

Meeting Tucson's electricity needs by managing operational data with WIMS

Problem

Operators at Tucson Electric Power's Springerville Generating Station wanted to improve operational efficiency at their large, complex electric generation facility. They needed a new system to track and trend data, operate more efficiently, and maintain compliance and performance goals.

Solution

A centralized system that handles all of the data streams at the facility based on Hach's Water Information Management System (WIMS) software. With data flowing through WIMS, staff tracks and trends process data from multiple systems, monitoring water quality, air quality, consumption of lab chemicals and coal, and more.

Benefits

The plant gained insight into every process and now tracks key indicators to closely manage costs and allocate resources. New, efficient protocols improved task management and empowered the team across the operation, producing greater operational flexibility and consistency.

Background

Tucson Electric Power's (TEP's) Springerville Generating Station (SGS) is 230 miles northeast of Tucson near the New Mexico border. Here, TEP operates and maintains four generating units with approximately 365 staff. Units 1 and 2 serve TEP's 424,000 customers in Tucson, unit 3 serves Tri State Generation and Transmission customers, and unit 4 is owned by the Salt River Project. Units 1 (commissioned in 1985) and 2 (online since 1990) can generate 387 MW and 406 MW, respectively, while unit 3, online since 2005, has a 415 MW capacity. Unit 4 added another 417 MW in 2009. Power generated here helps TEP keep the lights on for more than one million Tucson-area residents.

Data Access Challenge

As they looked at its growing customer base, the TEP team saw the need to centralize the station's data to improve operational efficiency, comply with environmental regulations, make things easier on employees, and reduce the amount of paper generated.

"We needed to more efficiently trend and track what was happening in the plant," said Michael Bryan, TEP Chemical Services Supervisor.

"Our complex systems measure water, air quality, fuel, chemicals and more. Seeing trends at a moment's notice is critical for efficiency. What stood out as we looked for options was Hach's



Tucson Electric Power facility, Springerville, AZ

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Water Information Management System (WIMS) software.”

After beginning research on a solution to their data management challenges in October 2017, TEP was able to get WIMS up and running by July 2018. The system was fully implemented across all aspects of SGS by December 2018.

Partnership & Training Accelerate ROI

The TEP team points to its partnership with Hach as key to the success of the program.

“There was a learning curve, and the support and training we got from the team at Hach was great,” said Bryan. “They showed us how to create log sheets and reports, and then we built our own, based on our users and our organizational needs. Whenever we had a question, it was easy to call the help desk for assistance; and the more we used the system, the easier it got.”

TEP also notes that a key to its implementation success was its internal point person on the project, Program Coordinator Johanna Wright. “With some very experienced people making up the bulk of our workforce, I knew we needed to make things as simple and user-friendly as possible,” said Wright. “The easier we could make it, the more appealing it would be for our front-line folks charged with entering data.”

“Hach compares the WIMS database to a house, and that we can put our data in and pull it out of the house in any way we wish. That gave me the ability to make our user interface and our forms as simple and attractive as possible. I literally just replicated the forms they were already used to using as the front end of the database.”

I was able to learn how to set up log sheets, and that gave me what I needed to create dozens of other log sheets, graphs, reports, and emails. Just a little foundational knowledge gave me the ability to go much deeper into creating what we needed. The ease of use with WIMS is amazing.”

“Once we showed our operators how easy it was, they were relieved, and at ease. If they had tweaks, fixes, changes to make, they knew they could come to me and it would be quick and simple to make those modifications. When they realized ‘Hey, this is easier than we thought,’ they were more apt to enter the data. That, in turn, made it easier for us to work through errors and make sure the system was not just up and running, but tuned and customized. That gave us a quicker ROI and opened our eyes to other possibilities of what we can do with the system.”

Workforce Benefits

Implementing WIMS also produced some unexpected benefits on the personnel front. “Before, our Chem techs did very specific jobs,” said Wright. “Now, we rotate positions. Everyone learns all the roles and knows where everything is and how to do each task – where to find entry forms, how to gather data, how to view reports; and they don’t have to hunt or backtrack, it’s all right at

