BROWN AND CALDWELL

QUARTERLY

Fall 2008 Volume 34, Number 1

PROCESS AUTOMATION DELIVERS

QUARTERLY

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DISTRIBUTION
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PRINTING
Bacchus Press

To speak with a Brown and Caldwell representative, call us at (800) 727-2224 or visit our web site at www.brownandcaldwell.com.

Brown and Caldwell provides environmental engineering and consulting services to public agencies, the federal government and industry.

Quarterly is published by Brown and Caldwell, P.O. Box 8045, Walnut Creek, CA 94596-1220; tel. (925) 937-9010. Subscriptions are free.

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PRINTED WITH SOY INK
Printed on 100% recycled paper (50% PCW)

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ISSUES & IDEAS

Ed Melanson
National Service Leader,
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10 CONSIDERATIONS

FOR IMPLEMENTING A PROCESS AUTOMATION SYSTEM

Process automation systems are the central nervous system of your critical water and wastewater infrastructure. Their scale ranges from supervisory control and data acquisition (SCADA) systems in a single location to regional supervisory process control systems (R-SPCS) for multiple major sites in a large region. At their core, these systems connect local processors that "read" data from field sensors, execute complex control schemes and generate alarms that notify staff of events or abnormal conditions.

They also feed data to other critical IT systems such as LIMS, CMMS, models, online operations and maintenance (O&M) manuals and public information web applications. These highly complex control systems are a major purchase and have an impact on all facets of your organization.

Whether you have a small facility with straightforward needs or a large agency with complex systems and data management goals, the basic considerations are the same. Here's a list of 10 recommendations that will help ensure that your process automation system meets your needs.

1 Involve stakeholders through the entire process. People make the difference between a project's success or failure. As a result, a key element of any process automation project is understanding the needs of operations, maintenance and management staff. Individuals want to know how the new system will work, what equipment and functions are being replaced or updated, when the changes will occur and how these changes will impact their roles. Involving key stakeholders early and throughout the entire process provides a mechanism for addressing and incorporating staff ideas and concerns and results in better acceptance of the system.

2 Develop a plan and follow it. Selecting a new process automation system is a challenging task. This type of technology is usually outside the comfort zone of many in our industry and, unfortunately, uninformed decision making frequently results in failure. So get an expert Hire staff with automation expertise or bring in a consultant who can inform and guide you along the way. As you consider implementing or upgrading your automation system, focus on the end result, define your expectations explicitly and take the time to go through each step of the process. Shortcuts rarely get you to your destination.

3 Develop and use standards. Many organizations have multiple process automation systems—typically one for each major facility, including distribution and collection systems. As a consequence, most facility process automation systems have little or no commonality with similar systems, even within the same agency. This lack of standardization leads to increased costs to cover items for:

- Training operations and maintenance staff on each different system.
- Stocking unique spare parts.
- Troubleshooting and equipment needs that are unique to each system.
- Programming costs for each individual system.

To lower costs, consider implementing a program to develop standards as part of a new or major system upgrade. These standards should define a framework for selecting hardware and software products, communications means and methods, controller programming methods, naming conventions, "look and feel" issues as they pertain to graphical displays, data storage requirements and system documentation. By having and using a common standard at all facilities, agencies can reduce their long-term O&M costs, operator errors associated with multiple or different systems and future capital costs by allowing the reuse of many common design and programming elements.

4 Identify and train your internal champions. In most public organizations, there are a few operations or engineering staff that embrace process automation and technology change more than others. These internal champions are crucial to your project success. Identify these individuals early on, get them involved in the entire automation development process and make them part of the development team. It's also important to train more than one champion, since an individual may opt to leave the organization to pursue other interests.

5 Decide early what your system will and will not do. Many agencies have SCADA systems that evolved and grew over time to meet changing and growing needs and address specific concerns. Most work well, but many have features that present challenges to staff on a daily basis. Instead of designing by evolution, perform a study at the outset of your project to determine what features your operations, maintenance, engineering,

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SETTING THE STANDARD

ILLUSTRATION BY TIM COOK

King County's Wastewater Treatment Division is developing control system standards for all of its regional operations

Like many utilities, the Seattle area's King County Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (WTD), has been facing the challenges of aging infrastructure. Although the computerized instrumentation and control (I&C) systems for WTD's two regional wastewater treatment plants have served the utility well, they are nearing the end of their useful life.

As computer systems age, according to the division's Project Manager Rob Mattern, there are concerns about rising maintenance costs, declining efficiency and a rapidly shrinking supply of parts and hardware.

To address these issues, WTD launched a planning study in 2000 to replace all of the organization's legacy computer systems. A key goal was to engineer new process control systems that will avoid premature obsolescence, increase automation and develop, for the first time, a single, uniform control standard for the regional utility, which includes two large wastewater treatment plants, conveyance and pumping systems and a new, greenfield treatment plant projected to be online in 2010.

"Right now," Mattern explains, "our two major treatment facilities—the South Plant and West Point Treatment Plant—use totally different process control systems, requiring different types of training and support." Installing a third, state-of-the-art system in the new greenfield facility, he adds, would only increase inefficiency and complexity.

"We need to work smarter as we move forward," Mattern states. "That means developing a

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PHOTO BY JIM SANDERSON

Rob Mattern (left) of the King County Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (WTD), has been working with BC's Kevin Stively (right) to develop new I&C standards and guidelines that will be applied across all the utility's existing and future facilities.

EVENTUALLY, THE NEW PROCESS CONTROL SYSTEM WILL CONNECT ALL WTD'S REGIONAL TREATMENT PLANTS—PERMITTING FLOW MANAGEMENT, PREDICTIVE MODELING AND LONG-TERM COST SAVINGS THAT WILL ENABLE THE UTILITY TO BE COMPETITIVE WITH THE PRIVATE SECTOR.

single, standardized approach that gives us a blueprint for the future, a high level of data integration and one set of standards for training purposes. Instead of the disparate systems we have now, we'll have a standard, cutting-edge process control system throughout the division."

