In the Heart of America: Smart Grid Demonstration
Kansas City’s Smart Grid Takes Shape
Making It Real

The Smart Grid is in the news lately, so often it’s become a buzzword nearly synonymous with all things energy. But the buildout of the Smart Grid is in its infancy. We as an industry have the task of educating our consumers and our regulators about the benefits the Smart Grid brings — the reasons our society must invest in the programs that will build it.

Beginning on Page 9, we take a look at how one utility, Kansas City Power & Light, is demonstrating the future of electrical power to its customers. We’re proud to be a partner in this initiative, which implements the full range of technologies and systems that make up the Smart Grid of the future.

The environmental, security, reliability and efficiency advantages that a fully realized Smart Grid can achieve are lofty — but achievable — goals. But sharing those goals clearly is essential. Projects that emphasize consumer benefits like the potential of lower electric bills are a great step forward.

Walt Womack
President
Transmission & Distribution Group
What’s Sustainable?
Sustainability permeates everything we do today — at work, at home, on our commutes. At Burns & McDonnell, we understand that sustainability is important to you, our clients and partners. That’s why we’re making it easier for you to find how sustainability impacts every topic we write about in BenchMark. Look for the leaf icon throughout the publication to see how our work is contributing to sustainability on all fronts.

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Environmental Engineer John Hesemann Finds Remediation Solutions That Fit
Creative thinking and innovation are key for cost-effective solutions.

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**Technical Q&A: 316(b) Regulations**

**Q:** Could the new Section 316(b) Phase II/III rule require all existing facilities with cooling water intakes and once-through cooling to install cooling towers and convert to closed-cycle cooling?

**A:** Under the proposed rule, all existing facilities using a cooling water intake with a designed intake rate greater than 2 million gallons per day must meet standards for impingement and entrainment mortality based on the best technology available (BTA). The entrainment standard is the most concerning because the BTA has been defined as reducing intake rate to that commensurate with closed-cycle cooling based on full-wet cooling towers.

Based on the Supreme Court ruling in Entergy Corp v. Riverkeeper Inc. et al. (April 1, 2009), which allowed the U.S. Environmental Protection Agency to consider costs and benefits when making BTA determinations, the proposed Section 316(b) rule leaves to each state the determination of BTA for entrainment on a case-by-case basis.

The rule prescribes the factors the states must consider in the determination and prescribes studies the facility owners must conduct to provide the states with the needed information.

Combined, these studies amount to a cost-benefit analysis. In many cases, the cost of converting to closed-cycle cooling is expected to greatly exceed the benefits to the aquatic resources, and retrofitting cooling towers will not be required.

For more information, contact Greg Howick, 816-822-3845.

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**How It Works**

Revamping Aircraft Parking Layouts

Airline passengers tend to think of aircraft gates simply as where they board their plane. The reality is more complicated. Success in revamping aircraft parking layouts at the gate requires careful planning and coordination.

Burns & McDonnell heads a team revamping aircraft parking layouts for United Airlines at Newark Liberty International Airport. There, changes are being made to accommodate United's new aircraft fleet mix, which includes wingspans modified through the use of winglets. Maximizing flexibility of the aircraft parking layout at the gate also requires modifying ramp services such as hydrant fueling, conditioned air and ground power.

Using special software, planners compare possible layouts of aircraft positions. After the layout is determined, each gate is individually redesigned, possibly with a combination of fixed walkways and one of several types of passenger boarding bridges. Fueling hydrants are relocated to support the new positions. Pavement is rehabilitated, and in some cases, added to extend ramps. At Newark Liberty, to squeeze the maximum aircraft positions from the available ramp space, some preconditioned air units were moved to rooftops, with telescoping ductwork connecting them to the aircraft.

The complexities of gate revamping don’t end with design. Construction must be phased around the ongoing operations of a busy airport. At Newark Liberty, work is scheduled so as to affect a limited number of gates at one time. Close communication with the client allows United to continue flights and related operations out of adjacent gates.

“In our role as prime architect-engineer, Burns & McDonnell is able to bring expertise in several highly specialized areas to this project,” says New York regional office manager Martin Durney. “The skill sets we have in fueling and boarding bridges — both real specialties — are impressive.”

For more information, contact Martin Durney, 973-526-5308.
In-House News

The Peanut Solution

To an American, it looks like an ordinary, one-story, pre-engineered metal building. But to the people of Haiti, the 20,000-square-foot Medika Mamba processing plant that Burns & McDonnell is designing represents much, much more.

It represents an opportunity to save lives in a country where 20 percent of children are malnourished. It means a living wage to 1,000 peanut farmers among the 85 percent of Haitians who are unemployed. It signifies hope in one of the world’s poorest countries, recovering from the 2010 earthquake.

