

A REPORT FROM BLACK & VEATCH • 2001

SOLUTIONS

**Atlanta Construction
Operation Building
Solid Reputation**

PAGE 6



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BLACK & VEATCH

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of Black & Veatch

ON THE COVER Overland Contracting, Inc. (OCI), a wholly owned subsidiary of Black & Veatch, is making a name for itself. Read about the history of the construction operation and some of the projects they've been involved in recently on Page 6.

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News In Brief

SMALL BUSINESS COMPLIANCE

New on-line environmental health and safety (EHS) software, which helps small- and medium-sized businesses meet federal, state, and local regulations, has now been backed by the National Federation of Independent Business (NFIB), the nation's largest small-business advocacy group with 600,000 members.

Partnering with EHSmanager.com (owned by Black & Veatch, Integrated Corporate Solutions, and Safety Management Corporation) and IBM, NFIB has launched WorkSafe System, a unique application provider subscription software management program. WorkSafe helps businesses comply with the vast array of current EPA and OSHA regulations.

In addition, EHSchemical — a new Internet utility — is being offered for a chemical inventory plus material safety data sheet management database.

EHSchemical is accessed via www.ehsmanager.com and clicking on Chemical Manager.



Solutions Online can be found via www.bv.com in the News section.



TBLISI TELECOM

While Black & Veatch is the main contractor upgrading the Georgian capital city's electrical distribution network, Black & Veatch will also be modernizing the telecommunications system for the city's power distribution company, AES Telasi. The recently awarded 2-year telecom project includes feasibility assessment, design specifications, technical advice, costing, installation supervision, and project management. The new system will include: PBX exchange, fiber-optic voice/data links, private mobile radio systems for operations and maintenance, voice recording system for network dispatch center, broadband radio data network, XDSL (digital) technology over old copper cables, LAN (local area network) and WAN (wide area network), and expansion of the customer billing system.



SINGAPORE WATER TREATMENT PLANT

Binnie Black & Veatch was recently selected by the Public Utilities Board of Singapore as engineer for the US \$28.6 million (Singapore \$50 million) upgrade of Singapore's 364 million liters/day Choa Chu Kang Waterworks, one of the largest on the island. Various treatment options are being studied, including high-efficiency ozone, granular activated carbon filters, and immersed membrane technology.

The plant's existing Supervisory Control and Data Acquisition System will also be upgraded. Binnie Black & Veatch will provide detailed design, as well as supervision of construction and commissioning of the upgraded plant, scheduled to be completed in 2003.

INDIA ARSENIC PROBE

Used for drinking and crop irrigation in India's West Bengal and Bangladesh, water from the River Ganges aquifer is naturally contaminated by up to 1,000 micrograms per liter (100 times the World Health Organization's safe limit Guideline Value) of arsenic, a carcinogen linked to high incidences of skin cancer.

The United Nations Industrial Development Organization (UNIDO) appointed Don Ratnayaka, a Binnie Black

& Veatch expert on water and sanitation, to investigate the problem and report on cost-effective and appropriate methods of monitoring, removal, and disposal of waste from the arsenic removal process. UNIDO will also recommend measures to improve Indian water utilities' efficiency and to help establish a management information system and database to capture information related to drinking water, irrigation water, health, and environmental issues.

SOUTH AFRICAN POWER PLANS

Helping South Africa meet future power demands is the goal of two studies undertaken by Black & Veatch for ESKOM, South Africa's state-owned electric utility. One project, completed under a US Trade & Development Agency grant, is a feasibility study for a pilot project to repower the idle coal fired Komati Power Station. This study reviewed the prospect of using low-cost, low-grade waste coal from nearby mining operations with circulating fluidized bed (CFB) technology, thereby reducing environmental hazards of this waste. In addition, a pricing study has been completed for various configurations of CFB power plants to assist ESKOM in developing a long-range generation expansion plan.