Building consensus

In 2003, WTD began a division-wide effort to develop new I&C standards and guidelines that will be applied across all the utility's existing and future facilities.

Brown and Caldwell, Mattern notes, has played a key role in the standards development. A BC team initially spent three months surveying each WTD facility and documenting more than 800 different, individual user requirements. Then, over the course of 2 ½ years, Brown and Caldwell held approximately 60 workshops with King County operations, maintenance and technical staff to present and discuss technology options, best practices, integration approaches and WTD requirements.

"These were crucial steps," explains BC Electrical and Process Automation Services Leader Kevin Stively. "The two major WTD plants not only had different technologies, but they also had very different cultures and system preferences. Our task was to address their needs and develop one overall standard that all of the stakeholders would accept.

"In the end," he reports, "we had clear consensus and a thumbs-up show of support for our approach."

Creating a framework

The team, Stively adds, used an open framework approach to developing standards. "A standard can be written one of two ways," he explains. "One common method is to decide what automation equipment and instrumentation is needed for a process control project, then document it by specifying makes and model numbers." This approach, however, can lead to premature obsolescence and inefficient single sourcing of equipment, Stively adds.

A better approach is to define standards of technology that are capable of supporting specific control tasks and create a framework for developing, applying and managing those standards.

"It's a much more adaptable and stable strategy than specifying hardware and equipment," Stively says. "Control system standards need to be both specific enough and general enough to grow with user needs and technology changes. With a standards framework, you don't have to update standards documents on a regular basis because they're based on a long-range technology plan and approach rather than specific parts."

Developing a framework, he continues, means understanding user requirements, then identifying detailed technical requirements for each control system component without specifying particular manufacturers or parts. With a framework approach, he adds, technology is not a product but a flexible tool for meeting business needs.

In line with this strategy, Mattern says, WTD has designed standards to meet its business requirements of treating wastewater in a safe, sustainable manner. Its new I&C standards and guidelines provide a framework for implementing control systems and supporting data and control integration within the division for the next 15 to 20 years, the expected life cycle of the new technology. Although they do not list specific technologies or vendors, the standards do define network infrastructure, redundant fiber optic communications for the plant control network backbone and core, non-vendor-specific control system technologies like controllers, field devices, and bus technologies with smart instrumentation and motor controls.

Implementing standards

After developing the standards, the WTD project team assembled a pilot control system and comprehensively tested it on a wide spectrum of applications in a large organizational environment. The pilot system and standards it tested, Mattern notes, were a scaled, vertical representation of the system architecture and its significant control and data system tiers.

WTD is now in the process of implementing the new standards in its 115 million-gallons-per-day (mgd) South Plant, a 40-year-old facility in Renton, Wash., south of Seattle.

"Replacing a plant's control system," Mattern says, "is an easy, straightforward task if the facility, or part of it, can be shut down during the upgrade. The South Plant, however, is fully operational and has to remain in service during the control system replacement."

The modular design and installation of the control system, Stively asserts, will make that possible. "Like a telephone or personal computer," he explains, "each control module plugs into the network independently." It can be installed, tested and put in use without affecting any other parts of the operation.

At present, the team is currently installing the South Plant's new fiber-optic network and switches. The next step, Stively says, will be to install the supervisory control system. By the end of 2007, he expects, the team will begin engineering designs to upgrade each of the process areas in the facility.

In 2008, he adds, WTD will begin applying all its new technologies and design standards to its new greenfield regional wastewater treatment plant, which will serve parts of King and Snohomish counties. By 2009, the utility will begin the three-year process of upgrading its 133 mgd West Point Treatment Plant on Puget Sound.

Eventually, Mattern says, the new process control system will connect all WTD's regional treatment plants—permitting flow management, predictive modeling and long-term cost savings that will enable the utility to be competitive with the private sector.

"Over the next five to seven years," he predicts, "our new control standards will give us a platform to visually monitor all our flows and processes, while also tracking operational and maintenance cost and efficiencies. In the past, that type of seamless management was technically and functionally out of reach. But in the future, with these control standards, it will be simple and manageable."

For more information, contact Kevin Stively at 206.749.2262 or kstively@brwncald.com.

