Water recycling in the food sector

Durban, South Africa

water scarcity impact

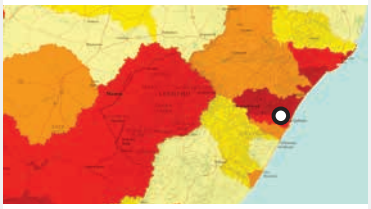
Reduced withdrawal	Main
Reduced consumption	Main
Improved water quality	
Increased productivity	Main
Net basin benefit	Main

volumetric impact
12 000 m^3/yr

capital cost
$2 900 000

estimated unit cost of water
>500 ¢/m^3

Water Stress
South Africa



Arid & low water use
Low (<10%)
Low to med (10-20%)
Med to high (20-40%)
High (40-80%)
Extremely high (>80%)
No data available

Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We wish to acknowledge the input of Geoff Sysum, Unilever in the preparation of this case study.

Project Overview

Durban, located on the eastern coast of South Africa, is one of the country's fastest-growing cities and its second-largest industrial centre. It is an area with high water stress and is expected to become dependent on desalination in future years. The demand for water by the industrial sector presents an additional challenge to the city authorities in meeting the water supply needs of the city and effective management of water resources.

Unilever, a global consumer goods firm, opened their $72m Indonsa factory in 2012. It is their second largest dry food goods factory. To reduce the use of municipal water supply, the factory makes use of alternate sources of water, such as rainwater harvesting and condensate recovery. In addition, it recycles most of the process water and greywater produced in the factory. These measures have resulted in the factory being one of the most water efficient dry food producing factories. Under normal circumstances, the need to use water from municipal supply has been almost eliminated, making available up to 12 000m^3 of water for the local community per year.

Unilever was not required to implement these water efficiency measures, but they were implemented as part of Unilever's sustainability policies and do not provide a direct financial payback to the firm.

Key Elements

- Harvesting rainwater from 22 000m^2 of factory roof.
- Air conditioner condensate captured and treated for use in toilet flushing.
- Process water from the factory and the greywater from showers captured for re-use.
- Central water treatment plant which includes biological treatment and reverse osmosis.

Key Outcomes

- 80% of water demand met by on site water recycling of water that would have otherwise discharged to the ocean.
- 20% of the water demand met by harvested rainwater and condensate capture.
- Reduction in rainfall runoff from the site reducing the risk of surface water flooding in nearby communities.
- Up to 65 000 tonnes of dry goods produced per year with minimal dependence on municipal water supply.

Durban, South Africa

Intervention Features

- Wastewater recycling in the food industry
- Condensate recovery and reuse
- Greywater recycling
- Rainwater harvesting

Project Levers

The plant is designed to operate without using water from the municipal water supply, although supply connection exists for use if necessary. Normally, most of the water requirements are met through recycling the used water on the site and the volume lost during use is made up by water captured from air-conditioner condensate and harvested rainwater. The flow of the water within the factory and treatment plant is explained in the figure below.

(1) Water treatment plant:

The $2.9m water treatment plant has a design capacity of treating 95 000 litres of incoming water every hour. It accepts process water from various parts of the factory, greywater from showers and basin, harvested rainwater and captured air-conditioner condensate. The incoming water undergoes filtration, biological treatment in membrane bioreactor, followed by reverse osmosis to remove microbial and biochemical pollutants.

(2) Process water capture:

Although the factory produces dry food goods, 1 000m^3 of purified water is used in various processes and for cleaning of the machinery. The facility has been designed to capture most of the used water, which is conveyed to the water treatment plant for purification and reuse.

(3) Greywater capture:

Every day up to 40 000 litres of greywater is captured from the canteen washing basins, staff hand basins and showers and is conveyed to the water treatment plant for purification and reuse.

(4) Rainwater harvesting:

The facility has been designed to capture most of the rain water that falls on its 22 000m^2 roof, which is then stored in a 1 200m^3 tank for use within the site following treatment.

(5) Condensate capture:

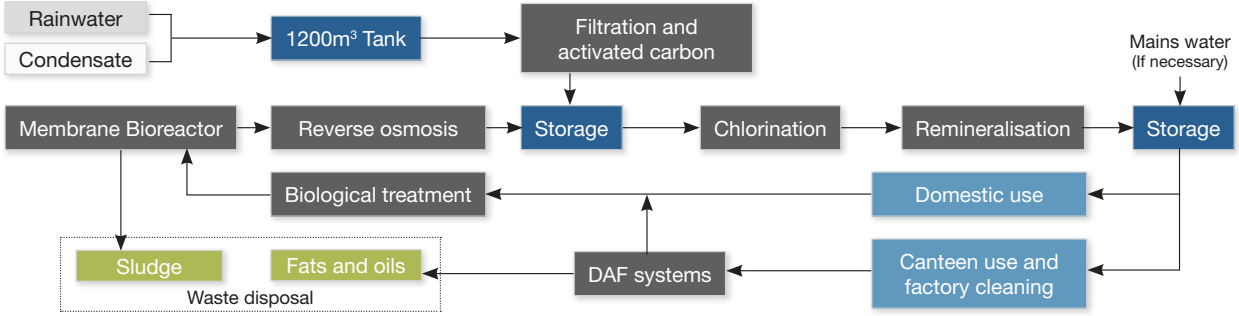
Up to 14 000 litres of condensate water is collected every day and stored in the rainwater harvesting tank. This condensate capture makes effective use of water that would have been lost through evaporation or through discharge into local sewers.

Outcomes and Challenges

The water efficiency measures at the Indonsa factory have ensured that it has minimal water footprint and is considered by Unilever as their most water efficient dry food goods factory. The use of water recycling, rainwater harvesting and air-conditioner condensate capture are adequate to meet all of the water needs, thereby making available 12 000m^3 of water per year for local community, enough to meet the needs of 200 families.

The rainwater harvesting is insufficient in size to capture most of the runoff from the roofs. It is also insufficient to meet demand during drought or extended periods of dry weather and low rainfall. In such circumstances, as experienced in Durban in winter of 2012, municipal water is also used.

The water reuse system ensures that a greater volume of municipal water is made available to the community. However, it does so at a significant cost.



Above: Process diagram (Siraj Tahir, © Arup)