HONDURAN HURRICANE RELIEF

When Hurricane Mitch ripped through Central America in late 1998, it killed more than 10,000 people and caused widespread destruction in Honduras. Since that time, several international relief agencies, including the United States Agency for International Development (USAID), have been working with the Honduran government on immediate relief efforts as well as massive, long-term reconstruction of vital infrastructure. In September and November, via two separate contracts, Black & Veatch was selected by the Honduran Social Investment Fund (FHIS) to provide detailed design and construction supervision of 27 water, wastewater, and solid waste projects for several municipalities throughout Honduras. All of this work is part of the \$320 million USAID-financed Hurricane Mitch Reconstruction Program.

The work, which will be partly supervised by the US Army Corps of Engineers, is on an extremely tight schedule. Designs of the first 13 projects are being bid in early 2001, and construction of all projects must be completed by the year's end.



Imagine trying to burn something that consists primarily of water. Typical of municipal treatment facilities that dewater sludge using a belt filter press, the sludge going into the 25-year-old incinerator at Green Bay Metropolitan Sewerage District's (WI) wastewater treatment plant is 77 percent water and only 23 percent solids. Not surprisingly, it seemed that the incinerator was running out of capacity. Black & Veatch was hired in 1999 to create a 20 year biosolids management plan for the District and is now designing a \$12 million fluidized bed heating dryer that will reduce the water content to 10 percent and deliver several important advantages:

- Drier biosolids will make the incinerator more efficient and restore capacity.
- Emissions will be reduced.
- Fuel costs will be cut considerably because the incinerator can burn the drier/biosolids as fuel, rather than the natural gas it currently uses.
- The District gains the flexibility of disposing of sludge by applying the drier biosolids to agricultural land as fertilizer.

Black & Veatch has pioneered the use of fluidized bed dryer technology for heating biosolids at wastewater treatment plants. Scheduled to be operational by the summer of 2002, this installation will be the second in the United States.

INTERNET DATA CENTERS

With the phenomenal growth of business websites around the world, the need for Internet data centers has also grown substantially. It is estimated that by outsourcing website needs, companies can save 80 percent of the costs of owning and maintaining their sites in-house, according to Steve Winchester, senior vice president and manager of the Advanced Technology Division.

With over 20 years of hands-on experience in mission critical facilities, Black & Veatch has expanded its technical services to offer assistance to companies building the infrastructure to support the new economy. Black & Veatch will be working with telecommunications companies, web and applications hosting groups, Internet hardware manufacturers, and enterprise center organizations to help them operate more effectively.

Having successfully executed projects in data center design and operations for TWA, the Federal Government (Department of Defense), AT&T, and others, Black & Veatch now intends to provide businesses with a comprehensive data center service to ensure high reliability, availability, and security. From data center design and construction to hardware procurement and backup facilities, the expanded Black & Veatch services also accommodate the latest trends in data centers, such as deploying advanced telecommunications facilities to bring together network providers and those seeking network access. Other services include global program management, site evaluation and acquisition, business continuity analysis and disaster recovery, and telecom infrastructure.

UELI 2000



Leadership in the New Millennium

The Blue Ridge Mountains provided a scenic backdrop as utility executives from around the country gathered for the third annual Utility Executive Leadership Institute (UELI), "Leadership in the New Millennium" in Asheville, North Carolina, U.S.A., September 13 and 14.

"Good topics and great peer interaction. . . may be the most time effective conference I have attended recently."

John Dunn, director of utilities, Norfolk, VA

The two-day event, hosted by Black & Veatch, provided an opportunity for executives to discuss the knowledge, strategies, skills, and attributes necessary to face the challenges of leading their utility in the new millennium.

The keynote speaker, Lou Kasischke, held his audience in rapt attention as he told of his harrowing experiences as a survivor of the 1996 expedition to Mt. Everest as highlighted in the book *Into Thin Air*. He took a life-threatening situation and discussed the importance of teamwork and individuality, mistakes and judgment, people and decisions.

A half-day workshop conducted by Patrick Lencioni entitled, "The Four Disciplines of Building a Healthy

Organization," provided the group with interaction and key information and ideas for building a solid organization by utilizing resources and maximizing employee productivity.

"Black & Veatch is happy to facilitate this annual, utility-focused meeting of the minds," said Dick Kuchenrither, Black & Veatch senior vice president, director, Technology Applications group.

