Water optimisation in mining sector

Lomas Bayas Copper Mine, Chile

water scarcity impact

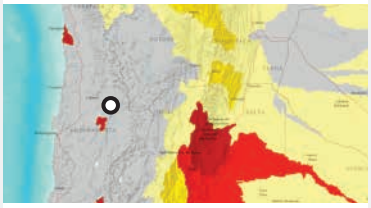
Reduced withdrawal	
Reduced consumption	
Improved water quality	
Increased productivity	●
Net basin benefit	

volumetric impact
0 m^3/yr

capital cost
$1 100 000

estimated unit cost of water
not available

Water Stress
Lomas Bayas mine, Chile



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 Laila Ellis, Yuri Zepeda, Miguel Monroy and Gina Caprioglio of Xstrata Copper for their assistance in the preparation of this case study.

Project Overview

Xstrata's Lomas Bayas copper mine is located 120km northeast of the port of Antofagasta, Chile. The mine is located on a desert with an annual rainfall of approximately 1mm and produces approximately 75 000 tonnes of copper each year. Xstrata's copper operations use a process called heap leaching where a mildly acidic solution is sprayed over crushed copper ore to leach out the mineral – the process uses a significant proportion of the mine's total water demand. The desert conditions of blue sky, high solar radiation, strong winds and very low air humidity give rise to very high evaporation rates in the order of 15mm/day. Water supply for the leach pads is withdrawn from the Loa River in the municipality of Calama and pumped 100km to the mine site. The site's water withdrawal is restricted to 5 794 000m^3. In order to continue expanding its operations without relying on additional water resources, Lomas Bayas investigated opportunities to improve its water efficiency including replacing the original leach pad sprinkler system with a drip system that significantly reduced the water lost to evaporation.

Key Elements

- The main driver of this project was to reduce water loss due to evaporation.
- Targets were set to optimise water consumption.
- New technology was put in place to reduce water loss on the leach pads.
- The implementation of the project was part financed by Xstrata Copper, with support from local academic centres and funding from the Chilean Corfo Innova Mining Programme to identify methods to reduce evaporation rates.

Key Outcomes

- The evaporative loss in the leaching process has been reduced by 54% from 9.8 to 4.5 litres of water per square metre per day between 2008-2013.
- The area of leach pad at the mine has increased from 540 000m^2 in 2008 to 1 000 000m^2 in 2012 without increasing the water demand.
- The drip feed system optimised the use of water of the Lomas Bayas site by 19% when comparing to the use of the previous sprinkler system.
- Savings in evaporative loss have been utilised for mine expansion.

Lomas Bayas, Chile

Intervention Features

- Drip feed application to leach pads

Project Levers.

(1) Water optimisation:

Lomas Bayas Mine identified water evaporation from the mine's solution ponds and leach pads as a key area to trial water use efficiency measures as it contributes more than 40% of the total water consumed on site.

The existing sprinkler system on the heap leach pads was replaced with a more advanced drip feed system. Impermeable plastic covers were initially tested to determine if their installation would reduce evaporative losses further. However, this option was not pursued as the covers limited access to the pads for maintenance and repairs. The introduction of the drip feed system reduced the evaporation rate in the leaching process by approximately 54%, from 9.8 to 4.5 litres of water per square metre per day.

Outcomes and Challenges

The recent expansion of the copper mine includes the construction of an additional pit and heap leach pads. Without further improvements in water efficiency, the leaching process would have required a further 24 litres per second of freshwater. Following the successful trial of the drip feed system there has been an increase in the productive use of the water utilised for irrigating the leach pads. The area of the leach pads at the mine has increased from 540 000m^2 in 2008 to 1 000 000m^2 in 2012 whilst maintaining the same total water consumption for the leaching process.

A key challenge for this study was the introduction of technology that had not previously been proven for use in the mining industry. As such, the study included an extended pilot testing phase during which the technology was adapted for the current operations.

The $1.1m investment in the project included research into methods to reduce evaporation as well as the testing and installation of technologies to achieve these reductions. The alternative to this project would have been to invest in a desalination plant to provide water for the leach pads.

Above: Leach Pad irrigation system (© Xstrata Copper)