Burns & McDonnell St. Louis is donating the architectural, civil and structural design for the $3 million plant to Meds & Foods for Kids (MFK), a St. Louis-based nonprofit that produces therapeutic foods for malnourished children in Haiti.

Chief among those foods is Medika Mamba, a ready-to-use, peanut-based food that is currently produced in a house in Cap Haitien, Haiti, according to Dr. Patricia Wolff, the St. Louis pediatrician who founded MFK in 2003. Within six weeks of starting treatment, 85 percent of children on Medika Mamba recover.

When complete, the new plant will allow the nonprofit to boost production from 80 to 800 metric tons a year, increasing the number of Haitian children it can treat for malnutrition tenfold to 80,000.

“We’re hoping not only to address the urgent problem of childhood malnutrition, but also to set a new national standard of excellence in food production in Haiti,” says Dr. Wolff.

Out-of-the-Ordinary Design Considerations

Designing a food plant for a third-world country raises issues that engineers in the Midwest don’t normally face, says Ron Jones, the St. Louis Process & Industrial Group practice leader.

“Because the power grid in Haiti is not reliable, the plant needs its own on-site power generation,” explains Jones. Normally, generators would be outside a plant, but given the high risk of theft, they are incorporated into the building’s design.

“This is a food-grade manufacturing plant, so we had to pay special attention to clean spaces design and material flows as well as efficient allocation of production and warehouse spaces,” explains Ken Francis, who is leading the Burns & McDonnell design team of Jennifer Rehg and Tanya Kwiatkowski.

“The design had to take into account seismic conditions, climate, and available labor in rural Haiti as well as materials sourcing and site access. Because Haiti has no building code, Burns & McDonnell used Florida’s Miami-Dade County codes to ensure a safe, robust design,” says Tim O’Mara, Burns & McDonnell engineering manager.

MFK aims to break ground on the plant later this year and expects to become financially self-sustaining within five years.

For more information, contact Ron Jones, 314-682-1571.

For more information about Meds & Food for Kids, visit http://mfkhaiti.org/.

New Website Is More Than Good Looks

This summer Burns & McDonnell launched a new website design with enhanced functionality for a better user experience.

“It’s not just a new look and feel,” says Kevin C. Fox, senior marketing communications manager for the Burns & McDonnell website. “Our new website will help visitors quickly find the information they’re seeking, with enhancements including intuitive breadcrumbs, a search portal and dynamic homepage content. It will also assist us in continuing conversations we begin with our clients face-to-face online through our blog and social media presence.”

With one click from any page on www.burnsmcd.com, visitors can access “The Burns & McDonnell World” blog and Burns & McDonnell pages on LinkedIn, Facebook, Twitter and YouTube.

“ ‘The Burns & McDonnell World’ blog features regular updates on what’s happening at Burns & McDonnell and in the industry.

“Even after the new website debut, we’re continuously working to improve our content-rich website and its functionality,” Fox says. “You’ll see new features, functionality enhancements and fresh value-added resources in the future.”

Discover the new user experience at www.burnsmcd.com.

For more information, contact Kevin C. Fox, 816-822-3225.
Smarter, Cheaper, GREENER

Environmental Engineer John Hesemann Finds Remediation Solutions That Fit
Among the 150 people working in the Burns & McDonnell Environmental Group, one engineer has arguably logged more miles, solved more problems and remediated more groundwater in the past decade than almost anyone.

His name is John Hesemann, and there’s a good reason why; at age 35, he’s one of the practice’s most in-demand professionals, says Tom Zychinski, vice president and Environmental practice leader in St. Louis.

“John is a true technical expert and thought leader,” Zychinski says. “He is constantly looking for a better, more cost-effective way to do things. People throughout our company rely on him, especially for the tough jobs.”

And there have been many tough jobs since the St. Louis native joined Burns & McDonnell in 1999. Since then, remediation systems he has designed, fabricated and operated have removed millions of gallons of contaminated groundwater and more than 100,000 pounds of contaminants from subsurface soil and groundwater for private, state and federal clients.

An Evolving Business
The business of environmental remediation has grown more complicated since Hesemann completed his bachelor’s and master’s degrees in geological engineering from the Missouri University of Science & Technology.

“Most of the low-hanging fruit is now gone,” Hesemann says. “The environmental problems we see today require more creativity and innovation to solve cost effectively.”

A prime example is a remediation system Hesemann designed for Camp Crowder, a former Army base in southwestern Missouri that was used to construct and test rocket engines for the Mercury and Gemini programs in the 1960s. Multiple locations at the test site became contaminated by rocket fuel and related solvents, says Robert Wasserman, project manager for ECC, the Virginia-based construction manager for the cleanup.