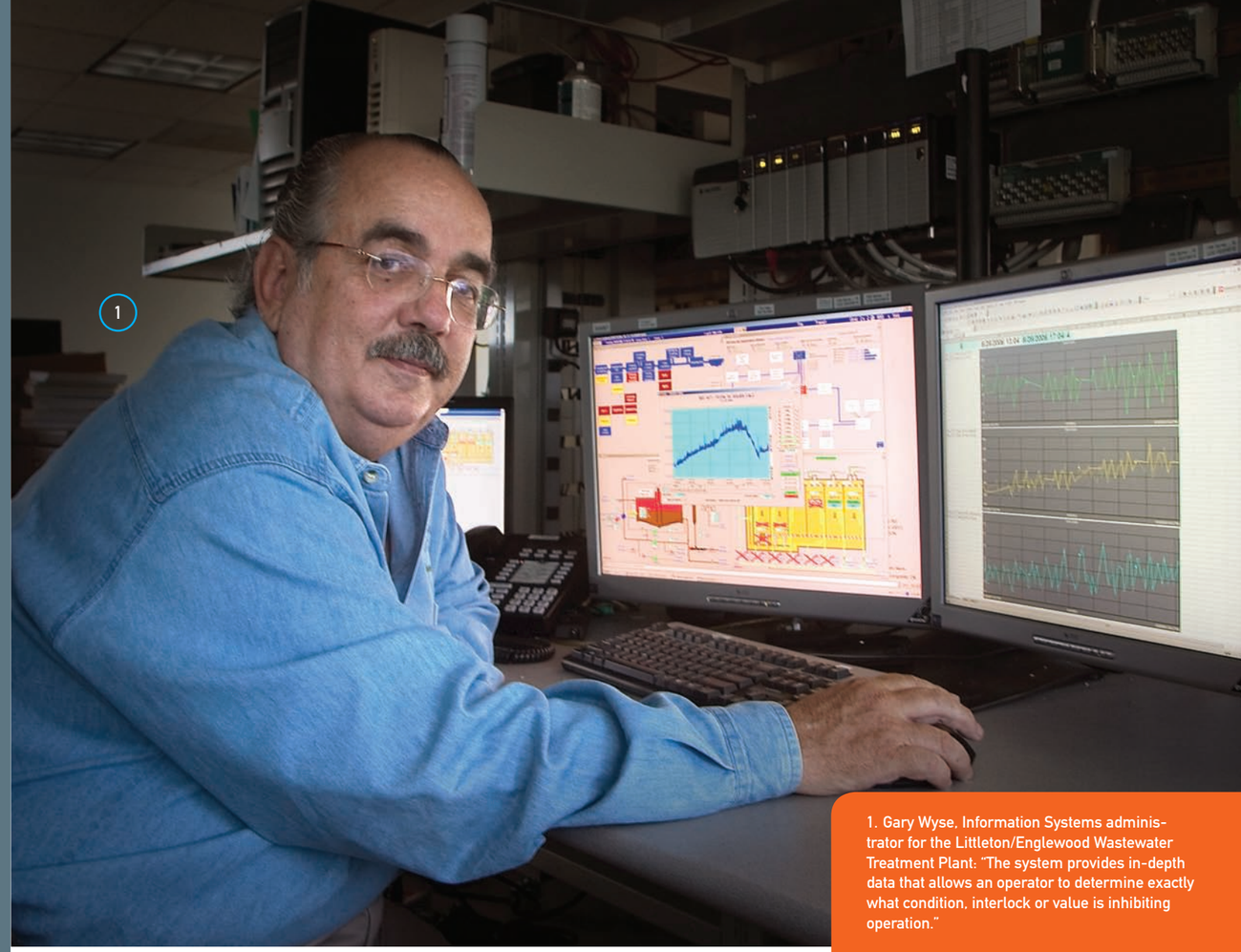
DATA-DRIVEN DESIGN

Two Colorado wastewater utilities are deploying smart, cutting-edge automation systems

Diagnosing equipment problems at the Littleton/Englewood Wastewater Treatment Plant in Colorado used to take quite a bit of guesswork, according to Gary Wyse, Information Systems administrator for the facility.

"In the past when we'd have a problem, someone would write it up, then a maintenance person would go out to the field and try to figure out what the problem was. Typically," he explains, "that involved some good guessing and some bad guessing."

PHOTOS BY JIM SANDERSON



1. Gary Wyse, Information Systems administrator for the Littleton/Englewood Wastewater Treatment Plant: "The system provides in-depth data that allows an operator to determine exactly what condition, interlock or value is inhibiting operation."

2. Colorado Springs Utilities Team Leader Jay Hardison: "No one is automating the work management system, based on diagnostics out in the field, the way we are."

Now, almost all guesswork is being eliminated, thanks to a new data-driven instrumentation and control (I&C) system for the 36 mgd facility. The new computerized control system conveys detailed information from every pump and instrument in the plant and makes it accessible to operators with just a few clicks of a mouse.

"The system provides in-depth data that allows an operator to determine exactly what condition, interlock or value is inhibiting operation," Wyse explains. "With this information, every maintenance problem is clearly understood before anyone ever goes out to make repairs."

The utility's new I&C system is part of a major electrical and control retrofit for the Littleton/Englewood Wastewater Treatment Plant Phase 2 Expansion, now under construction. Final design will include a network of programmable controllers and graphic interface stations interconnected by a fiber optic cable backbone. The project, which will fully automate plant operations, will offer configuration flexibility and support real-time maintenance diagnostics and computerized maintenance management, process analysis, alarm paging, operations manuals and asset management tools.

"It's on the cutting edge of wastewater automation systems," states BC's Lead Electrical Engineer Dennis McQuillan. Brown and Caldwell is developing control systems standards for the project and providing programming, commissioning and operator training services.

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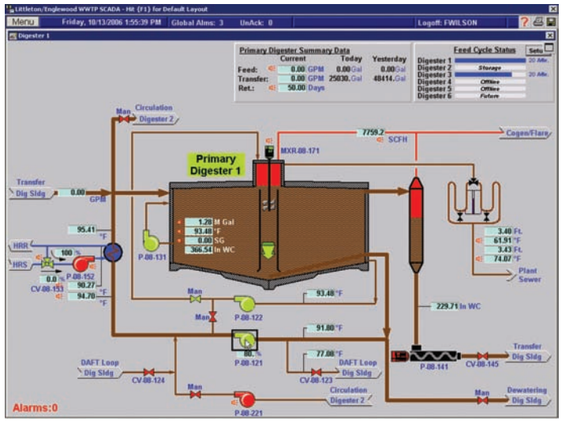
"A new data-driven instrumentation and control system conveys detailed information from every pump and instrument in the plant and makes it accessible to operators with just a few clicks of a mouse."



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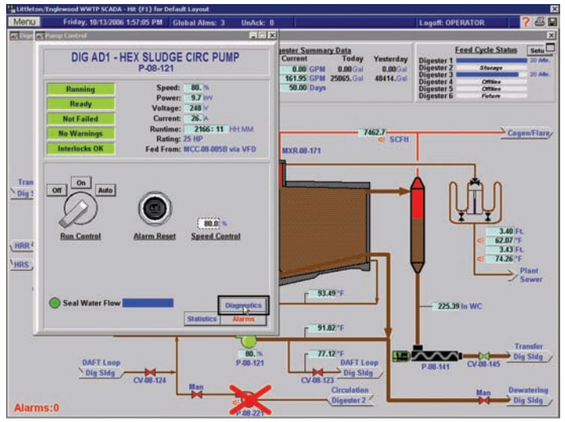

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1. A process overview screen for Digester 1 at the Littleton/Englewood Wastewater Treatment Plant shows the basic status of all equipment and instruments. Operators can access detailed equipment control screens and trends by clicking equipment or numeric indicators.