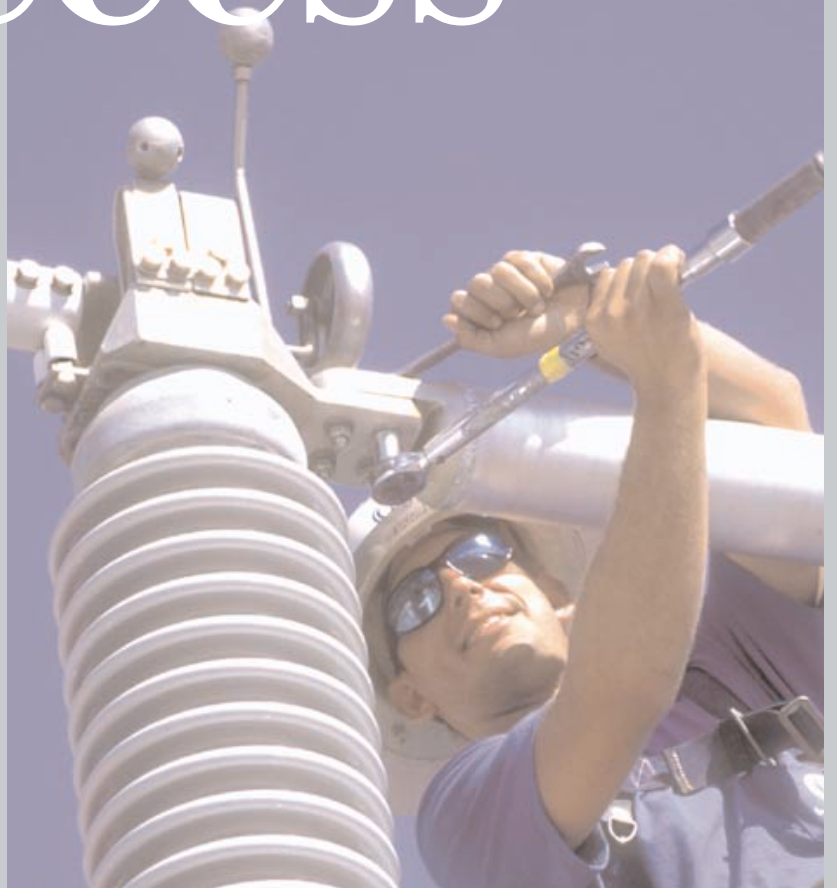
"Assembling a group of creative, committed, and successful utility leaders in an inspirational setting once again yielded valuable information exchange and stimulating interaction. This year's increased participation demonstrates that these busy executives believe this time together is well worthwhile."

Building Success

Atlanta Construction Operation Building A Solid Reputation

“We literally do every part of the process, so we can schedule work more closely than if we had to subcontract it out.”

John Murphy, general manager for OCI-Atlanta.



What's one of the best kept secrets at Black & Veatch? It's probably the success of the Atlanta Construction Operation. With a solid reputation for outstanding performance, the operation has quickly grown to a staff of over 110. The Atlanta office, the first permanent construction operation in the history of Black & Veatch, constructs power delivery and telecommunications projects throughout the United States.

HISTORY

The Atlanta Construction Operation provides services as Overland Contracting, Inc. (OCI), a wholly owned

