

EFFICIENCY

Doubling water
capacity

Sweetwater Authority and Enterprise Automation,
California, USA

End user and system integrator collaboration reduces
operational cost and increases reliability of water supply.



Modicon PLCs and EcoStruxure Control Expert are part of the Edge Control portfolio of Schneider Electric's EcoStruxure™ Plant IoT-enabled architecture. EcoStruxure Plant enables the scalable design and operation of connected systems with best-in-class cybersecurity built in at each layer to drive measurable operational profitability improvements, safely.

Providing clean, safe water

Water scarcity is an ongoing problem in Southern California, USA. Six of the past seven years have been drought years, leaving most of the region highly dependent on imported water. Providing a drought-resistant, reliable water supply is an almost impossible feat. Yet, by leveraging the best available technology, sound management practices, public participation, and a balanced approach to human and environmental needs, [Sweetwater Authority](#) (Authority) has succeeded in providing its customers with clean, safe water from local water supplies.

The Authority is a publicly-owned agency that delivers water via 388 miles of pipeline to serve 190,000 people in a 32-square mile service area in southern San Diego County. Authority customers were among the first in the region to benefit from a desalination (desal) process designed to treat “brackish,” or saline, groundwater to make it safe for human consumption.

The Authority's Richard A. Reynolds Groundwater Desalination Facility uses reverse osmosis (R/O) treatment to remove dissolved salts and microscopic particles that can be found in groundwater. The R/O processed water is treated to prevent corrosion; and chlorine and ammonia are added to ensure disinfection.

The desalination facility began operating in 1999, drawing brackish groundwater from five wells and creating a capacity of four million gallons per day. Later, a sixth well and a side stream process for the treatment of iron and manganese were added, increasing the capacity to five million gallons per day.

In 2017, a \$42 million expansion project was completed with the installation of three additional reverse osmosis trains, an additional iron and manganese removal system, 23,000 feet of conveyance pipe, and additional system upgrades. The expansion project also included drilling five new brackish groundwater wells. The facility now has a full production capacity of 10 million gallons of drinking water per day and provides Authority customers with about one-third of their annual water supply.

Goal

Double water capacity to provide a drought-resistant, reliable water supply.

Story

Sweetwater Authority selected Schneider Electric Master Alliance Partner, Enterprise Automation, as their sole SCADA and controls integrator, and completed a \$42 million upgrade and expansion project.

Solution

- Modicon
- EcoStruxure Control Expert
- Altivar
- AVEVA's Citect SCADA*
- AVEVA's Ampla Operations Management*

Results

- Doubled plant capacity
- Savings of \$850 an acre foot versus imported water
- Automated reporting eliminated 8 hours per week of manual data collection
- Up and running in days, saving \$9,000 a day

*The Schneider Electric industrial software business and AVEVA have merged to trade as AVEVA Group plc, a UK listed company. The Schneider Electric and Life is On trademarks are owned by Schneider Electric and are being licensed to AVEVA by Schneider Electric.

“For the expansion project, we were looking to automate the desal facility while doubling the capacity of the plant,” says Ron Mosher, Director of Engineering, Sweetwater Authority. “The original control system never worked the way it was intended. We wanted to update it to match the control scheme established for the Authority’s Perdue Surface Water Treatment Plant, which is our flagship standard in terms of control systems.”

Forging a strong alliance

Following a selection process where control system integrators were evaluated for water industry experience, SCADA and PLC expertise, communications competence, client references, and emergency response capacity, the Authority engaged [Enterprise Automation](#) (EA) as their sole SCADA and controls integrator.

Enterprise Automation has been a [Schneider Electric Alliance](#) partner since 2013 and was the first in the United States to achieve a Master Alliance status. Schneider Electric’s Alliance partner engineers have in-depth product knowledge, proven through rigorous certification programs. Master Alliance recognition is reserved for top tier Schneider Electric partners who demonstrate extraordinary professionalism and expertise in multiple areas of automation and process applications.

“Over the years, we’ve run the gamut of implementing control schemes — from having a contractor provide them to having an Authority staff member as the programmer,” says Mosher. “Our experience led to the vision that we need a quality platform that

we can standardize on and build from. We need a system integrator that understands our unique requirements and has the skills to deliver the ideal automation solution. For us, that is EA. Together, we developed the best control scheme for our needs. Their knowledge of the Schneider Electric products and solutions, along with their other demonstrated capabilities, have been instrumental to our success.”

For this project, the Authority saw the immediate benefit in forging a close relationship with the system integrator. Rather than having the control integration done by a party that is subcontracted by an electrical contractor who, in turn, is subcontracted by the general contractor, the team from the Authority worked directly with the team from EA.

“There were many players involved in making this orchestra come together,” says Scott Pickford, Principal, Enterprise Automation. “It was a good collaboration between the various representatives of the Authority and our team. We were all working together to ask, ‘How are we going to deal with this problem?’ Ultimately, because of the relationship that the Authority established, and that we both nurture, the Authority ends up getting what they want and need as opposed to simply getting what they are given.”

“The fact that Enterprise Automation is certified in so many Schneider products means the Authority gets an integrated and better designed control ecosystem,” adds Luke Stephenson, Business Operations Manager, Enterprise Automation.