2. This pop-up equipment control screen shows the detailed status of a pump shown in the previous overview screen. It features navigation links to statistics, alarms and diagnostics.

Collaborative design

"BC is playing the dual role of mentorship and stewardship—mentorship by introducing us to new concepts and options and stewardship by listening to people throughout the organization, using their ideas to make the system functional as well as user friendly," Wyse notes.

According to BC's Lead Process Automation Engineer Fred Wilson, staff participation is a key part of the development process. "The best way to keep operators engaged with the system," he explains, "is to ensure it makes things easier for them. So my priority during design and startup is interfacing with the operations staff. They're the ones who use the detailed information, and they have to feel that their feedback is valued."

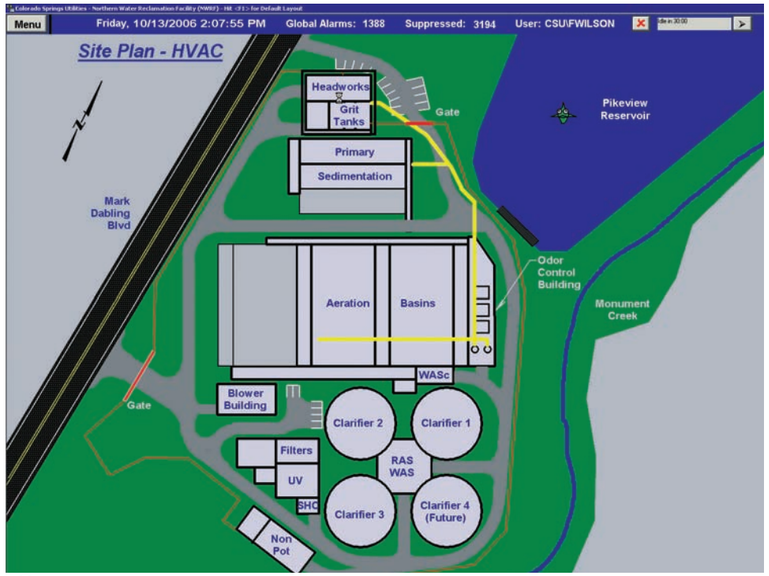
Based on their input, BC has designed a system that gives staff all the information they need through a simple, intuitive user interface. "We created a system that lets operators easily access almost any piece of information within three mouse clicks, and detailed diagnostics for maintenance within five clicks," Wyse says.

The system accesses more than 2 million pieces of data, compared to about 2,500 in the facility's old system. The primary reason for the dramatic increase is the availability of detailed historical and diagnostic data from intelligent devices in the field.

"We need to give operators access to all that data," Wilson explains, "but present it in a way that doesn't overwhelm them. If they're constantly bombarded by useless information, they can become frustrated and may disengage, ignoring or missing critical alarm information."

A layered interface keeps the data from being overwhelming. In the first layer, he explains, animated schematics of piping and equipment show basic process information like flows, levels and run status. The second layer, he adds—accessed by clicking a picture of a pump, for instance—is a pop-up display that provides detailed equipment operating data and alarms and allows access to control functions. The pop-up also features links to deeper layers that provide specialized information for administrators, maintenance staff and others. Valves and instruments have similar layers of detail.

"Operators are only exposed to the level of information they request," Wilson explains. "And because all the screens and icons have a consistent appearance, they become comfortable with the environment very quickly."



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3. This screen provides an overview of facility operations at the new Colorado Springs Utilities Northern Water Reclamation Facility, along with navigation for HVAC.

4. BC's Lead Electrical Engineer **Dennis McQuillan (left)** and Lead Process Automation Engineer **Fred Wilson (right)** have designed a system that accesses more than 2 million pieces of data through a simple, intuitive user interface.

4

Joint efforts

The design process, Wyse says, is benefiting from BC's parallel development of the Colorado Springs Utilities Northern Water Reclamation Facility, a 20- to 30-mgd greenfield facility now under construction. Brown and Caldwell is providing design services for electrical and instrumentation and control system architecture development, as well as construction and inspection services. BC is also providing process automation and startup services, integrating the system into the utility's wide area network and implementing a process historian software system.

"The end goal is to get all instrumentation and values on networks, bringing diagnostic information into our work management systems and automatically creating work orders," explains Colorado Springs Utilities Team Leader Jay Hardison. "The result will be better quality work and maintenance, performed at the right time."

The system and interface—developed on the same platform as the Littleton/Englewood plant—is "very advanced," Hardison says. "No one is automating the work management system, based on diagnostics out in the field, the way we are."

Wyse adds, "It was a genius stroke to align with Colorado Springs and build around similar features and standards. Both facilities end up with much better process automation for a lot less cost than if we'd done it individually."

Mobility and support

Both plants feature secure wireless networks that allow maintenance people to be mobile, using laptop SCADA and diagnostic tools throughout the plant instead of at fixed stations. "While on-call," Wilson adds, "they can also access information from home or other remote locations with

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QUARTER NOTES

In the Eye of the Storm

Everglades pump stations function flawlessly during record hurricane

In October 2005, Hurricane Wilma slammed into Florida with 125 mph winds. The most powerful storm to hit the state since Hurricane Andrew in 1992, it tore off roofs, destroyed water mains and knocked down power lines.

As it raced over the Everglades, it also scored a direct hit on major pump stations—including two designed by Brown and Caldwell—that move water through Everglades Stormwater Treatment Areas (STAs). The facilities pump water into and out of the STAs—filter marshes designed to remove excess phosphorous and clean and restore the ecosystem of the Everglades.