Burns & McDonnell was a subcontractor to ECC for soil and groundwater remediation.

“John is always thinking a step or two ahead of the immediate issue,” Wasserman says.

After removing more than 11,000 pounds of volatile organic compounds over a two-year period, a mobile remediation system Hesemann custom-designed and fabricated for Camp Crowder was reused to clean up another site for the same client, resulting in significant savings.

Clean and Green
That project showcased Hesemann’s commitment to green, sustainable solutions, says Walter McClendon, an associate geologist in the Burns & McDonnell Kansas City office who has collaborated with Hesemann on dozens of projects since 2002.

“John’s solutions are not only designed to remove contamination, but also lower the carbon footprint and maximize the environmental benefit of the remedial action,” McClendon says.

Contaminated soil and groundwater, for example, have traditionally been removed and transported off-site for treatment. At Camp Crowder, however, Hesemann’s remediation units were optimized and programmed to maximize soil and groundwater contaminant recovery, while minimizing the amount of groundwater extracted. As a result, both could be treated on site.

“The cost savings from treating everything on site was significant,” McClendon says, “and it was less disruptive to the environment.” Often, Hesemann’s solutions also incorporate cutting-edge chemical and biological processes or highly adaptable automated process equipment.

“Consulting is a demanding profession,” he adds. “But John works hard to keep balance in his life. As committed as he is to his work, he shows the same commitment to his family. He is the kind of professional you want on your team.”

Contact John at 314-682-1560.
Treating to a Higher Standard

Erie, Colo., North Water Reclamation Facility Provides New Water Source
The town of Erie, Colo., has seen significant and sustained growth over the past 10 years, with the population growing threefold from approximately 6,200 in 2000 to more than 19,000 today.

The growth is expected to continue with estimates reaching as high as 40,000 residents by 2025. The growth — and the strain it placed on the town's existing 1.6 million gallon per day (MGD) South Water Reclamation Facility (SWRF) — forced town officials to take a hard look at how to plan for future wastewater needs of this budding bedroom community near Denver.

Eye on the Future
The obvious answer to the problem was increased capacity to meet both the immediate needs and expected future growth. Planning studies determined a new 1.5 MGD facility, the North Water Reclamation Facility (NWRF) could provide reclaimed water and biosolids for beneficial reuse in the town's other public services divisions.

The population growth has been heaviest in the northern and northeastern parts of town, and that's where growth is expected to continue over the next several years. By locating the new facility in the area of the heaviest growth, the town could also relieve concerns about its SWRF and use a more efficient design.

"Our old plant is close to downtown, and we were concerned about odor and having a big wastewater plant near the area," says Gary Behlen, Public Works Director for the town of Erie. "We chose the site in the northern part of town so we could utilize gravity flow to provide wastewater to the facility."

The SWRF is now offline for maintenance work and will be ready to return to active service when needed.

"Having the new reclamation facility gives us a lot of flexibility in the future," Behlen says.

Beneficial Reuse
The NWRF does more than meet a capacity need. It also provides a state-of-the-art solution for reducing wastewater impact on the environment.

The facility uses biological treatment techniques to reduce nutrient levels in the water to be returned to Boulder Creek, a main water supply for several downstream entities, while also treating water to appropriate levels for use in industrial, commercial and landscape irrigation. The reclaimed water will flow to an on-site reclaimed water storage reservoir for subsequent usage in the town's reclaimed water system.

The facility’s ability to treat both water to be discharged back into Boulder Creek and used in the reclaimed water system falls in line with the town of Erie’s Water Conservation Plan.

"It’s more efficient for us to process wastewater to a higher standard, store it, and reuse it as reclaimed water instead of discharging all of the flow to Boulder Creek," Behlen says. "And it’s a method for us to help preserve our resources and be more sustainable."

The plant is also equipped with a technology to turn waste activated sludge (WAS) into a high-quality usable product. The waste solids generated in the biological treatment process are pumped as a liquid to a WAS tank where they are mixed and aerated before being deposited in a tank where lime slurry is added to increase the pH for nearly 24 hours. The mixture then goes through a rotary screen thickener to remove excess water and increase the solids concentration before being passed through a screw press with heat to remove more water and provide pasteurization.

"The NWRF is designed to process all biosolids to reach the U.S. Environmental Protection Agency’s Class A standards so the biosolids can be beneficially reused in parks and other areas,” says Darin Brickman, water practice manager for the Rocky Mountain Region, working out of the Burns & McDonnell Denver office. “The town of Erie clearly executed a plan to be stewards of the environment and provide a long-term solution to its water and wastewater needs.”