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— Luke Stephenson
Business Operations
Manager
Enterprise Automation



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Preparation saves time and money

To kick off the project, the team from EA visited the desalination facility to watch how it was being operated. They observed operators manually starting up and shutting down the plant.

“We noticed the operators had issues trusting the data from the desalination plant,” says Pickford. “One of our first jobs was to audit the data, clean it up, and establish standards. We had to implement the new system such that an operator could come from their other plant (the Robert A. Perdue Treatment Plant at Sweetwater Reservoir) over to the desal plant and everything looked and worked the same. That was what we were there to achieve.”

Next, several workshops were held for Authority staff, Enterprise staff, and others to understand how the plant would operate and what the control system needed to do. Then, EA created a duplicate platform at their Irvine, California, facility to conduct factory acceptance testing, evaluate the control logic, and work out problems before the system was deployed in the field.

“The entire control scheme was well thought out and thoroughly tested before a single bit of data was entered into the control scheme,” says Pete Baranov, Director of Water Quality, Sweetwater Authority. “When it was deployed, it was essentially flawless. The design and implementation approach EA used allowed us to be up and running in days.”

The methodology resulted in enormous cost savings. “Where the real money starts flowing is when you are onsite,” says Pickford. “You’ve got engineers, technicians, electricians, and others all waiting for the control system integrator to get that system running. If you start adding up all those people’s time, any hour we can save is a massive benefit to the Authority. If we save days, weeks, or months, we are talking about a very quick payback.”



“Then there is the cost of water,” adds Mosher. “While the plant is offline, the Authority is buying water at a rate of \$9,000 a day beyond what we would have spent treating the water at the desalination plant. That is a tremendous added expense we were happy to avoid.”

\$9,000

savings per day

Powerful automation technology

The site was already using a Schneider Electric Modicon system with remote I/O, which was retained. EA installed one master Modicon controller that was programmed using EcoStruxure Control Expert. All additional I/O was Modicon I/O. AVEVA's Citect SCADA was the overall supervisory system. The configuration allowed the Authority's National City fresh water wells, the Perdue plant, and the desalination plant to all be monitored from a single location.

“An operator with the right privileges can see anything from anywhere,” says Pickford. “You can be at the Perdue plant and see the desal plant. Also, when you have so many assets relying on a single SCADA system, redundancy is a very important factor.”

They always had redundancy, but both servers were in the same location. Those servers were then moved so that one of them stands at desalination and one of them stands at Perdue. They talk over a microwave ring network. Either server can go down and they still have complete control and visibility of both plants from either place.”

Space for the plant’s chemical feed system was also a challenge. Typically, such a plant has two pumps for every chemical feed system. If one pump fails, the other can take over and maintain operation. “With new OSHA regulations, there was the problem of making sure there were proper working clearances,” says Pickford. “All the variable frequency drives (VFDs) that controlled the chemical feed pumps were feeding to a single cabinet. If they needed to fix one, they had to power both pumps down. Unfortunately, splitting these cabinets meant we needed more space. We put in Schneider Electric Altivar 32s, which are very compact. They are Ethernet connected so there wasn’t a lot of wiring. They ended up consuming less space than the original cabinet. We then installed the exact same design at their National City wells. We built about 27 of those little things, so they could get a fair bit of value from that single design.”



The six existing wells used Modicon Compact 984 PLCs, which had become obsolete and needed to be replaced. The new wells are controlled with the cost-effective Modicon M340s. EA designed new I/O and PLC panels at each of the new well sites, but they knew that replacing the existing panels would be expensive. “So, we decided to remove the Compact 984s and replace that technology with M340s,” says Pickford. “We used a little trick that Schneider Electric has up their sleeve, which are these compact connector modules that allow you to take the wiring harness off the old PLC, snap it onto this connector and then snap it onto the new M340. We had to program the new unit, of course, so those wells would all work the same and all communicate back to the plant the same. That saved us from having to redo those six panels — saving a lot of expense for the Authority.”

From manual to automated

Today, operation of the plant is automated and can be fully controlled remotely. “The control system now works how it should’ve worked all along,” says Justin Brazil, Water Treatment Superintendent, Sweetwater Authority. “The operator starts the wells and the water starts flowing to the plant. When the operator is ready to start the plant, and if all the system permissions are met, they click the ‘enable production’ button. Once production is enabled, the control system brings on an R/O train and starts processing water. If it can’t get the pressure down to a predefined setpoint, it calls on another train, and another train and another train, until it can get the pressure to where it needs to be. As trains are coming online, the chemicals will automatically start at their given dosage setpoints based on the dosage the operator has input. The flow rate of the chemicals is automatically calculated based on the pacing source. It’s as simple as that.”

10 million

Gallons of drinking water
produced per day

“The design and implementation approach EA used allowed us to be up and running in days.”

— Pete Baranov
Director of Water Quality
Sweetwater Authority



“Every day that we run this desalination plant, it’s continuing to pay back the cost that we put into making it run right.”