Direct hit

"The pump stations got the full brunt of the wind, since there's very little protection in the Everglades," explains George Horne, deputy executive director, Operations & Maintenance, for the South Florida Water Management District (SFWMD), the agency responsible for Everglades infrastructure. "Despite those ferocious winds," he says, "the pump stations performed flawlessly."

All of the stations—built with 12-inch exterior walls, minimal exterior openings and a cast-in-place column, wall and roof system—are designed to withstand 155 mph winds, explains BC Client Service Manager Albert Basulto. The stations are manned during hurricanes, he adds, but they can also remotely operate the low-flow pumps during routine operations.

"The SFWMD," he says, "is well-prepared for major storm events and ahead of the game when it comes to automated control processes."

For more information, contact Albert Basulto at 561.684.3456 or abasulto@brwncald.com.

FOSTERING THE FUTURE

International Water Association lauds BC's development programs for young professionals

The International Water Association (IWA) has reaffirmed BC's commitment to fostering a workplace environment in which young professionals can learn, grow and have fun, bestowing the company with its 2006 Professional Development Award.

In announcing the award—which recognizes companies in the water industry for making a significant contribution to employees under 35—IWA's judging panel said: "Brown and Caldwell has clearly demonstrated a commitment to learning and development of their workforce with a well-structured comprehensive professional development program.

"Through its Progression Path, Young Professionals and Turn Up the Volume initiatives, the company has enshrined a professional development culture throughout its workforce. Moreover, it has ensured that young water professionals are involved in the development of both their careers and the business.

"This award is a testament to the work and commitment of employees companywide to create more than a program or curriculum," says BC Training Manager Jeffrey Mills. "Our Young Professionals benefit from a unique learning infrastructure that provides time and resources to support discussion, reflection, practice and sharing of ideas and experience. This is definitively not your grandfather's Oldsmobile of training programs—it's different and it's helping to make us a better company."

BC engineers Adam Ross and Jenny Gain, who felt strongly enough about BC's Young Professionals program to offer it up as a model of career development, submitted the award application and a brief essay. In September, the two traveled to Beijing to accept the award at the IWA World Water Conference and Exposition.

What's on OUR MINDS?

Safer Systems

Replacing hard-wired security, access and safety systems with programmable controllers running on safe versions of open-architecture data communication bus networks may lower costs and the number of on-site subcontractors you need

Plant and facility security and access systems have traditionally been built with hard wiring, electromechanical relays and separated dedicated panels. It may be a smart move, however, to replace those hard-wired security and access systems by integrating a dedicated, robust safety system controller into the process system programmable logic controller.

According to BC Electrical and Control System Engineer Hugh Pace, P.E., "Data communication networks provide an alternative to hard-wired systems just as, over the last few decades, standard PLCs and data bus networks have replaced hard-wired relay logic for control functions. Their advantages include lower costs, better diagnostics and improved flexibility for adding devices."

More security

The networking approach, he says, reduces component count compared to a hard-wired system, lowers upfront engineering requirements, shortens the installation time—which lowers labor costs—and allows a plug-and-play network system with built-in, point-level diagnostics.

In addition, use of a dedicated safety controller—which can be integrated into the process logic system controller—may tighten facility security by reducing the number of on-site subcontractors.

"With the new, robust PLC security control modules," Pace explains, "you can combine three systems into one chassis, eliminating the need for two contractors. That means fewer folks who have access to your facility and know everything about it.

"It's a change," he adds, "that many facilities can make right now to improve their security and access flexibility."

For more information, contact Hugh Pace at 602.567.3873, or hpace@brwncald.com.

Targeting Air Force

Efficient aeration controls mean big energy savings

In most wastewater treatment plants, aeration control is one of the prime energy consumers. Microorganisms in the treatment process require oxygen, but if blowers provide them with too much air, the plant's energy load and costs can climb unnecessarily. Depending on the facility, there can also be other unintended process effects.

"It's often difficult for plant operators to find just the right balance between enough and too much air," explain's BC's Fred Wilson. As a result, he says, many plants are spending more on energy than they should.

Brown and Caldwell, he notes, can fine-tune the aeration control process so it works more efficiently.

"We verify, first, that plants have the right blowers, valves and instrumentation," Wilson explains. "Our electrical and process automation services group can then tune the system properly so it operates smoothly, automatically and cost-effectively."

For more information, contact Fred Wilson at 303.239.5460 or fwilson@brwncald.com.

BC Names New National Wastewater Practice Leader

Donald J. Wuerdeman takes the reins

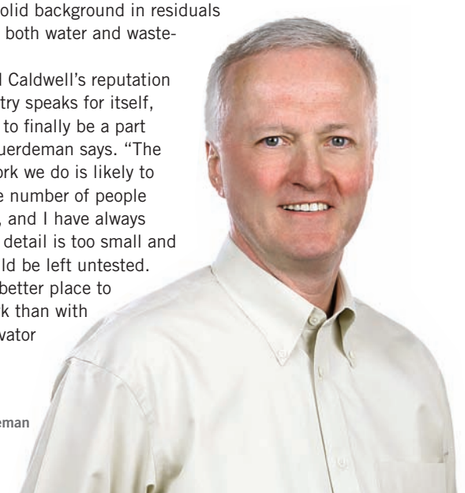
Brown and Caldwell recently announced that Donald J. Wuerdeman has joined the company as National Wastewater Practice Leader. A 33-year veteran of the wastewater industry, Wuerdeman held vice president, director of client development, national practice director and regional practice leader positions for Malcolm Pirnie before joining BC. He's based in the company's Los Angeles office.

"Don brings some impressive credentials to Brown and Caldwell," says BC's CEO Craig Goehring. "We're confident his management background and project experience will help us deliver what our clients have come to expect from BC—exceptional service, resourceful solutions and lasting quality."