For more information, contact Darin Brickman, 303-474-2244.
For most Americans, the Smart Grid remains an abstract and overly complicated concept — the stuff of Popular Science to debut in some distant, high-tech future. But for many residents of the Ivanhoe and Manheim Park neighborhoods in Kansas City, Mo., the Smart Grid made real means saving energy and money — and participating in a unique initiative to modernize the nation’s power grid.

Making this effort possible in the heart of the city’s urban core is a $24 million U.S. Department of Energy (DOE) grant awarded to Kansas City Power & Light (KCP&L) — an amount matched by the utility and its technical partners for a total investment of more than $48 million. With its SmartGrid Demonstration project, KCP&L gains knowledge about customer needs and usage patterns, while improving service reliability and power delivery, resulting in more efficient energy delivery and consumption for an entire district within the city.

Launched on Oct. 18, 2010, with installation of its first smart meter, KCP&L’s SmartGrid Demonstration project has since deployed more than 14,000 smart meters to residential and commercial customers. Other elements of the program include distribution of more than 1,600 in-home displays (with 800 already in place), 1,600 smart thermostats, 400 advanced home area network devices and access to an enhanced web portal for all customers in the district. The MySmart Display, in particular, provides real-time information on a customer’s electricity use, offering information necessary to effectively reduce consumption and save money. So far, 800 of these devices have already been deployed as part of the project, which is believed to represent the highest concentration of this technology anywhere in the world, according to KCP&L.

Intelligent Monitoring, Communication, Reporting

Supporting each of these customer-facing applications is an advanced infrastructure designed to share real-time, or near real-time, data between power plants and local electric transmission and distribution systems as
well as customers. The advanced metering infrastructure (AMI) rollout and subsequent phases required KCP&L to rely on its project partners, including Burns & McDonnell, for expertise in information technology, telecommunications, power and project management.

By definition, a Smart Grid enables enhanced, two-way communication between a utility and its customers. This information allows utilities to better monitor and manage electricity supply and demand, improving security, reliability and efficiency. In turn, it provides consumers with improved reliability (fewer outages) and tools to make better decisions about their energy use.

"It's really complicated to define, but not that hard to understand once you see some of its working parts," says Bill Menge, director, SmartGrid at KCP&L. "I relate it to what's happened in the last 25 years in computing and telecommunications. Once heavy and centralized, computing has shrunk down to personal computers and now to your phone. It's that type of technological change that we're looking to infuse into the electric delivery system."

End-to-End Demonstration
KCP&L's DOE award, like many other Smart Grid initiatives nationwide, originated with the American Recovery and Reinvestment Act of 2009. The two largest elements from this funding include the Smart Grid Investment Grant program and the Smart Grid Demonstration Program. The latter focuses on 32 projects demonstrating new, more cost-effective Smart Grid technologies, tools, techniques and system configurations. Of these, half are energy storage demonstrations; the other half, including Kansas City's, are regional Smart Grid demonstrations "to verify Smart Grid viability, quantify Smart Grid costs and benefits, and validate new Smart Grid business models at scales that can be readily replicated across the country," according to a DOE statement.

While each demonstration grant is designed to test cutting-edge technologies or new customer pricing concepts, KCP&L's initiative stands out nationally as a fast-tracked, end-to-end effort. The utility conceived its SmartGrid Demonstration project around an upgraded smart substation that features a local distributed control system based on IEC 61850 protocols and control processors. Created as a framework for the design of electrical substation automation, IEC 61850 addresses the requirements for interoperability of intelligent electronic devices. When complete, the KCP&L system will feature advanced generation, distribution, energy storage and smart customer end-use programs, in addition to co-located renewable energy sources, such as solar and other parallel generation, feeding into the energy grid.

"It's a truly comprehensive Smart Grid program," says Matt Olson, Smart Grid project manager for Burns & McDonnell. "A lot of utilities are just doing an AMI rollout or substation or distribution automation, and they're not necessarily deploying all of these technologies all at once." Lucas McIntosh, a Burns & McDonnell Smart Grid consultant, adds: "Essentially, you could say that KCP&L is setting up a mini-utility within a utility."

Green Impact Zone
What also makes this particular demonstration project different is its emphasis on disadvantaged neighborhoods in midtown Kansas City known as the Green Impact Zone. This 150-block area has experienced extreme economic decline and abandonment. As a national model for...
Growing the Smart Grid

Burns & McDonnell teams from Telecommunications & Network Engineering and Business & Technology Services groups continue to support utilities across the U.S. on the design and deployment of Smart Grid initiatives. These include:

- **FirstEnergy**, the nation’s largest investor-owned electric system: Supporting this diversified energy company on adaptive relaying as part of its Smart Grid Demonstration grant in targeted areas of its Pennsylvania, Ohio and New Jersey service territories.