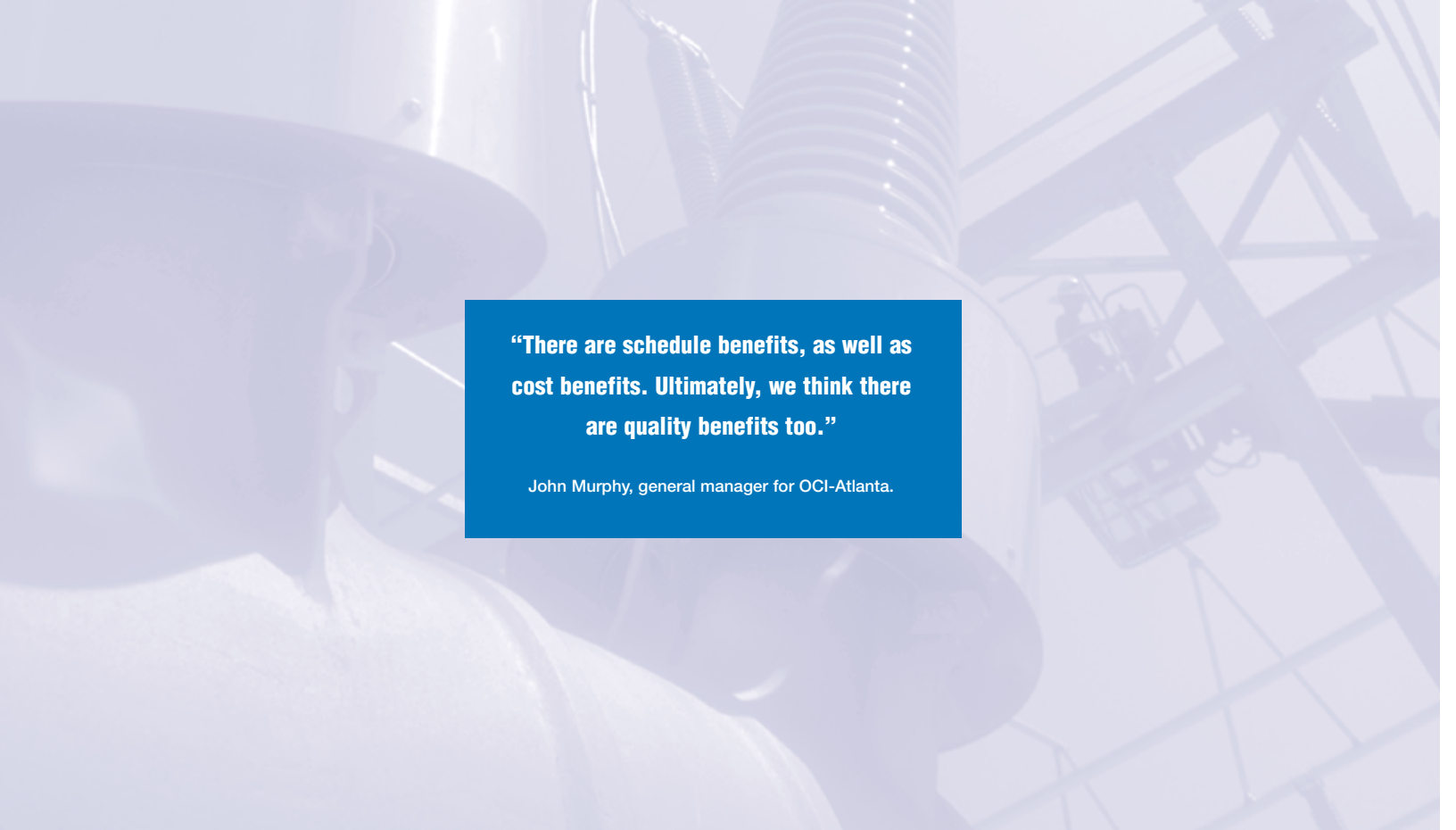
construction subsidiary of Black & Veatch. The Atlanta operation was originally established in 1997 in Covington, Georgia, USA (near Atlanta), to support telecommunications construction for Sprint in the Atlanta area. Since that time, the operation has grown substantially to include a very busy power delivery agenda as well as continuing telecommunications work. The operation moved into newer quarters in Conyers, Georgia, in the spring of 2000.

SERVICES

OCI is a full service contractor able to perform all construction services on a project with internal resources. For electric utility substation projects, OCI routinely provides civil/foundations, ground-

ing, equipment installation, steel erection, cable and raceway installation, bus welding, control building installation, and testing and commissioning. In conjunction with the firm's engineering resources, OCI provides full EPC (engineer-procure-construct), or turnkey services. “We literally do every part of the process, so we can schedule work more closely than if we had to subcontract it out,” said John Murphy, general manager for OCI Atlanta. “There are schedule benefits, as well as cost benefits. Ultimately, we think there are quality benefits too. We're working with our own people, most of which have been with us for many years. They know how we do the work, and they know – most importantly, that we're serious about safety.”

continued



“There are schedule benefits, as well as cost benefits. Ultimately, we think there are quality benefits too.”