Technical leadership

A seasoned water and wastewater engineer, Wuerdeman has designed toxic process waste collection systems for large industrial clients and developed, designed and constructed water and wastewater infrastructure and treatment facilities for municipalities nationwide. His leadership and technical skills include strategic planning, facilities planning, construction management, start-up and facility operations. Don also has a solid background in residuals management for both water and wastewater facilities.

"Brown and Caldwell's reputation across the industry speaks for itself, and I'm pleased to finally be a part of the team," Wuerdeman says. "The impact of the work we do is likely to be felt by a large number of people over many years, and I have always believed that no detail is too small and no concept should be left untested. That said, what better place to do your best work than with a technical innovator like BC."



Don Wuerdeman

Beyond SCADA to Smart Utility Management

By Kevin Young and Pervaiz Anwar

Kevin Young
Managing Director,
Hunter Water, Australia

Pervaiz Anwar
Director, BC's Business
Consulting Practice

Today, best-practice utilities are characterized by superior data collection and support systems that drive process control and automation, as well as real-time decisions that constantly optimize system behavior.

Many of these same utilities are also embarking on the asset management journey. Their organizational conversations are increasingly focusing on risk management, maintenance management, whole-of-life analysis and asset knowledge and capability.

At the same time, utilities must execute their missions in the face of daunting challenges. Many are unique to this era of diminishing resources and heightened public scrutiny, including organizational "brain drain" through loss of experienced personnel, aging assets, competitiveness pressures and significant reinvestment needs.

Smart systems

As a result, the key question is how to transition SCADA systems from their traditional role of status, alarm and process-control functions to smart systems for higher-level utility management decisions. To do this, many international utilities are capturing the knowledge base from their experienced workers and using this as the heart of new automation projects that are fast developing.

These new, leading-edge utilities demonstrate a thorough knowledge of their assets and their appropriate operation, maintenance, and replacement decisions, which are backed by computer systems and automation. These systems, which are starting to emerge, have the capability to:

- Highlight assets whose replacement or refurbishment is worthwhile
- Constantly reassess the criticality of assets and the appropriate maintenance approaches
- Examine daily the capacity of assets (e.g., pumps or networks) and record their deterioration in efficiency, with trigger points for intervention
- Model the system in real time and simultaneously track actual system performance. This process highlights where the system is not performing to expectations and where it is likely the system's operational configuration may be different from the optimum (e.g., critical valves mistakenly left shut, with adverse consequences)

Start with asset management

System capabilities are not the limiting factors in utility management, but organizational capabilities certainly can be. The secret is not to go straight to black-box IT solutions. Many of these systems are gathering dust across the country. The best path for a utility is, first, to build organizational capability and confidence in the foundational aspects of good asset management before reaching for high-end systems capable of providing critical data and information for the best management decisions. This course of action can then systematically lead a utility to full integration of SCADA, CMMS, GIS and other IT systems to successfully deploy:

- A work management system to track asset costs
- Decision-support models, including optimum time periods for replacing or refurbishing assets
- Maintenance systems that adopt appropriate maintenance techniques for the asset types
- Modeling systems that help the asset owner configure the system to operate as efficiently as possible
- Risk models that can point out a system's critical assets as those which you never want to fail

At the end of the day, isn't this really what smart utility management is all about?

Arc flash hazard analysis saves lives

Every year, about 2,000 people are admitted to hospitals with severe burns caused by arc flashes. An explosive short circuit of energized electrical equipment, an arc flash can reach temperatures above 35,000 degrees Fahrenheit—spreading hot gases, melting metal, creating pressure waves that can damage hearing and brain function, and producing a blinding flash that can damage eyesight. Arc flashes can and do kill at distances of 10 feet or less.

"The cause of an arc flash can be as simple as a loose wire or a snake, bird or other small animal in energized electrical equipment or systems," explains BC Electrical Engineer Hugh Pace, E.E., C.S.E., P.E.

Arc flash incidents, he adds, not only are extremely dangerous to human life, they're also immensely costly, with treatment often exceeding $1 million per case and skyrocketing costs for litigation and insurance.

Managing arc flash

The good news, however, is that arc flash can be managed with proper procedures, training and personal protective equipment. Brown and Caldwell, Pace adds, can perform complete electrical distribution arc flash evaluations—including short-circuit analysis, protective device coordination and condition assessment—and educate clients about OSHA, NEC and NEC safety codes governing energized equipment.

"BC can determine the state of electrical systems, the appropriate flash protection boundary and the personal protective equipment needed within that perimeter," he says.

For more information, contact Hugh Pace at 602.567.3873 or hpace@brwncald.com.

BC EXPERTS MEDAL AT WEF

Wastewater experts honored for industry contributions

The Water Environment Federation (WEF) has honored two of Brown and Caldwell's most experienced and well-respected wastewater experts. The Federation, one of the industry's most renowned professional organizations, named Perry Schafer this year's recipient of the Thomas R. Camp Medal and awarded Jim Courchaine the Charles Alvin Emerson Medal.

Schafer takes Camp Medal

The organization awards the Camp Medal to a member who demonstrates a unique application of basic research or fundamental principles through the design or development of a wastewater collection or treatment system. WEF recognized Schafer for advancing the science of the kinetics of pathogen destruction in biosolids and successfully applying it to new Class A digestion processes across North America.

"It's a terrific honor to be recognized by WEF and my colleagues in the industry," Schafer says. "Digestion of municipal wastewater sludges continues to be an exciting arena for achieving advanced levels of biosolids processing."

Currently, Schafer is the process lead for the world's largest egg-shaped digester facility, which BC designed for the DC Water and Sewer Authority in Washington, D.C. The digesters will stand 10 stories tall, hold 4.5 million gallons and process more than 300 dry tons/day of raw sludge to Class A, pathogen-free biosolids standards. The facility will also be operable in several different Class A and Class B digestion modes—another first-of-its-kind innovation.