- **PEPCO Holdings Inc.**, one of the largest energy delivery companies in the mid-Atlantic region: Upgrading its entire communications backbone to support a Smart Grid AMI and distribution automation rollout in the District of Columbia.

- **Southern Mississippi Electric Power Association** and its 11 member-owner electric power cooperatives, representing nearly two-thirds of the state: Building an entire new communications backbone to support its AMI and distribution automation rollouts — plus integrated resource planning to evaluate demand-side management offerings.

- **Naperville Electric**, serving more than 141,000 residential and commercial customers in north-central Illinois: Assisting the public utility with rates and strategic approach for the Naperville Smart Grid Initiative.

- **Lincoln Electric System**, servicing more than 137,000 customers in Nebraska’s capital city and surrounding areas: Providing Smart Grid business cases and an educational forum.

- **Rochester Public Utilities**, the largest municipal utility in the state of Minnesota: Presented a business case and community meetings on Smart Grid deployment.

- **CenterPoint Energy**, an electric transmission and distribution utility serving the Houston metropolitan area: DOE grant-supported upgrade and integration of distribution substation relaying, communications and monitoring systems to enable Smart Grid functions through its distribution management system.

**Evolving the Grid**

Given the complexity of launching automation protocols, distribution system and substation upgrades, and improvements to back office IT networks — all in parallel — KCP&L sought outside assistance. In October 2010, the utility asked Burns & McDonnell to join the team, subsequently playing a vital support role in four contract areas:

**Metrics and Benefits Analysis**: The DOE requires regular reporting and project updates as well as assessments on value delivered and major issues presented through the KCP&L demonstration grant. As a result, Burns & McDonnell helped develop a strategic metrics and benefits plan with the utility, detailing key project tasks — for substation upgrades and voltage optimization, for example — along with measuring the benefits of distributing in-home displays to customers and other energy management technologies. Burns & McDonnell continues to lead this information-gathering effort with KCP&L.

**Distribution Management System**: With Siemens as a partner, Burns & McDonnell assisted with the definition, deployment and integration of a new distribution management system to monitor and control KCP&L’s distribution and substation automation architecture for the Smart Grid.

KCP&L’s demonstration project includes support of the restoration of a home in the Green Impact Zone to be more energy efficient. The installation includes rooftop photovoltaic panels and wall-mount solar heating panels.
Home Area Networking:
Burns & McDonnell provided KCP&L with technical expertise in deploying the smart meters and radio frequency network (working with manufacturer Landis & Gyr) and the in-home network (with Tendril). In addition, Burns & McDonnell provided assistance to increase customer engagement with the web portal (Home Energy Management Portal), also hosted by Tendril.

“These projects require us to figure out new solutions to new problems ... and a willingness to take on problems that we’ve never seen before.”

Industry Use Cases: KCP&L’s SmartGrid Demonstration project contains approximately 30 systems and interfaces designed to transmit myriad system-to-system messages and data. With the DOE focused on developing Smart Grid standards and interoperability protocols so other utilities can leverage the lessons learned, Burns & McDonnell has been tasked with creating as many as 90 use cases for this project to document functionality, information flow and all other details of intersystem communications.

Further Integration and Coordination
In just a matter of months, the firm’s role expanded to support additional project areas.

“They are providing a critical service to our project team, giving extremely valued, professional input to our project,” observes KCP&L’s Menge. “We’ve been nothing but pleased with the resources and expertise coming from Burns & McDonnell.”

Today, consultants are helping the utility analyze time-of-use rates to be offered in conjunction with several Smart Grid technologies. Equally important, they continue to play a vital role in facilitating communications among KCP&L engineering, customer relations, energy services, regulatory and other departments — enhancing its ability to deliver multiple new services on an accelerated basis.

A SmartGrid Future
KCP&L believes this project will serve as a blueprint for future Smart Grid implementation and accelerate the possibilities for utilities across the U.S. to deliver safer, more reliable electricity.

As the initiative progresses, more advanced home area networks, a new version of the smart thermostat, an enhanced web portal and new rates will be available to customers in the demonstration area later this year along with the emergence of rooftop solar panels and electric vehicle charging stations. The next major milestones: installing a grid-connected battery and completing substation upgrades by next spring. All Smart Grid technology is slated to be in place and operational in 2012, with all analysis and reporting finalized and a technical report ready for the DOE in early 2015.

“From my perspective,” Olson says, “the biggest thing happening with the grid is that we are applying information technology to help optimize it. What I look most forward to as a consumer is that my power will become more reliable and the grid will become self-healing, so I’m not waiting for a utility to dispatch a technician to restore my electrical service. The Smart Grid will be able to recognize the fault and restore it for me automatically.”

McIntosh sees the Smart Grid as a new frontier in power, filled with challenges and opportunities for perpetual learning.

