

# Design-Build Zero Liquid Discharge (ZLD) System

Power Industry | Case Study

## New Harquahala Generating Project Tonopah, AZ USA

The New Harquahala Generating Project serves as a power and electrical wholesaler in the Southwestern United States.

To fill the need for growing energy consumption in the region, this facility was built to provide power to the area.



## Project Description

The Harquahala Generating Project is a 1,000 MW combined cycle power facility located in Maricopa County, Arizona and a major supplier of wholesale energy to the region. The plant was designed to utilize water resources from either the Colorado River via the Central Arizona Project (CAP) aqueduct or from a local groundwater source.

Treatment of the water for upstream plant use, primarily as cooling tower makeup, as well as the subsequent waste generation from the process was critical to facility operations. Protection of the environment was another equally important consideration when designing this system. Harquahala is a Zero Liquid Discharge facility where no aqueous waste is permitted.

## The Client's Needs

The project at Harquahala required generation of high-quality water for reuse by the power plant and process remaining solid waste based on the chemistry of feed water to the plant. Zero Liquid Discharge regulations mandate that the resulting solid waste, in the form of wetcake, was to be generated with a nominal content of 10% moisture for proper landfill disposal.

Veolia Water Technologies was selected to supply the entire plant on a Design-Build project basis.

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## Project & Technology Solutions

The designed wastewater treatment facility consisted of the following critical elements integrated with HPD® Evaporation and Crystallization technologies:

- Precipitation softening system to remove calcium, silica and other scale forming materials from the cooling water circuit. The system includes two 50% solids contact clarifiers, a sludge thickener/storage tank, twin sludge presses and chemical storage/feed systems for softening.
- RO Pre-concentration system to recover a majority of water in the softened tower blowdown prior to evaporation and concentration in the ZLD system.
- Zero Liquid Discharge (ZLD) system consisting of two MVR (Mechanical Vapor Recompression) driven, 50% HPD falling film evaporators and HPD brine crystallizer trains for reclamation of waste water and concentration of plant effluents in the form of wetcake for landfill disposal.
- Entire infrastructure including site preparation, foundation with chemical, electrical and control buildings.

The softening system is designed for a flow rate of up to 2,600 gallons per minute (gpm) of sidestream softening. While a majority of the adjusted water is transferred back to the cooling tower, the balance is sent to an RO preconcentrator at a flow rate of up to 745 gpm.

The RO system design recovers ~65% of the softened blowdown. The remainder is sent to the evaporation set at a rate of 260 gpm where further concentration takes place to minimize the load to the crystallizer. In turn, the brine crystallizer system, designed at a flow rate of 26 gpm, further concentrates the stream. The resulting slurry is sent to a centrifuge for de-watering where the wetcake is collected and the centrate is returned to the incoming crystallizer feed.

## The Results

The New Harquahala Generating Project came on-line in the winter of 2002 and was able to provide valuable power to the region.

The entire wastewater treatment facility was successfully designed and the project executed by Veolia Water Technologies on a design-build basis. The plant was able to reclaim valuable water resources while generating no aqueous waste to the surrounding environment.



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