Schafer also served as an advisor on planning and design for wastewater residuals at the Greater Vancouver Regional District's 150-mgd Annacis Island Wastewater Treatment Plant in British Columbia. In addition, he was project engineer for the Western Lake Superior Sanitary District's temperature-phased digestion project in Minnesota and advisor on Class A digestion process development for the Columbus Water Works in Georgia and the Orange Water and Sewer Authority in North Carolina.

Courchaine wins Emerson Medal

WEF awarded the Emerson Medal—commemorating Charles Alvin Emerson, the first president of WEF—to Jim Courchaine for his contributions to the wastewater collection and treatment industry.

Courchaine, who has spent nearly 40 years working with water, wastewater, stormwater and infrastructure, is one of the original WEF reviewers of the proposed CMOM regulations (now CMOM guidelines) in 2000 and is an expert in the management, operation and maintenance of wastewater collection, water distribution and stormwater systems. He has also developed CMOM programs for municipalities nationwide, including Pima County, Ariz.; Narragansett Bay Commission in Providence, R.I.; the City of Columbus, Ohio; the Milwaukee Metropolitan Sewerage District; and the City of Sacramento.

"This is a tremendous honor for me as well as Brown and Caldwell," Courchaine says. "We volunteer our expertise because it's the right thing to do."

As a University of Lowell professor from 1981 to 1991, Courchaine developed a 45-hour basic and advanced course in the management, operation and maintenance of wastewater collection and water distribution systems. He currently provides training programs for municipal and regional water and wastewater agencies. He has also developed courses for water treatment and distribution, including presentations as a U.S. delegate to a technical exchange symposium in Taiwan.

Perry Schafer

Jim Courchaine

Making Waves

BC employees fill Water for People coffers

Employees from across Brown and Caldwell raised more than $22,000 in the workplace and online in just three months last summer for Water for People, a nonprofit organization dedicated to supporting locally sustainable drinking water, sanitation facilities and health education programs in developing countries.

Yard sales and surf boards

The fundraising effort, dubbed the Workplace Giving Campaign, got under way in May, and employees quickly hit the original $15,000 target. By the end of July, proceeds from events like yard sales, pie-in-the-face contests, poker nights, silent auctions, concerts, bake sales—even a surf board auction on eBay—pushed the donation total past the $22,000 mark.

"Brown and Caldwell's performance was amazing, especially considering it was a first-time effort," says Water for People's Nancy Stewart. "The dedication, attitude and commitment of BC employees to help so many people around the world say a lot about the company."

Smart BC Tools Boost Accuracy

Designers input data only once in dynamically linked drawings and documents

Typically, design engineers spend considerable time checking the accuracy of hundreds of equipment, SCADA I/O references and drawing titles in long contract document sets. That tedious task, however, is no longer necessary, thanks to the new BC Tools data-management package.

"Now we just input information in one place, and it's dynamically linked to all the other facility-design drawings and documents," explains Lloyd Slezak, BC Vice President and Manager of Technical Systems.

"BC Tools enable us to link all our contract document drawing title, equipment or instrument references to common records in a relational database system that stores important information about each of the items. The tools help ensure that design documents have a place for everything, and that everything is in its place."

Use of BC Tools is growing rapidly across the country, and it's already been used to organize nearly two dozen projects, according to BC's Sam Kharouf, who developed the system and is helping teams in Atlanta, Seattle, Orlando, Sacramento, Las Vegas, Denver and Walnut Creek use the package.

The result is substantially improved accuracy and quality control. "Designers can now focus on much more important things than checking references," he says.

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appropriate security protections."

Twenty percent of the existing Littleton/Englewood facility has already migrated to the new system. "We'll keep the plant running," McQuillan explains, "transitioning a piece at a time to the new advanced process control technology." The new Colorado Springs facility, by contrast, will start up in a single day. In both cases, Wilson says, BC will remain on-hand long term to gather feedback from operators and make adjustments.

Frequently, he says, programmers disappear after construction is completed. "But the tweaking process is critical," he adds, "and with plant staff coming up to speed with new systems, it often takes time for problems to surface. If there's no plan for feedback and adjustment, a facility can end up with areas that just aren't working right. Even though the problems may not be that difficult to solve, they can cause operators to abandon the entire system.

"Knowing they'll want us to come back, spend more time with operators and tweak a few things," he adds, "our clients have planned these projects with a software support contract that extends after construction ends."

Process automation, he reflects, is a major investment for any facility. "In the end," he says, "the best way to make sure that investment pays off is to have a mechanism for soliciting meaningful feedback, incorporating users' suggestions and improving performance."

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management and lab stakeholders require and how the new process automation system will integrate into daily operations. Then design your system to meet those needs while providing sufficient flexibility to adapt to changing requirements and technology improvements.

6 Think about the future and integrate assets. Technology is constantly evolving. Today, modern control systems (excluding sensors and local controls) have a 7- to 10-year life span. In your design process, build in methods for easily replacing components or adding new technology as it becomes relevant to your needs. At the same time, integrate existing assets. Some process automation components have significantly longer life cycles than others. Instead of replacing all existing equipment as part of a large upgrade, consider integrating long-lasting components into your new system. For example, many sensors have life cycles of 10 years or longer, and most PLC equipment should last 15 years. As a cost-saving measure, design your new system to integrate the older technology and preserve some of your existing automation investment.

7 Stick to the major vendors. Process automation vendors come and go at an alarming rate, and system life cycles are short. A key strategy for success is having a vendor with sufficient resources to weather changing market conditions, while supporting your system needs for years to come. Major vendors, moreoever, have connections to many players in our industry—consultants, contractors, system integrators, and panel shops. Each of these organizations can also provide technical support and assistance when needed, bringing an inherent value to your project.