For more information, contact Matt Olson, 913-871-6686.

KCP&L’s SmartGrid Demonstration Project Timeline

Phase 1: Project definition and compliance (2009-2010)
Phase 2: Project performance baseline (2010)
Phase 3: Smart Grid infrastructure deployment (2011-2012)
Phase 4: Distributed energy resource deployment (2011-2012)
Phase 5: Data collection, reporting and project conclusion (2012-2014)
Bringing Airspace Down to Earth

The nation’s airspace is a complex network of imaginary 3-D surfaces based on airport locations, restricted areas and military use. These imaginary surfaces are difficult to understand and even more difficult to explain to those outside the industry. But when someone needs to site a tall structure such as a wind turbine or telecommunications tower near an airport, it can impact more than just the land it occupies. Last year, the state of Kansas saw more than 2,000 Notice of Proposed Construction applications for wind turbines alone. Most proposed sites violated local airspace, resulting in a Notice of Presumed Hazard from the Federal Aviation Administration (FAA). The Kansas Airspace Awareness Tool (KAAT) — created through a partnership between the Kansas Department of Transportation’s Aviation Division and Burns & McDonnell — is designed to reduce the number of violations in applications and help the general public visualize airspace.

“Users can insert structures using precise coordinates and elevations of structures, or they can identify a site on the map to conduct a preliminary analysis,” says Robert Crain, project manager for Burns & McDonnell. “This tool, the first of its kind in the U.S., will help identify potential airspace conflicts and initiate early coordination between the affected government agencies and developers. The system eliminates a lot of guesswork in site selection.”

Local planning agencies can use the tool to help establish height and hazard zoning to protect their airport’s airspace. The FAA rulings do not prevent a developer from building a structure; cities and counties must enact the necessary legislation.

“Burns & McDonnell helped us turn a good idea into a great product in less than eight months,” says Ed Young, director of Kansas Aviation. “We used unconventional testing procedures and innovative outreach and training. We have already challenged airspace conflicts with the tool’s output. It allows Kansas to be a credible participant in the broader airspace discussion. Ultimately, it helps us protect the millions of dollars in infrastructure and planning that is already in place at Kansas airports.”

The Burns & McDonnell Business & Technology Services Group made the tool come to life. “Using Google Earth as the platform for the tool gives the user the ability to see the airport and its associated airspace in a 3-D view, creating a real-time visual representation of the existing landscape,” says Jamie Katz, senior information specialist. The KAAT was featured in a webinar for other state aviation agencies, demonstrating how it can eliminate the need to imagine airspace surfaces beyond Kansas.

For more information, contact Robert Crain, 816-349-6698.
Prominently located within the Qatar Foundation’s Qatar Science and Technology Park, the GE Advanced Technology and Learning Center’s rounded glass atrium dramatically evokes the image of the historically significant pearl. The design concept grew from the idea that just as a grain of sand becomes a pearl, a single idea sparks innovation. The Qatar Science and Technology Park propels Qatar’s emerging knowledge economy by creating a place for international companies and universities to collaborate to develop new technologies.

The GE Advanced Technology and Learning Center supports the technical training of GE aviation, energy, oil and gas, plastics, and healthcare customers in the Middle East, Africa, Europe and Asia.

Burns & McDonnell provided architectural and engineering design for this 144,000-square-foot, high-tech, interactive learning center, which recently received honorable mention in Metal Architecture’s 2011 Design Awards. Features include a high bay for hands-on training with the world’s highest-thrust jet engines, a 150-student lecture hall, training labs, conference rooms, private and open office space, a distance-learning lab for instant teleconferencing worldwide, a cafeteria, and 135-space parking garage.

GE held its first training session in this new, state-of-the-art facility in fall 2010, and the inauguration took place on April 19, 2011.

For more information, contact Mike Roark, 816-822-3190.
Green to the Max
Zero Liquid Discharge for Iatan 2
Iatan 2, Kansas City Power & Light’s 850-megawatt (MW) generating station near Weston, Mo., is one of the cleanest coal-fired power plants in the United States. With high fuel efficiency and low air emissions, it’s also the first coal-fired unit in the world to achieve zero liquid discharge (ZLD).

Background

Burns & McDonnell provided permitting, design, procurement, construction management and startup services for Iatan 2, which began operation in the summer of 2010, and for air-quality control upgrades to KCP&L’s existing Iatan 1 unit. Air-quality controls for the plants include wet flue gas desulfurization (FGD) systems that remove sulfur dioxide (SO₂), known for its role in creating acid rain.

Challenges

“The client required a zero liquid discharge system,” says Don Schilling, Burns & McDonnell chemical engineer. “That prompted a series of discussions on how we were going to achieve that.”

