed, in which four microfiltration and ultrafiltration technologies were tested. The purpose of this testing was to select the most suitable system for the quality of the water feeding the tertiary treatment and to consolidate the design criteria for the reverse osmosis pretreatment.

The conclusions of this testing resulted in the selection of the Zenon Zeedweed 1000 submerged hollow fibre membrane (polyvinyl difluoride) ultrafiltration system with a nominal pore size of 0.034μ .



The ultrafiltration comprises six trains, with four cassettes per train and a total filtration surface area of $53,510 \text{ m}^2$.

The system production is $33,318 \text{ m}^3/\text{day}$, with a 90% recovery. In addition, the plant design and the already constructed civil works are prepared so that expansion from six to twelve UF trains can be carried out in the next future, which would double current ultrafiltered water production.





Reverse osmosis

A reverse osmosis system for 25,000 m³/day, the 83% of the ultrafiltrated water production, was designed to reduce the raw water conductivity from 3,800 $\mu\text{s}/\text{cm}$ down to the required value of 1,000 $\mu\text{s}/\text{cm}$. This process will lead to the separation of salts from the water, with a 78% recovery, using a double-stage 2:1 configuration and a between-stage booster pump.

The plant has three racks of reverse osmosis, each with 67 pressure vessels distributed in two stages (44 in the first and 23 in the second). The total production is 19,500 m³/day of permeated water. This installation uses an osmosis membrane that is specially designed (aromatic polyamide) for the treatment of low-soiled brackish water.

The blending of 5,000 m³/d of ultrafiltrated water and 19,500 m³/d of permeated water turns out in a 24,500 m³/d daily flow of product water, which provides an overall plant conversion rate of 81.7%.

R+D+i

The use of reverse osmosis applied to wastewater reuse is an innovating process in Spain, but in constant development and expansion. For this reason, the plant has a reverse osmosis membrane verification unit in which several production, washing and storage tests are performed.



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Sole responsibility,
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the highest quality in solving
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