

Reuse of municipal effluent at a petrochemical complex

Tarragona, Spain

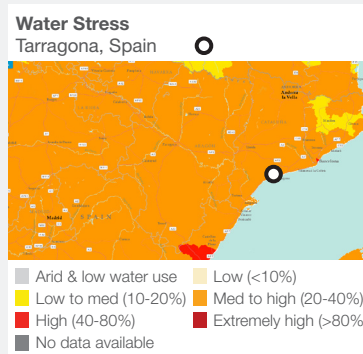
water scarcity impact

Reduced withdrawal	●
Reduced consumption	●
Improved water quality	
Increased productivity	
Net basin benefit	●

volumetric impact
6 800 000 m³/yr

capital cost
\$52 500 000

estimated unit cost of water
70 ¢/m³



Water Stress Map:
F. Gassert, P. Reig, T. Shiao, M. Luck and M. Landis, 2015. "Aquaduct Global Maps 2.1."

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Credits
We would like to acknowledge María Jesús Fernández of Ibérica Water Technologies for their input in the preparation of this case study.

Project Overview

The coastal city of Tarragona, with an annual precipitation of just 560 mm, has been supplied with water by a man-made water transfer system from the Ebro River since 1989. However, the city has been struggling to keep up with growing water demands from residents and the growing petrochemical industry.

Due to availability of EU funds and a strong water sustainability vision, the Catalan Water Agency decided in 2011 to construct the Camp de Tarragona Water Reclamation Plant. This plant treats municipal secondary effluent collected from two urban wastewater treatment plants (WWTP Tarragona and WWTP Vila Seca-Salou) and generates 6.8 million m³ of reclaimed effluent per year for use in water for cooling towers and boilers at the local petrochemical complex.

This approach was supported by the Chemical Business Association of Tarragona (AEQT) and Tarragona Industrial Water Company (AITASA) that represented the trade and technological needs of the industrial end-users operating at the Complex, such as Dow Chemical and Repsol.

The project was financed by the EU Cohesion Funds (85%) and the Catalanian Government and the Spanish Ministry of the Environment (15%).

Key Elements

- Treatment of wastewater using ballasted flocculation, double stage filtration, two-pass Reverse Osmosis (RO) and Ultraviolet (UV) disinfection.
- Treated effluent is used as a cooling water make-up (90%) and deionized water for boilers (10%).
- Establishment of a water partnership between municipal and industrial players for the benefit of Tarragona

Key Outcomes

- Water withdrawals from the Ebro River by the petrochemical complex were reduced by 25% from the original water withdrawal of 74 000 m³/d to 55 000 m³/d.
- 19 000 m³/d of wastewater secondary effluent return flow that was previously disposed into the Mediterranean Sea is now treated and made available for use by industry.



Tarragona, Spain

Intervention Features

- Wastewater recycling for industrial use
- Wastewater reuse as cooling water
- Provision of grants

Project Levers

(1) EU and Governmental funding

EU Cohesion Funds that covered 85% of the project's capital cost (\$43 200 000). The Catalan Water Agency was eligible to receive this funding as the project met sustainability and financial criteria. The remaining 15% (\$7 600 000) was financed by the Catalanian Government and Spanish Ministry of the Environment. The end-users (the cluster of companies situated at the Petrochemical Complex) did not contribute to the capital cost of the project; instead they pay a set fee for the volume of water they use.

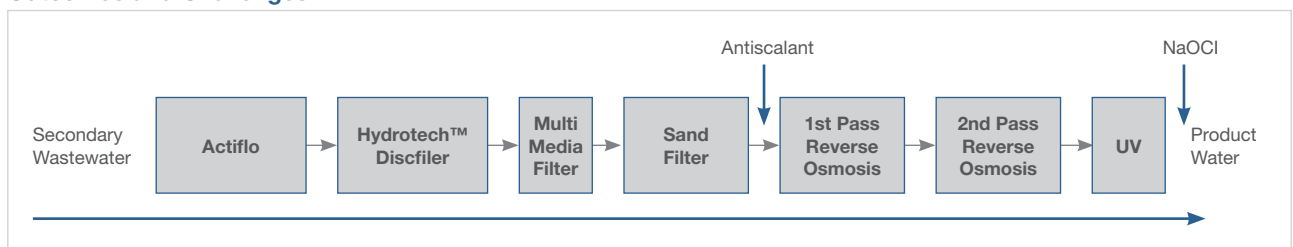
(2) Reuse of Municipal Effluent

The Camp de Tarragona Water Reclamation Plant produces 19 000 m³/d of treated effluent. The quality of the treated effluent has to meet stringent regulatory and end-user requirements for use at the Petrochemical Complex. Particularly, two-pass Reverse Osmosis is required to reduce the ammonia level below 0.8mg/L, and UV disinfection is installed at the end of the treatment train to meet Spanish RD 1620/2007 regulation for industrial application at cooling towers. Prior to the project, a 9-month demonstration project was carried out to determine the efficiency and reliability of the treatment process. The demonstration project was paid for by the Catalan Water Agency.

The Camp de Tarragona Water Reclamation Plant project successfully demonstrates that municipal industrial water reuse projects can be economically and technologically feasible without jeopardising the industrial operation process. The project reduces annual freshwater withdrawals from the Ebro River by up to 6 800 000 m³. This water can be also used for higher priority residential customers. The treatment capacity of the plant is set up to expand to 10 500 000 m³/yr (stage 2) and 20 000 000 m³/yr (stage 3) as the industrial water demand increases.

Public consultation was carried out throughout the development of the project. The public acceptance of the project at the community level was very high as it was seen as positive solution for addressing water scarcity problems. The biggest challenge for building the project was establishing agreement between stakeholders.

Outcomes and Challenges



Above: Process Flow diagram