One of the options discussed was distillation and crystallization. The technology existed — it’s commonly used in some manufacturing processes. Burns & McDonnell had previously designed such a system for a power plant, but it was never installed, partially because the crystallization process is energy- and maintenance-intensive. During one brainstorming session, the project team had a flash of inspiration.

Solution

The idea was elegant in its simplicity. Although some of the fly ash would be sold for use in construction products, the balance would be disposed of in an on-site landfill. Fly ash has to be wetted before transfer anyway. Using the concentrated blowdown stream to wet down the fly ash would take care of both waste products, eliminating the need for the costly crystallization process. But there were still challenges in technology and material selection for distillation of the blowdown stream.

Based on experience with distillation in other industries, the team decided to adapt a falling-film evaporator that contained a vertical heat exchanger with a large recirculation flow rate. As the blowdown stream circulates through the evaporator tubes, it’s reduced to concentrated brine. For every 100 gallons of the blowdown stream, approximately 75-90 gallons of water are recovered through the distillation process and piped back for reuse. Because the high concentration of calcium chloride makes the remaining brine extremely corrosive, specifications for the ZLD system had to include high-grade, corrosion-resistant alloys, including titanium for some of the evaporator vessels.

As the final step in the ZLD process, the brine is combined with fly ash in a giant mixer. The mixer blends 120-140 gallons of brine into each 4-5 ton batch of fly ash. The mixture can then be transported to the on-site landfill.

Outcome

The environmental benefits of the system are twofold. “The first is the fact that you’re not discharging the wastewater,” Scroggin says. “The second aspect is that you use a lot less water in the FGD process.” Since the FGD process normally discharges around 50 gallons of water per minute, reclaiming 75 percent to 90 percent for reuse represents substantial water savings. And even though Iatan’s power output has increased by more than 800 MW with the addition of the new unit, the combined SO₂ emissions from the two units are 74 percent lower than the levels emitted from Iatan Unit 1 alone before the scrubbers were installed.

“The ZLD system designed by Burns & McDonnell is unique and innovative,” said Brent Davis, Iatan 2 project director for KCP&L. Just one more example of the Burns & McDonnell mission — making our clients successful.

For more information, contact Patricia Scroggin, 816-822-3097.

Iatan Facts

- Iatan 2 is the world’s first coal-fired plant featuring a wet FGD system with zero liquid discharge.
- Completed in 2010, the Iatan project was the largest construction project in the state of Missouri at the time.
- Iatan 2 supplies an additional 850 MW of reliable power.
- Designed with a supercritical steam boiler to produce maximum electrical power from each unit of coal burned, Iatan 2 emits 1.3 million tons less carbon dioxide per year than the average for U.S. coal plants.
- FGD is one of several technologies installed to reduce emissions at Iatan 1 and Iatan 2. Other technologies include pulse-jet fabric filters to remove particulates and selective catalytic reduction units that remove nitrogen oxide, a greenhouse gas.
- Burns & McDonnell provided permitting, design, procurement, construction and startup management for Iatan 2 and for air-quality control upgrades to Iatan 1.
When President Obama signed the Food Safety Modernization Act in early 2011, it had been more than seven decades since the U.S. had enacted a law aimed at improving the quality of food inspections and introducing proactive measures to prevent foodborne illnesses.

As the number of foods available in the marketplace increases, the manner in which those foods are processed changes, and the population of “at-risk” individuals exposed to foodborne illnesses grows. New concerns surrounding food safety have surfaced.

“The current climate is right for new food-based regulations and improvements in the industry,” says David Dixon, business development manager in the Burns & McDonnell Food & Consumer Products Group. “There have been advancements in food safety over the past 10 years and a lot of new trends are forcing our clients to upgrade facilities and review operations to improve food quality.”

Shifting Focus
Sparked by salmonella issues in the peanut industry that led to hundreds of illnesses and at least nine deaths in 2008, the focus on food safety has shifted to the possibility that contamination can occur within a facility.

“After the peanut recalls, increased pressure from the retail community and consumers began forcing food safety back up the food chain,” Dixon says. Recommendations from groups such as the Global Food Safety Initiative, formed to provide third-party certification of suppliers who review food safety and quality issues, became broadly adopted in 2008.

Although some of the FSMA rules took effect immediately, full implementation will take three years. Emphasis will be placed on food transportation, food defense and preventative controls within facilities.

Burns & McDonnell is designing facility and process upgrades to improve food safety and to promote food defense to meet the new law.

“Many aspects that affect the design of a plant related to food safety involve ensuring an adequate lethality step and avoiding recontamination after the lethality step occurs,” Dixon says. “The process requires recommending measures to manage flow of the product and taking a look at how physical spaces are isolated through ventilation, sanitation and other means.”