John Murphy, general manager for OCI-Atlanta.

The Sewell Creek Substation, located near Cedartown, Georgia, is a 230 kV interconnection substation with six-position ring bus design connecting four combustion turbines at a new peaking plant.



In fact, the firm's safety program is one of the best in the country with an EMR rate that stands at 0.50, half the industry average. "Beating schedules and budgets really doesn't mean much if a project isn't performed in a safe manner," said Morris Stover, Black & Veatch Southeast Region vice president.

For telecom projects, OCI provides construction services such as civil work, tower erection, and equipment installation and testing. Under a full turnkey project the Atlanta Construction Operation works in conjunction with the Black & Veatch Telecommunication, Inc to deliver a full service design-build solution.

POWER DELIVERY PROJECTS

OCI has developed an outstanding relationship for meeting aggressive project schedules safely. Of particular note are several interconnection substations recently constructed for Georgia Transmission Corporation (GTC), a Georgia electric cooperative.

"These projects require a lot of coordination," said Jerry Lawson, project manager for GTC, Tucker, Georgia. "They're building a substation to connect somebody else's generator to our transmission system, so they're sandwiched between two other projects going on at the same time. They have to be flexible to coordinate schedules and make sure that everything comes together at the same time." GTC contracted with OCI for EPC services for its new Sewell Creek and Doyle substations, which had to be ready for commercial operation in time for Georgia's peak power season, beginning around June 1. In conjunction with OCI-Atlanta, the firm's Orlando, Florida office provided engineering for these projects.

The Sewell Creek Substation, located near Cedartown, Georgia, is a 230 kV interconnection substation with six-position ring bus design connecting four combustion turbines at a new peaking plant. Doyle Substation connects five combustion turbines at a new Monroe, Georgia peaking plant. It consists of two adjacent

yards, one with a four-position 230 kV ring bus and one with a five-position 115 kV ring bus.

Despite the Doyle site being released a month later than scheduled, close coordination and flexibility by both GTC and OCI brought the projects in on schedule.

OCI is presently providing GTC with EPC services for the 500 kV Heard County interconnection substation and the 230 kV LG&E interconnection substation. Both are scheduled to be energized in early 2001.

OCI has also provided EPC services to other utilities including Conectiv, formerly known as Delmarva Power & Light. Recent projects have included two new EPC SVC projects. The Nelson 138 kV and Indian River 230 kV static VAR compensation projects, located in Delaware, were both completed in 2000. Engineering for these projects was provided by the firm's Kansas City office.

"Beating schedules and budgets really doesn't mean much if a project isn't performed in a safe manner."

Morris Stover, Southeast Region vice president.

OCI is also presently providing EPC services for the new 230 kV Payne Creek Substation as part of a new power plant for Seminole Electric Cooperative, Inc., in Florida. In this instance, the substation engineering for the project is being provided by the firm's office in Ann Arbor, Michigan, also the location of the plant design.

Construction-only projects are also part of the mix as work has been underway for some time for Georgia Power Company (GPC) and Alabama Power Company (APC). To date, several projects have been completed for GPC and APC. Representative projects include the new 115-12 kV Industrial Boulevard Substation for GPC and the new Crooked Creek 230 kV Switching Station for APC.

continued



Above, Doyle Substation connects five combustion turbines at a new Monroe, Georgia peaking plant. It consists of two adjacent yards, one with a four-position 230 kV ring bus and one with a five-position 115 kV ring bus.



OCI is presently providing GTC with EPC services for the 500 kV Heard County interconnection substation (left) and the 230 kV LG&E interconnection substation. Both are scheduled to be energized in early 2001.

Building Success

“They have to be flexible to coordinate schedules and make sure that everything comes together at the same time.”

