

# Cryoquip Works To Create Drinking Water In Australia

## **R**emineralization and Potabilization Systems

One of the main purposes of water treatment technology is to take untreated well or sea water and create clean drinking water for a thirsty world.

Desalination plants use a number of water treatment processes to create clean drinking water. The water treatment processes include:

- Clarification and filtration – separating suspended matter from liquids by forcing the liquid through a filter
- Ultrafiltration – a very fine filtration system that removes microscopic particles
- Sterilization – uses chlorine, chlorine dioxide, ozone and ultraviolet ray-based techniques to kill germs and bacteria
- Reverse osmosis – removes specific pollutants typically present in well water

The system involves a remineralization process which re-establishes the optimal level of salinity in a reverse osmosis permeate or in an evaporator distillate. Water to be remineralized is saturated with carbon dioxide and is made to flow through different filters. The reaction between carbon dioxide and calcium carbonate (which takes place naturally when water seeps through the layers of calcareous rock) causes the calcium or calcium+magnesium bicarbonate to become soluble.

The remineralization process is completed by injecting processed water with previously filtered seawater to provide the needed sodium chloride.

### **Potabilization**

Before any water is released for consumption, the water must be treated using the processes described below. (The chemical dose and the filtration controls approach will vary depending on the site and the consequent approach to introducing the water to the supply system.)

Desalinated water from a two-pass reverse osmosis process will have very low concentrations of dissolved constituents. The water is aggressive and needs to be further treated before it is suitable for transfer into the supply network. Carbon dioxide and lime are added to increase the residual alkalinity and hardness of the water.

Dose rates are part of the conceptual design work and are aimed at producing water quality similar to the water supply already found in Melbourne. The Total Dissolved Solids (TDS), pH and calcium carbonate precipitation potential have all been considered.

It is anticipated that the final water quality will be in the range of 30 – 100 mg/L TDS, comparable to Melbourne's existing supply. The desalinated water is likely to be lower in dissolved sodium but higher in dissolved calcium than Melbourne's water.

### **Potabilization Process Description**

- Water pH control and stabilization by dosing with lime and CO<sub>2</sub>
- Levels of Calcium and alkalinity can be varied
- Targets require a compromise between protection of pipeline assets and keeping Calcium and alkalinity levels low, which could provide benefits to some industrial customers.

### **Cryoquip's Involvement in the Process**

Cryoquip has supplied CO<sub>2</sub> vaporizers for desalination plants in the states of Western Australia, New South Wales, Queensland, Victoria and South Australia. Cryoquip CO<sub>2</sub> vaporizers have been installed at 8 desalination plants and many potable water supply systems.

CO<sub>2</sub> is used in the remineralization of the water after it has been desalinated, and is dosed in proportion with lime to ensure that the water chemistry is suitable for reticulation and personal consumption.

The desalination plant built for Southern Seawater Alliance (SSWA) was the second desalination plant built in Perth, the capital city of Western Australia. The plant has an annual capacity of 50 Gigaliters/year of water. The desalination plant produces water via reverse osmosis (RO). There are two RO trains, each

with 80 Megaliters/day capacity. The CO<sub>2</sub> is injected into a side stream of the desalinated water, and dissolved in this stream through sintered filter dissolvers.

The normal CO<sub>2</sub> system flow rate for the Perth desalination plant was 70 to 170 kg/hr, with a maximum of 340 kg/hr. Other CO<sub>2</sub> systems for desalination plants are sized in excess of 700 kg/hr. We have just received another inquiry from Perth to duplicate the CO<sub>2</sub> system to double the plant's capacity

Cryoquip supplied all the bulk storage vessels, pipe work, vaporizers, dosing system and dissolvers for the Melbourne project, where it was shipped as a package to the site, and assembled by Cryoquip employees. The complete system was installed in under a week, ahead of schedule and within budget.



CO<sub>2</sub> storage vessels