TDS with Lbs/Hr								
September 2019								
Date	Unit 1 Circulating Water				Unit 2 Circulating Water			
	TDS 1st Run mg/L	TDS 2nd Run mg/L	TDS Lbs/Hr (1st Run)	TDS Lbs/Hr (2nd Run)	TDS 1st Run mg/L	TDS 2nd Run mg/L	TDS Lbs/Hr (1st Run)	TDS Lbs/Hr (2nd Run)
9/1/2019								
9/2/2019								
9/3/2019								
9/4/2019								
9/5/2019								
9/6/2019								
9/7/2019								
9/8/2019								
9/9/2019	22,250.00	22,687.50	98.04	99.97				
9/10/2019								
9/11/2019					19,975.0	19,800.0	88.02	87.25
9/12/2019								
9/13/2019								
9/14/2019								
9/15/2019								
9/16/2019								
9/17/2019								
9/18/2019								
9/19/2019								
9/20/2019								
9/21/2019								
9/22/2019								
9/23/2019	22,150.00	22,082.50	97.00	97.21	23,250.0	22,675.0	102.48	99.91
9/24/2019								
9/25/2019								
9/26/2019								
9/27/2019								
9/28/2019								
9/29/2019								
9/30/2019								
Minimum	22,150.00	22,082.50	97.00	97.21	19,975.0	19,800.0	88.02	87.25
Maximum	22,250.00	22,687.50	98.04	99.97	23,250.0	22,675.0	102.48	99.91
Average	22,200.00	22,375.00	97.82	98.58	21,612.5	21,237.5	95.24	93.58

TEP WIMS user interface

Important Parameters Measured:

- Steam cycle chemistry (silica, conductivity, pH, iron, etc.)
- Cooling Towers (silica, pH, conductivity, TDS, etc.)
- Closed Cooling (pH, Conductivity, Nitrite, etc.)
- Reverse Osmosis and Clarification (Hardness, Alkalinity, Silica, pH and Conductivity)
- Coal Fineness
- Environmental compliance / air quality

their fingertips. It gives us greater staff flexibility, keeps things flowing smoother, makes everyone’s job easier, and helps us retain workers as well as assets and institutional knowledge.”

Getting More from SCADA

Another important payoff for TEP is how the WIMS integration with its SCADA system has made things easier. “It can be a challenge to pull data from SCADA systems,” Bryan noted. “With Pi, we almost need a full-time person to set up and manage that,



from checking and verifying chemistry, correlating that to lab data, and more. WIMS makes it easy, without knowing databases, programming, and integration at an expert level, to access that data, see standard deviations, analyze trends, and adjust how we do things in near-real-time.”

WIMS gives us the ability to do what-if scenarios, carry out complex calculations, and use predictive modeling. ‘If we do something like this, what happens? – with WIMS, we can do that, and we’re just getting started. We plan to pull in the cooling tower temp data, use that with lab data, and see, for example, what the actual silica data looks like. When we have a back-pressure problem in the winter, we can look at root causes.”

WIMS in Action

Today, TEP relies on WIMS and the operational data it stores daily across all aspects of the plant, for everything from field data entry to creating regulatory reports.

“Field data entry was especially important to us, because we want to move toward being a paperless operation,” noted Wright. “We want to get field data into WIMS as quickly and efficiently as possible to look at trends and do further analysis.”

That removes a layer where there might be an entry error, because we put in limits to avoid entering any data that is significantly outside of the bounds of a normal entry. It’s just so clean, it takes moments to go through specific screens and check KPIs (key performance indicators), and make sure everything looks right. Our next steps are to continue to have more data entered from the field and incorporated directly into WIMS.”

Here, again, a close working partnership with Hach proved important. “Due to stringent IT requirements, we don’t have a cloud database, and that means we can’t use Claros Collect,” Wright noted. “We also don’t have internet for our tablet PCs in the field, so we use the WIMS-to-WIMS interface.”

Hach’s Claros Collect software allows users to enter field data on a mobile device and transfer those measurements directly to the main database. Because it is a cloud database, and given TEP’s strict IT requirements, the Hach implementation team developed a WIMS-to-WIMS interface that effectively provides the same functionality to update the main on-site WIMS database when each user brings a tablet in from the field.

For this approach, Wright continued, “A WIMS client goes on each tablet, and each user selects the proper entry form in the field to record data. Back at the office, the user connects the tablet to the network and uses the WIMS-to-WIMS interface to automatically populate the main WIMS database. This gives us a way to capture all our data and efficiently get it into the main database in a way that meets IT’s requirements.”

There were options to use Claros Collect, but since this solution exactly meets the needs of the facility, it saved time, paperwork, and multiple layers of approvals to go this route.