Jerry Lawson, project manager for GTC



TELECOM PROJECTS

The Atlanta Construction Operation staff has an impressive history of establishing relationships with key telecom customers and remaining integral to ongoing plans for these customers. For example, the Atlanta Construction Operation has provided services for wireless carriers PowerTel and DiGiPH in Jacksonville, Florida and Mobile, Alabama since the inception of these companies nearly 5 years ago. This “repeat business” tradition is a core value to Black & Veatch Telecommunications Inc.

“Being able to provide complete self-performing services to our telecommunication customers is a strong differentiator between our competitors in the industry. The Atlanta construction capabilities provide us that differentiator which translates to higher quality and shorter schedules for our customers,” said Martin Travers, vice president, development for Black & Veatch Telecommunications Inc.

The portfolio of telecommunications customers that Black & Veatch Telecommunications Inc has supported is a variable “Who’s Who” of industry leaders including the following significant projects:

Microcell Management

Engineering, procurement, and construction of 70 multi-tenant wireless

sites in South Carolina, North Carolina, Georgia, and Virginia.

Qualcomm

Chattanooga, Tennessee, U.S.A. Deployment of 50 wireless sites for ChaseTel (Leap Wireless).

Lucent Technologies

Chattanooga, Tennessee, U.S.A. Base station replacement project for Leap Wireless.

Poka Lambro

Engineering, procurement, and construction of 40 PCS sites including RF equipment installation in Midland/Odessa, Texas, U.S.A.



Top, Industrial Boulevard 115-12 kV Substation, Georgia Power Company. Above, Alabama Power’s Crooked Creek 230 kV Switching Station.

OCI SCORES BIG

“Being able to provide complete self-performing services to our telecommunication customers is a strong differentiator between our competitors in the industry.”

Martin Travers, vice president, development for Black & Veatch Telecommunications Inc.

Penasco Valley Telephone

Engineering, procurement, and construction of 20 PCS sites including RF equipment installation in Rosewell, New Mexico, U.S.A.

Teligent

Broadband wireless equipment installation for Nortel throughout San Antonio, Texas, U.S.A.

Williams Communications

Regeneration site design and construction throughout the United States.

INTO THE FUTURE

The Atlanta Construction Operation is building a solid reputation in the construction industry. It has become the model by which Black & Veatch will work to establish additional construction offices throughout the United States to service their customers.

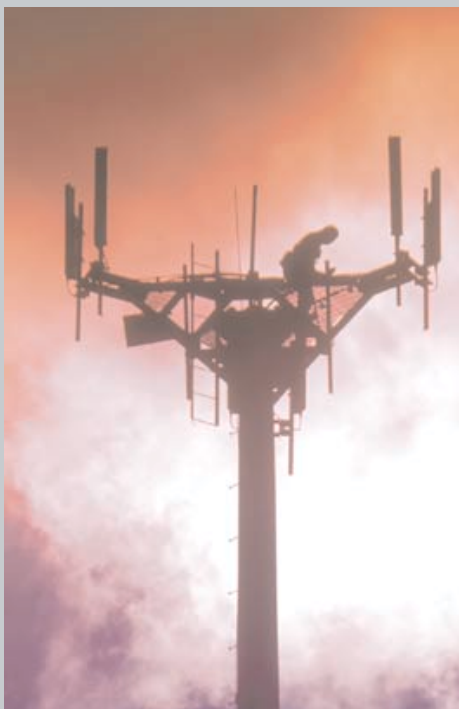
It's one thing to think you've done a good job on a demanding project. It's quite another to have the customer affirm that perception through their own evaluation. The Sewell Creek and Doyle projects for Georgia Transmission Corp. (GTC) are good examples. OCI recently earned high marks for technical skill, professionalism, and production on GTC's contractor assessment, which is used to monitor the quality of the work performed by their contractors. Performed by a GTC field representative, the assessment rates contractors on a scale of 1 to 10 for each of 16 criteria, including such things as the quality and accuracy of workmanship, the attitude of the workforce, management of subcontractors, safety and OSHA compliance, flexibility to work around outage constraints, and completion on schedule. OCI earned a 9.5 out of 10 across all criteria.