The process also examines employee interaction with products, as well as focuses on pathogens from ingredients and packaging materials.

Burns & McDonnell has designed facilities and renovations that take all of these measures into account to allow for improved sanitary operations and food defense.

Protection First
Strengthening the barriers that protect food processing facilities from purposeful contamination, food defense measures are a vital component of the FSMA regulations. The measures can be enforced in part through security cameras, scannable ID cards and careful consideration of facility layout to monitor operations and identify potential adulteration of food.

R.J. Hope, senior physical security analyst, says the food defense plan within the FSMA presents a challenge to companies because it uses a risk-based performance standard model without a clear model for success.

“That’s a double-edged sword,” Hope says. “The lack of restrictions gives each company free rein in developing their own means to mitigate risks that works best for their specific environment. On the flip side, it also does not give a clear threshold to obtain compliance.”

Hope says facility owners can prepare for the new regulations by analyzing potential breaches of the concentric rings of security surrounding a facility. A review of local emergency response times in relation to the time it may take to breach existing barriers can help determine additional measures that may be necessary.

“The focus should be on a security structure that addresses the traditional security philosophy of threat deterrence, threat detection and threat delay measures, and includes threat response,” Hope says.

Companies will have until July 2012, when the final rules for the food defense portion of the FSMA are released, to make changes that enhance their food defense plans.

The new FSMA regulations are forcing the industry to take a thorough look at operations and facilities and modify designs and processes.

“This is a complicated regulation that our clients are up against, and we have a unique capability to sort through it and provide guidance on improvements that will be necessary,” Dixon says.

For more information, contact David Dixon, 770-510-4520.

The Food Safety Modernization Act may force changes to food processing plants.
New Technology Helps Tap Source of Renewable Natural Gas

The state of California arguably has the strictest environmental regulations of any state in the country. The state as a whole already embraces renewable energy sources, such as wind and solar, and by 2020, 33 percent of the state’s energy sources must be renewable.

“Over the past 10-15 years, as the state of California has made environmental regulations increasingly strict, almost all power plants run on a combination of natural gas, wind, solar geothermal and other sources of renewable energy,” says Patrick Hirl, project manager for Burns & McDonnell. “There are only two coal-fired plants left in the state.”

A New Look at Biogas
As a result of the emphasis placed on renewable energy sources, Southern California Gas Co., the largest distributor of natural gas in the country, has turned its focus to biogas. Biogas is a renewable resource and is the product of the decomposition of organic matter in wastewater treatment plants, cattle manure, food waste and landfills.

In some cases, biogas is conditioned for combustion in a reciprocating engine or microturbine for electrical power generation. But in many wastewater treatment plants and landfills, biogas is burned off, or flared, because it is does not meet the requirements for use as a pipeline gas.

“Flaring the biogas from organic matter is not a problem in terms of damage to the environment because the carbon being released is already part of the current carbon cycle,” Hirl says, “but it’s a waste of energy.”

Realizing the potential biogas holds as a renewable energy source, Southern California Gas is investigating a new technology to extract pipeline-quality natural gas — methane — from biogas emitted from a wastewater treatment plant in Escondido, Calif. The process, pressure-swing adsorption (PSA), works to separate gas species — specifically carbon dioxide from methane.

As owner’s engineer for Southern California Gas, Burns & McDonnell helped identify potential technology providers, and Southern California Gas ultimately chose Canada-based Xebec because it could provide the purest form of methane through the PSA process and guarantees meeting — and even exceeding — California’s standards for natural gas in pipelines.

“Southern California Gas is taking the first steps in the industry to find alternatives to natural gas that are renewable,” Hirl says.

Environmental Win
These efforts to reduce reliance on fossil fuels as the main source of energy for power plants not only ensure a supply of natural gas, but also put the carbon cycle a step closer to being balanced.

“Right now, the main source of natural gas is fossil fuels, and the carbon released from burning that natural gas was pulled from the environment thousands of years ago,” Hirl says. “But natural gas extracted from biogas contains carbon from within the last couple of years and is still considered part of the current carbon cycle. So it would reduce the amount of old carbon being released and reduce greenhouse gases.”

“Although we’re a ways away from it, there is the potential to completely eliminate the use of fossil fuels.”

It also helps pave the way to completely eliminating fossil fuels.

“That is a vision people have,” Hirl says. “Although we’re a ways away from it, there is the potential to completely eliminate the use of fossil fuels.”

For more information, contact Patrick Hirl, 952-656-3634.
Your Roadmap to Sustainability

Now more than ever, our way of life depends on reliable, efficient power.

But today, “efficient” encompasses sustainability. The Smart Grid offers a more intelligent means of efficiency while improving security and reliability.

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