— Justin Brazil
Water Treatment
Superintendent
Sweetwater Authority

“From that point on, it’s adaptive,” adds Pickford. “If a well tripped out and stopped working for some reason, it will dial itself down automatically or turn off one of its R/O trains. If that well comes back online again, or if an operator starts up another well, the plant will automatically dial itself back up and increase production automatically without operator intervention.”

“To contrast that with the old plant, if you lost any part of the process, be it a single well or a single train, you would lose the whole plant,” says Brazil. “Now we can control that plant either onsite or remotely, 10 miles away at the Perdue Water Treatment Plant. I can start it remotely as if I am there. If everything is mechanically working, there is no need for an operator to be on location to start or stop the plant.”

Reliable, fast reporting

Reporting is now much easier and more reliable, as well. In the past, an operator would walk around with worksheets and manually record data. Now, the process equipment is tied into the SCADA system and the values are automatically sent to the reporting system.

“Prior to this project, we produced reports for the plant manually,” says Baranov. “It was probably a full day’s worth of work. Shortly

after the project was completed, AVEVA’s Ampla Operations Management reports were done. It has really streamlined everything. And pulling data points from SCADA is a lot more reliable than manually taking the daily readings.”

“Once you get into the system-produced spreadsheet, you can calculate whatever you want,” says Brazil. “You can look at: cost per acre foot of power to pump water into the plant from wells; cost of power for treating the water; cost of power for pushing the water out into the distribution system and chemical costs; breaking it down as cost per acre foot of water produced. You run the report for any given month and it builds it for you in a few minutes. If I didn’t have the Ampla report for the new plant, it would have been tedious and required a lot of time every month. It’s made the work a lot less now.”

Quick ROI

According to the Authority, the control system has already paid for itself. “We produce treated potable water at about \$350 an acre foot,” says Mosher. “That compares to over \$1,200 an acre foot if we were to buy imported water. Every day that we run this desalination plant, it’s continuing to pay back the cost that we put into making it run right.”

EcoStruxure™

Innovation At Every Level

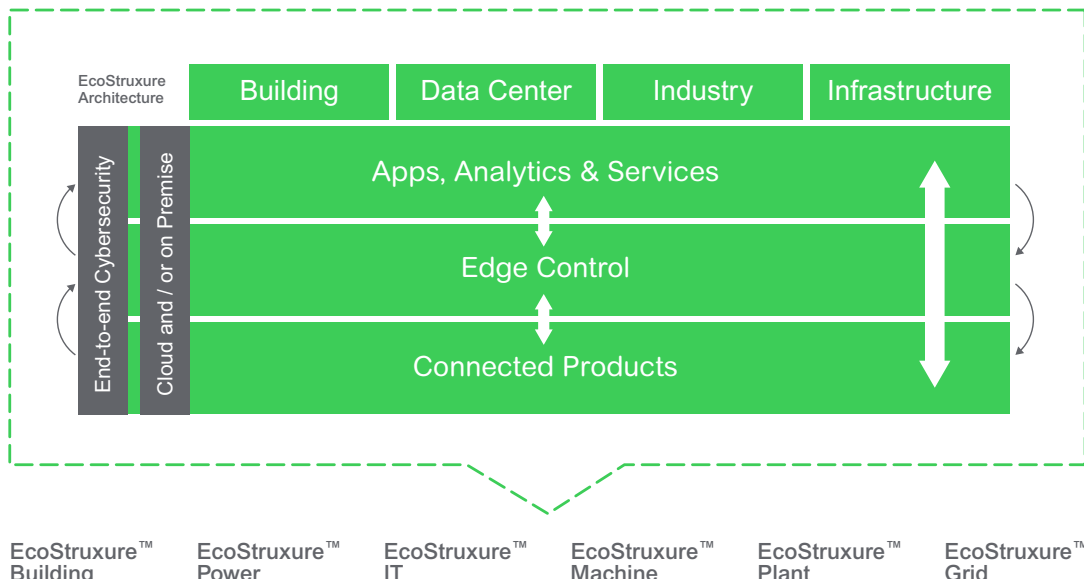
IoT-enabled solutions that drive operational and energy efficiency

EcoStruxure is Schneider Electric's open, interoperable, IoT-enabled system architecture and platform.

EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for our customers.

EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level including Connected Products, Edge Control, and Apps, Analytics & Services. EcoStruxure has been deployed in 480,000+ sites, with the support of 20,000+ system integrators and developers, connecting over 1.6 million assets under management through 40+ digital services.

One EcoStruxure architecture, serving 4 End Markets with 6 Domains of Expertise



Connected Products

The Internet of Things starts with the best things. Our IoT-enabled best-in-class connected products include breakers, drives, UPSs, relays, sensors, and more. Devices with embedded intelligence drive better decision-making throughout operations.

Edge Control

Mission-critical scenarios can be unpredictable, so control of devices at the edge of the IoT network is a must. This essential capability provides real-time solutions that enable local control at the edge, protecting safety and uptime.

Apps, Analytics & Services

Interoperability is imperative to supporting the diverse hardware and systems in building, data center, industry, and grid environments. EcoStruxure enables a breadth of agnostic Applications, Analytics & Services for seamless enterprise integration.

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