“On both of the projects, Overland scored in the outstanding category, which doesn't come that easy,” Jerry Lawson of GTC said. He attributes the high marks to the example set by the construction managers, who happen to be brothers – Chris Symons on the Doyle site and Ben Symons at Sewell Creek. “One of the keys is that the Symons brothers were on top of the job. They were flexible and conscientious, and that filtered down to all the people that worked for them.”

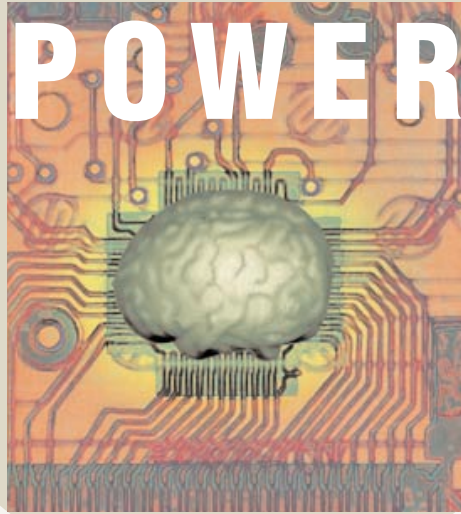
OCI's outstanding performance on the GTC substation projects has positioned the company for large-scale work in the region. “They're at the top of the list,” said Lawson. “They'll have the opportunity to bid on our most complex projects.”



Top, left to right: OCI's Ben Symons, GTC's Jerry Lawson, and OCI's Chris Symons.



Clean Combustion



Neural Networks Optimize Boiler Operation and Reduce Emissions

What if a power plant worked like the human brain, learning to adapt and change behavior based on inputs from throughout its system? That is precisely the goal of a neural network, a relatively new approach to boiler optimization that extracts real-time data from a Distributed Control System (DCS) to adjust plant performance. The result is more efficient operations and reduced emissions – once thought to be mutually exclusive objectives.

In today's energy market, utilities are under pressure to produce low-cost electric power while meeting increasingly stringent environmental regulations. In issuing the "NO_x SIP Call," the US Environmental Protection Agency has set new requirements for reducing emissions of nitrogen oxides (NO_x) to an average of 0.15 pound per million Btu in the eastern half of the United States. With a recently revised compliance deadline of May 31, 2004, utilities are looking for low-cost ways to reduce NO_x emissions without sacrificing performance.

EXPLORING VIABLE OPTIONS...

Traditional solutions involve a trial-and-error combination of NO_x reduction strategies, such as switching to Powder River Basin coal. The western coal's low-nitrogen content produces less NO_x, but its high moisture and low Btu content may require a plant retrofit or result in a performance degradation. Other options include low NO_x burners, overfire air (OFA), and postcombustion controls.

"The option that is talked about the most is selective catalytic reduction (SCR)," said Jeff Arroyo, fuels and combustion project manager for Black & Veatch's Energy Services Group. "It's a postcombustion technology that is very

expensive, but it gets compliance in one fell swoop. The other options have to be done in combination to have a chance of achieving the same results. But together, they're all less expensive than an SCR."

Recent advances in computer hardware and software technology have made boiler optimization a viable alternative to one or more of the options that require large capital outlays. Based on neural network computing, which uses real-time data to learn from plant operation experience, boiler optimization can reduce emissions while improving plant performance. Neural network models differ from traditional engineering and statistical computing models because they accurately make predictions for complex, time-varying, nonlinear relationships.

"NO_x emissions reduction has been the major driver behind interest in these systems, but there are utilities that are buying boiler optimization systems for efficiency and plant heat rate improvements," Arroyo said. "Emissions reduction and heat rate improvements can go hand in hand."

