Managing water towards zero discharge

Lerma Chapala Basin, Mexico

water scarcity impact

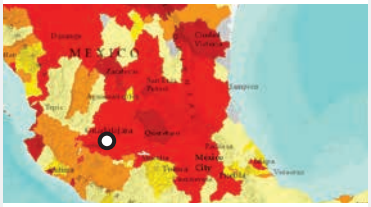
Reduced withdrawal	Main
Reduced consumption	
Improved water quality	Main
Increased productivity	Main
Net basin benefit	Minor

volumetric impact
226 000 m^3/yr

capital cost
$1 900 000

estimated unit cost of water
80 ¢/m^3

Water Stress
Planta Milenio, Mexico



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 Gordon Wrin of Procter and Gamble in the preparation of this case study.

Project Overview

The Lerma Chapala Basin in Mexico is responsible for over 50% of Mexico's exports and is home to over 10 million people yet the basin is under extreme pressure from water scarcity with an aggregated annual deficit of up to 1.8 billion m^3/yr. The main water resource in the basin is groundwater which is heavily overexploited.

In 2010 Procter and Gamble (P&G) established the Planta Milenio manufacturing facility in the basin. In order to minimise business risk and environmental impact the plant has been designed to minimise the volume of water that must be abstracted from the basin. The total groundwater abstraction of the site had the potential to be in order of 480 000m^3/yr, however through the use of extensive on site recycling, low water use fittings and rain water harvesting the total abstraction has been reduced to 254 000m^3/yr. While the volume of water used by the plant remains largely unchanged, the volume of abstracted groundwater has been reduced by nearly 50%.

Key Elements

- Wastewater recycling for use as cooling water.
- Reverse osmosis process to recycle waste streams from the water treatment plant.
- Installation of low flow plumbing fittings to reduce domestic water use for 3 000 staff.
- Pollution prevention measures to protect freshwater sources.
- Rainwater harvesting to reduce water run-off and groundwater abstraction.
- The project was 100% financed by P&G as part of a factory relocation work package.

Key Outcomes

- 47% reduction in ground water abstraction.
- 50% reduction in volume of water used by staff through low plumbing fixtures.
- Evaporation of the final wastewater discharge avoids groundwater pollution.
- Consumptive use by the plant is unchanged.

Lerma Chapal Basin, Mexico

Intervention Features

¬ Wastewater reuse as cooling water ¬ Low flow showerheads ¬ Low flow taps
¬ Low flow toilets ¬ Industrial water metering ¬ Rainwater harvesting

Project Levers

The main components of the water re-use cycle are described below.

1) Water treatment for use in cooling water:

The raw water supply contains high levels of phosphate and silica which must be reduced to levels acceptable for use in the plant. The water is treated by Reverse Osmosis (RO) which supplies the process and domestic water. The waste stream from this treatment is then passed through second RO stage before being used for cooling. This minimises waste to an appropriate degree, as the water is evaporated.

2) Recycling of domestic and process water for use as cooling water:

Over 73% of the direct demand on the abstracted water is for domestic and process use. Waste domestic water is treated by a wastewater treatment plant before it is used in the cooling towers. The recycling of domestic and process water provides 77% (570m^3/day) of the total water demand of the cooling towers.

3) Domestic demand reduction:

Low flow plumbing fittings including low flow shower heads, low flow faucet aerators and low flow toilets were installed for use by 3 000 staff. The low flow shower heads have reduced water consumption from 10 litres per minute to 4 litres per minute. Low flow faucet aerators have resulted in a reduction from 8.3 litres per minute to 4 litres per minute and low flush toilets have saved over 8 litres per flush (from 13 litres per flush to 4.8 litres per flush).

4) Pollution control measures:

The plant produces 140m^3/day of highly saline reject water, this is discharged to the solar evaporator. This minimises the risk of pollution of water resources.

5) Rainwater harvesting to reduce runoff and abstracted groundwater:

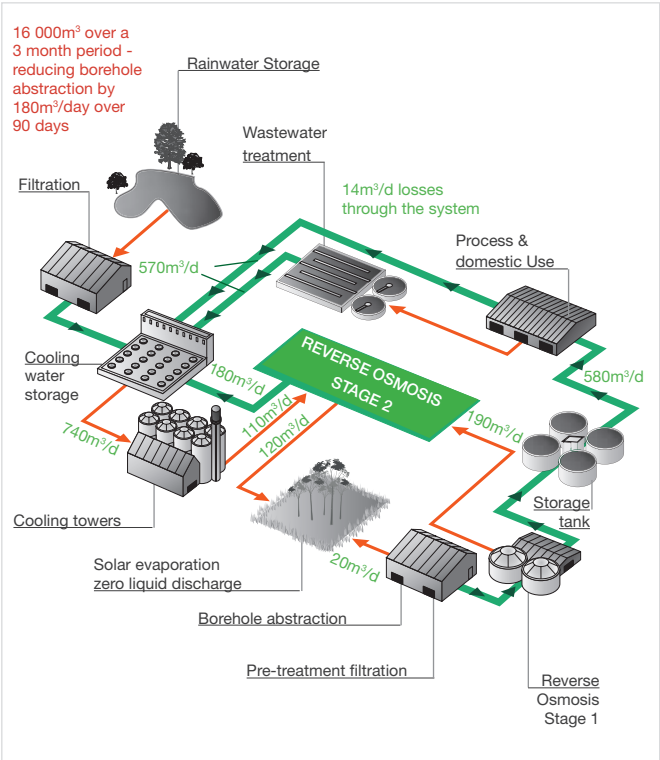
The Milenio facility installed measures to harvest rainwater. The harvesting system is active in the three-month rainy season permitting reduced ground water abstraction during this period. Roof rainwater is collected, screened and filtered prior to being discharged in a detention basin. Minor treatment takes place before the water is used in the cooling towers.

Outcomes and Challenges

The water savings can be summarised as follows:

- 100% of the cooling water demand is met through a combination of recycling of domestic and process water (77%) and a second stage RO process on water treatment plant waste streams.
- Low flow plumbing throughout the manufacturing facility has reduced the on-site water use by 18 400m^3/yr.

The interventions have also removed potential environmental impacts from effluent discharges and have increased the security of water supply for the long term operation of the site. The $1.9m cost included the cost of the water treatment system equipment including the RO treatment systems, filters solar evaporator, and pumps.



Above: Planta Milenio Water Cycle (© Arup)