

Maximising water reuse at a brewery

Vialonga, Portugal

water scarcity impact

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

volumetric impact
82 000 m³/yr

capital cost
\$620 000

estimated unit cost of water
120 ¢/m³



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

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Credits
We wish to acknowledge the input of João Paulo Mendes of Sociedade Central de Cervejas e Bebidas Brewery in the preparation of this case study.

Project Overview

Sociedade Central de Cervejas e Bebidas Brewery (SCC) (part of the Heineken Group), located 13km from Lisbon, uses 950 000 m³ of water for its brewing process per year producing 290 000 m³ of beer. Lisbon is one of several regions within Iberia that is suffering from serious water scarcity. Since 2008 the plant has been under pressure to reduce its water use. Firstly to reduce the overall cost of water that was as high as \$3.05 per m³, and secondly to help SCC lower its water use of water per beer ratio under 3.5 hectolitre per hectolitre (HI/HI) and meet the goals of the Heineken's Brewing a Better World plan.

The SCC originally installed Reverse Osmosis (RO) tertiary treatment in 2008 that was operational until 2012. However, the system was experiencing frequent shutdowns and was not performing satisfactorily. An external partner, GE Water and Power, was then brought in to optimise the process.

Between 2012 and 2014, the project succeeded in increasing the production performance of the system by 58% reducing the amount of shutdowns by fivefold. The RO treatment is now producing 82 000m³ per year and reduces the water withdrawal from local municipality that allows for this water to be used by higher priority customers elsewhere.

The entire project was completed in April 2014 for \$620 000 and was fully self-funded by SCC.

Key Elements

- Installation of tertiary treatment process in 2008 (phase 1) including multi-media filters and RO.
- RO optimisation process carried out between 2012 and 2014 (phase 2) using specialised software.
- Reuse system produces 82 000m³ per yr of treated effluent for use at non-product applications such as boilers and cooling towers.
- Fully funded by SCC for \$620 000 (part 1: \$85 000; part 2: \$535 000).

Key Outcomes

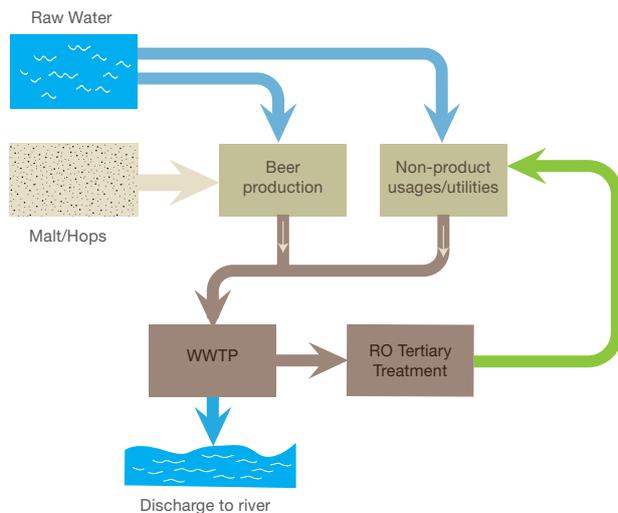
- Reducing fresh water withdrawal from the municipality by 52 000 m³ per year in 2012 and 82 000 m³ per year in 2014.
- Reducing the water use by 9% from 3.58HI/HI in 2012 to 3.26 HI/HI in 2014.
- Reducing the cost of sourcing water from \$3.05 per m³ in 2012 to \$1.79 per m³ in 2014.
- Reduction in use of electricity by 17% from 2011 to 2014, averaging around 3kW per hr in 2014.
- The payback period of the optimisation phase is five years.



Vialonga, Portugal

Intervention Features

- Wastewater reuse in the food industry
- Wastewater reuse as cooling water
- Education, technical training and capacity building
- Optimisation programme



Above: Diagram of Vialonga Brewery (© Arup)

Outcomes and Challenges

SCC underwent a journey of trial and error where in a period of six years firstly installed and operated in-house RO tertiary treatment processes (2008-2011) and then optimised its function by bringing in external expertise (2012-2014). The intervention did not eliminate the use of local boreholes but made the brewery less dependent on external water resources (primarily municipal water) allowing for this water to be used elsewhere. It also protects the brewery against future water tariff increases.

The project has demonstrated that wastewater reuse systems can be cost-effective especially in regions where the price of water is high. The Heineken Group is now evaluating other locations where the same process can be replicated. Secondly, it also showed that technology alone might not deliver anticipated results if it is not operated adequately.

Project Levers

(1) Installation of RO tertiary treatment

In 2008, SCC installed tertiary treatment that consisted of multi-media filtration followed by RO membranes. The plant achieved a water reuse rate of 52 000 m³ per year in 2012. This allowed the brewery to expand its beer production capacity and reduce the amount of water purchased from the local municipality and extracted from local boreholes. The tertiary treatment was operated by SCC but was not performing to the designed specification.

(2) Optimisation of the RO tertiary treatment

In 2012, an optimisation programme commenced to improve the efficiency and reduce the cost of the tertiary treatment. The main improvements were achieved by installing software tools such as Argo Analyzer or Winflows to analyse membrane autopsy and particle size distribution throughout the whole system. This led to the optimization of salts solubility, the RO backwash process, the Clean in Place (CIP) process and overall hydraulic performance of the system.

(3) Water Reuse Supervision & Monitoring

The external technical team reviewed and monitored the tertiary treatment process and provided training to the SCC personnel on the optimal operation of the system.



Above: Tertiary Treatment Plant (© SCC)