



Control Systems International®



Project Profile: U.S Bureau of Reclamation

Desalting Plant – Yuma, Arizona

In 1998, the *Yuma Desalting Plant* near Yuma, Arizona was faced with a control catch-22. Its control system had become obsolete and was no longer supported by the manufacturer. Moreover, the control system was not Year 2000 ready. It had to be upgraded but without the large expense of replacing the existing I/O.

Operated by the U.S. Bureau of Reclamation, the plant removes salt from farm runoff and discharges it into the Colorado River before the river crosses into Mexico. The United States must deliver 1.85 billion cubic meters of relatively salt-free water to Mexico each year in order to meet treaty obligations dating back to 1944.



One vendor contacted by the Bureau of Reclamation, [Control Systems International \(CSI\)](#) of Lenexa, Kansas, offered a solution that would allow the Bureau to continue using their existing I/O and replace it later without having to redesign the control system. CSI further proposed building an I/O interface card that would make [UCOS®](#) think that the existing I/O was actually Allen-Bradley I/O. This would allow UCOS to be used off-the-shelf and preserve a future migration path to Allen-Bradley or other I/O.

Another advantage to the CSI solution is that the control logic developed within UCOS is independent of any particular manufacturer's I/O. So, the Bureau of Reclamation can develop the logic for the current I/O, then switch to another manufacturers' I/O without having to redesign the project. That way the plant can be ready for the Year 2000 now and preserve a migration path for the future.

When the Bureau of Reclamation does install new I/O, they merely need to move the Allen-Bradley Data Highway connections to the new I/O and make a few minor configuration changes in UCOS. No other changes to the control system will be necessary. The immediate cost savings and the flexibility to choose I/O at a later time was a significant factor in choosing CSI's solution.

The plant uses more than 13,000 I/O points, 32 controllers, one engineering workstation for development, eight operator workstations for monitoring and control, and a pair of redundant archivers.

Using UCOS' built-in and user-defined templates, the Bureau of Reclamation is able to quickly design, test, and configure functionality faster than would be possible with other systems. For example, once control functionality for a certain type of pump is tested, it can be quickly replicated for any pump in the system requiring that same functionality.

The Yuma Desalting Plant is the largest reverse osmosis desalting facility in the world. Located about 5 miles west of Yuma, Arizona, the plant can desalt about 72.4 million gallons of drainage water per day.

The drainage water processed by the plant travels from farms east of Yuma through a concrete-lined canal. As the water enters and moves through the plant, screens and other pre-treatment processes remove large debris, algae, sedimentation, calcium, and other suspended solids that would clog the sensitive membranes used to desalt the water. Chlorine is also added to stop the growth of micro-organisms and algae, and ammonia is added before desalting in order to minimize the negative effects the chlorine would have on the membranes. Without such elaborate pre-treatment, the expensive desalting membranes would last about an hour instead of their current three to five year lifespan.

After pre-treatment, the water is ready for desalting using the reverse osmosis process. Reverse osmosis involves separating components of a solution, in this case separating salt from water. Fourteen high-pressure pumps force the treated water through about 9,000 membranes at an average pressure of about 362 pounds per square inch. Walls of cellulose acetate in the membranes allow the water to pass, but not the salt. This removes all but about three percent of the salt. This process allows the plant to produce about 837 gallons of desalted water per second.

The control system is used to monitor and control all operations at the plant from intake through pre-treatment through desalting and discharge.

The Yuma Desalting Plant saves the U.S. up to 97 million cubic meters of Colorado River water it would otherwise have to deliver to Mexico each year, according to U.S. Bureau of Reclamation estimates.



The plant uses more than 13,000 I/O points



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