

## Case Study

# Seawater RO: Minera Esperanza, Chile



### Project Details

Location: Michilla Port, Chile

Application: Seawater Desalination

Capacity: 80 m<sup>3</sup>/hour  
520,000 gallons per day

Engineering: Nicolaides S.A.

Commissioned: 2010

### Overview

Located in the Antofagasta region of Chile's north coast, Minera Esperanza's copper-gold mine is about 1,500 kilometers north of Chile's capital city of Santiago. The area is a desert, with extremely scarce supplies of drinking water. As a result, the Chilean government has placed constraints on drinking and industrial water supply; requiring developers of mines and other industrial facilities to provide their own water.

The availability of reliable potable water is a key issue in developing mines and other facilities located far from developed regions. Since there is no potable water available at the mining site, and no other local water source available, the only other way to supply potable water would be to truck it from cities, the closest of which are from 50 to 70 kilometers (30 to 45 miles) away. Aside from the expense and reliability of such a system, logistical and transportation issues make it impractical to ship such a high total volume of water by truck.

### The Challenge

To find a cost-effective way to provide drinking water to mining camps in remote areas.

### The Solution

While other technologies were reviewed to meet the demands of the mining operation, a seawater membrane solution was the most feasible because of the lack of available surface or ground water.

Koch Membrane Systems (KMS) was selected to develop an innovative seawater reverse osmosis (RO) system. The system uses KMS' MegaMagnum<sup>®</sup> high capacity seawater membranes, made from a unique thin film composite developed specifically for seawater applications.

Nicolaides S.A. chose KMS' MegaMagnum seawater elements to take advantage of the significantly reduced footprint, project costs, and installation time. The large diameter RO systems use one-seventh the number of elements compared to standard 8-inch elements and also contain far fewer of the o-ring seals that prevent mixing between the seawater and

product water. This results in significantly lower maintenance costs over the life of the plant. The RO system supplies water to the mine's facilities at Michilla Port, which is located about 170 kilometers (105 miles) from the mine.

**The RO System**

The water supplied to the copper-gold mine begins with seawater drawn from the Pacific Ocean. The seawater is pumped for about a mile to a water treatment unit that includes a pre-filtration system. From there, the water is pumped through the RO system, which consists of two skids, each comprised of two MegaMagnum® RO vessels with a combined effective membrane surface area of 30,500 square feet (the equivalent of 76 standard size 8" x 40" elements).

The final permeate is disinfected with chlorine, making it acceptable for drinking water. The permeate capacity is 520,000 gallons per day given a maximum feed total dissolved solids (TDS) of 40,000 parts per million (ppm) and the required chloride concentration is less than 250 ppm in the finished water.

The system operates at a rate of 20 cubic meters per hour.

**Product Overview**

KMS offers a wide range of RO elements suitable for a variety of separation requirements. Our pre-engineered, packaged water treatment systems using RO and NF technology offer optimum water treatment for brackish and seawater applications within a compact, skid-mounted package.

KMS offers two options to suit your needs: Standard pre-engineered RO packaged plants complete with all equipment; and modular, reduced-scope Vessel Control Block suited to larger projects and operators who prefer to provide auxiliary equipment.

For larger systems, KMS engineers can design and build a custom system to meet your specific needs.

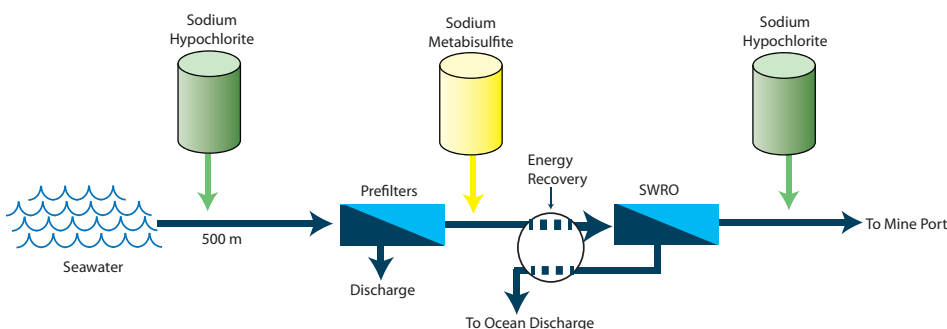
Both KMS packaged and custom water treatment systems offer:

- A flexible, cost-effective design with lower auxiliary equipment costs
- Fast installation and start-up
- Capacities ranging from 565-1,700 m³/d (150,000-450,000 GPD)
- Production of high-quality permeate water
- Drinking water and industrial wastewater recycling



RO Installation at Michilla

Process Flow Diagram



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