8 Pick products that meet your needs. A key issue with implementing a new process automation system is information overload from vendors. Most know how to demonstrate their products in the most favorable light, but many times these products have features—and associated costs—that don't necessarily bring value to your specific application. Before design, consider visiting several neighboring agencies to see and discuss how they implemented their process automation system. Also consider having structured demonstrations by several vendors to gain more insight into their products and service capabilities. Understanding what works for similar agencies and what is available and common among the various vendors will help you contain costs and get a system that meets your specific needs.

9 Don't forget your sensors. Most vendors focus only on computers, networks, software, and controller devices. The most critical elements of your control system, however, are field sensors. Without accurate and timely information, a control system becomes a very expensive paper weight in your control room. As part of your process automation project, consider evaluating all of your existing field sensors. Do they work? Are they calibrated? Are they maintained? Do you trust their readings? Feeding bad information into your control system will likely result in poor operations, distrust of the system or simply non-use, so focus attention on your sensors and install new ones as needed to meet process objectives.

10 Think through life cycle costs. Automation can have a profound impact on your operations, and the costs of your system extend beyond the initial capital investment. Life-cycle costs include many elements:

- maintenance costs
- support costs
- product obsolescence costs
- labor demands and skill sets
- optimization and its impacts on utility and chemical costs
- impacts on other elements of your organization, such as IT, lab and planning

As you look at process automation and the benefits it can bring to your organization, consider the related life-cycle costs and the impacts a specific vendor or approach may have on your organization.

Keep in mind that your process automation system is simply a tool by which staff can more readily achieve your organizational goals. It should provide a net positive benefit to you and not become a long-term resource drain.

Smart Automation

The best I&C systems focus on business needs and the human element

Craig Goehring, P.E., CEO

Does technology make things easier? If you asked many water/wastewater managers, they'd probably answer "that depends."

In too many cases—and too many I&C process control systems—technology delivers less than it promised. Like a TV remote control with scores of buttons, more features and complexity don't always mean a positive, productive experience for the end user.

Like any worthy investment, technology must meet clear business needs. It has to make operations easier and more efficient. Above all, it has to be approachable and simple to use—otherwise, it will probably be underused, no matter how many bells and whistles it may have.

Brown and Caldwell has considerable experience and depth in this area, so I asked several of our top I&C people what makes process control systems fall short or succeed for owners.

Q. Why do automation systems so often disappoint their end users?

A. For many reasons. According to Hugh Pace, P.E., in Phoenix, the problem often comes down to low-cost solutions that fail to perform the intended functions. Dennis McQuillan, P.E., in Golden, Colo., points out that owners only get the minimum under a low-bid contract—the high-value stuff is supposed to come later, but usually doesn't.

Owners also often underestimate the amount of training needed for a fully modern and integrated control system. Another common problem is that once the system is up and running, it needs accurate data from field devices to perform right. John Diedrich, P.E., in Atlanta warns that these instruments need periodic maintenance to work properly. If that's not done, it becomes a "garbage in, garbage out" situation.

Q. Is the added complexity of integrating multiple systems really worth it?

A. Sometimes. According to Scott Bash, VP, Information Technology, in Atlanta, integration can be simple in situations where an organization has set up standard hardware, compatible databases and data standards. But the decision to integrate systems should always involve a cost-benefit analysis. Integrating databases, streamlining data flow, centralizing data and reducing redundancy of data elements and datasets can all reduce costs, risks and O&M time. On the other hand, the cost of integration can potentially outweigh the benefits. Owners should proceed carefully.

Q. Is there a growing "acceptance factor" for automated systems?

A. In some ways. With the changing of the guard in most water and wastewater facilities, says Automation Services Vice President Ed Melanson, P.E., staff are more computer literate and in tune with the value and benefits of technology and automation. And, because more and more municipalities are growing and their staffs are not, there's a definite need for tools that can help them perform better and more efficiently.

At the same time, certain technologies, such as programmable logic controllers (PLCs), now have long track records of successful performance. Combine track record, trust of technology and computer literacy, and you get wider acceptance of automated systems.

Bash adds that automated systems have been the norm in the water/wastewater industry in western and northern Europe for a decade. Their use is certainly growing in the U.S., and it's only a matter of time before people see the light and recognize the benefits.

In U.S. manufacturing, in fact, automation systems aren't optional—they're a competitive necessity. The water/wastewater industry is behind the curve because its systems are just entering the upgrade cycle. According to James Fordyce, senior engineer in Phoenix, "The water/wastewater industry is kind of like a guy who's just seen his first DVD disk and wonders if the technology will catch on like VHS. Owners need to understand this stuff is not the alpha rollout, and from what I have seen, many are catching on."

Q. Why now...for getting these systems "right?"

A. Because control systems are aging and need replacement. Automation tools, when tapped for their potential, give organizations the opportunity to meet their budget and labor challenges more readily than older approaches. According to Kevin Stively in Seattle, they also free plant staff from the duties of monitoring and controlling the facility, enabling them to focus on fine-tuning the plant and maximizing its efficiency.

Q. What's the hardest part of getting one of these systems up and running?

A. Integration and troubleshooting can be challenging, but most important is the human element. As Bash points out, systems are not solely separated by technology. People need to be involved. The integration of systems is part hardware, part software and a great deal of brainware. Ultimately, however, it's the emotions of end users that determine if a system is successful. When integrators ignore this fact, you can have problems. Melanson advises owners to use qualified contractors and integrators who understand the value of teamwork and partnership in getting the system up and running.

At Brown and Caldwell, we want clients to get full value out of automation. We design systems with the user in mind, with interfaces that are approachable, intuitive and simple to use. We also listen, we engage, and we're there long after startup to make sure things are working right.

As Gary Brown, P.E., in Sacramento explains, an owner isn't a person or department—it's the organization. We understand the organization's culture, the needs of departments and key individuals, and we work closely with owners, long-term, to build system acceptance, not just technology. When you get that right, you've got a winner.