	Last	Min	Max	Avg
Raw Water Pond Cond	2,191.00	2,191.00	2,191.00	2,191.00
Raw Water Pond pH	7.63	7.63	7.63	7.63
Raw Water Pond Ca	460.00	460.00	460.00	460.00
Raw Water Pond Mg	152.00	152.00	152.00	152.00
Raw Water Pond Silica	17.00	17.00	17.00	17.00
SW Cond	2,305.00	2,280.00	2,305.00	2,292.50
SW pH	8.36	8.36	8.41	8.19
SW Ca	68.00	50.00	68.00	62.00
SW Mg	32.00	32.00	48.00	40.00
SW Silica	11.70	11.70	12.00	11.85
Reactivator 1 Ca	64.00	24.00	80.00	53.00
Reactivator 1 Mg	24.00	24.00	44.00	31.33
Reactivator 1 Silica	10.60	9.00	12.00	10.93
Reactivator 1 Turbidity	12.21	3.59	14.30	9.99
Reactivator 2 Ca	44.00	20.00	200.00	99.52
Reactivator 2 Mg	20.00	12.00	100.00	43.43
Reactivator 2 Silica	11.60	10.00	13.00	11.85
Reactivator 2 Turbidity	9.70	9.70	14.20	7.43

	Last	Min	Max	Avg
CPD Cation Conductivity	0.12	0.12	0.19	0.16
CPE Cation Conductivity	0.10	0.08	0.12	0.10
CPE pH	9.31	9.31	9.45	9.40
Economizer DO	18.00	16.10	18.80	17.35
BDC DO	17.00	3.40	17.00	10.25
BDC pH	9.16	3.40	17.00	10.25
BDB pH	9.08	9.08	9.26	9.19
Steam Silica	2.21	1.94	2.21	2.07
CW Waterbox Inlet Temp	64.40	7.80	81.80	69.22
CW Waterbox Outlet Temp	66.40	9.00	97.80	74.08
CT Local 1 pH	7.70	7.70	7.72	7.71
CT Local 2 pH	7.58	7.58	7.69	7.73
CT Local 1 Conductivity	26,150.00	26,150.00	27,320.00	26,742.50
CT Local 2 Conductivity	26,100.00	26,100.00	27,300.00	26,705.00
CT Dispersant	20.58	20.58	21.40	21.08
CT Silica	136.00	124.00	136.00	131.50
CT Ca	680.00	575.00	720.00	637.50
CT Mg	136.00	124.00	136.00	131.50

Operators access data via digital logbooks, and track key performance indicators with a dashboard view of the plant

Creating regulatory reports removed additional layers of work and chances for errors while significantly shortening the time required to create them. “With our coal, for example, data was entered as we received results, in a spreadsheet,” said Wright. “But the data entry was always being passed around and we had to make new spreadsheets every year. The time to enter data each week hasn’t changed, but with WIMS, we save the environmental experts who do our reporting a lot of time, and they have better data and produce better reports.”

With WIMS, a standardized, separate report automatically provides an average for each week of the month. There is no need for additional reports, and weekly and monthly reports are saved and stored and quickly and easily accessible.

“It saves staff hours of time, and makes problem solving and

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troubleshooting significantly easier,” Wright added. “Before, they would block out a whole week for reports. Now, it takes a few clicks and a couple of hours. We can be proactive and think about other things we can do, and how to make important data, trends, and reports available right when they’re needed. That’s for our department, and other parts of the organization. All of our data is readily available to everyone.”

The Future

“Now, we have a fully functional WIMS program, and we’re learning more each day,” said Bryan. “We can do a lot more with it than we originally thought, and that’s a great thing for our efforts to improve operations, support our staff, and prepare for the future. There is so much we want and need to do with this system, and it gives us the tools to make those things happen.”

“Next steps are to find more ways to improve our environmental and compliance approaches,” noted Wright. “We also will track chemical inventory, so we no longer need to look at multiple spreadsheets to analyze high and low consumption rates and track usage trends. In WIMS, it will be easy to create that graph to detect usage spikes or slight changes.”

With bulk chemicals purchased and used by the railroad carload, and consumable chemical budgets in the eight-figure range, anything TEP can track and trend more accurately helps the bottom line directly.

Conclusion

For TEP, the selection and customization of WIMS for a power generating plant is somewhat unusual. “Ultimately, it’s all about asset protection, reliability, lower costs, and environmental compliance,” said Bryan. “Each is a huge key business driver for us. Any tool we can use to meet those needs is important, and this is an incredibly powerful tool when used in the right way.”

With 127 years of service to the people of Tucson, TEP continues to look ahead, investing in innovative, reliable new technologies. The TEP team in Springerville and across the entire enterprise, understands its key role in the growth and success of southern Arizona. Proactively tracking and using their data using WIMS is a significant part of the future for TEP and southern Arizona.



By proactively tracking their data using WIMS, TEP continues to invest in innovative, reliable technologies to optimize their operation.

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