NEURAL NETWORK TECHNOLOGY

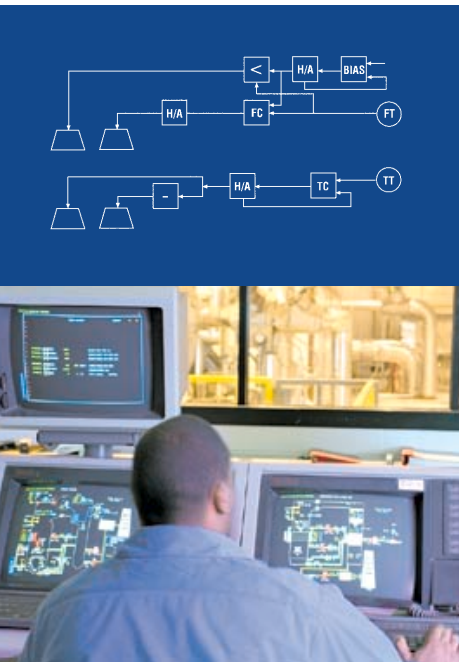
Neural network technology has matured since it was first introduced about five years ago, when the systems were poorly received in the industry.

"Early systems were unstable, and the technology wasn't fully developed," Arroyo said. "They were primarily used for off-line analysis and optimization recommendations. Today, neural networks are closed-loop systems that are faster, cheaper, more reliable, and stable."

Based on past research of the human brain and other biological systems, neural networks have the ability to learn complex patterns and trends in data. Neural networks apply knowledge from past experience to new problems. They reduce multiple inputs to one output, then feed that back into the system until it arrives at an optimal output. "As you continuously feed data into the system, it learns over time," Arroyo said. "Because a neural network interacts with a plant's DCS, it automatically and continuously monitors where the plant operation is and where it needs to be in the future to reduce emissions and, at the same time, improve the plant's heat rate."

Neural network systems have the potential to reduce NO_x emissions from 10 percent to 35 percent and improve heat rate from 0.5 percent to 1.0 percent. Through better management of fuel, air, and furnace temperatures, these systems can also significantly reduce carbon monoxide, opacity, and loss of ignition. Other side benefits include optimization of soot blowing and improved boiler steam temperature control.

A properly implemented boiler optimization system can reduce, defer, or possibly avoid the need for other emissions-related capital expenditures. As part of a total compliance strategy, the system can also help fine-tune combustion characteristics after a burner retrofit or OFA modification. Even if an expensive post-com



“Through Black & Veatch’s knowledge of available systems, their detailed technical specifications and rigorous decision-making process, we were able to select the boiler optimization software which best satisfied our requirements.”

Pat Looney, senior project engineer,
Colorado Springs Utilities

bustion control such as SCR is deemed necessary, utilities can significantly reduce their annual ammonia consumption and extend other catalyst life by properly utilizing an optimization solution.

Closed-loop boiler optimization systems are available from several major vendors. Depending upon the number of DCS control variables, costs range from \$200,000 to \$500,000. For most small-to-medium-sized coal fired units, the payback in improved performance and lower NO_x is in a few months. For large coal fired units, the cost can be easily recouped within a month of startup. “As part of a total emissions compliance solution, this is the lowest cost option with the best payback,” said Arroyo. “For emissions reduction or efficiency improvement, it’s the best value for the dollar spent.”

SEPARATING FACT FROM FICTION

Determining which emissions reduction technology, or combination of technologies, is right for a given plant can be confusing and costly. Black & Veatch consults with utilities to help evaluate the options, taking into consideration the specific requirements and limitations of each plant. A technical needs discovery identifies which systems are the best match for the plant configuration. Black & Veatch offers an objective analysis and helps separate fact from fiction in vendor claims.

then develops a client-specific, vendor-neutral system specification.

Following a detailed bid analysis and vendor recommendation report, Black & Veatch offers implementation support. “We help facilitate communication, project management, and design review to make sure the vendor adheres to the specification, and the customer gets what’s been promised, on schedule.”

IN THE FINAL ANALYSIS

Because boiler optimization systems interface with the plant’s DCS, ensuring that plant operators, engineers, and instrumentation and control staff are comfortable with the system is critical to success. “They usually run it in an open loop initially, until the operators get comfortable with it. It’s an advisory system at that point,” Arroyo said. “They go to closed-loop operation once the operators get comfortable with it and trust it.”

“The vendors have an interest in their solution being chosen,” said Arroyo. “Boiler OEMs like boiler modifications. SCR manufacturers like postcombustion controls. And because of the fees involved, some firms tend to push high-end solutions. We encourage clients to look for low-cost solutions first. We bring in vendors for presentations to educate and get buy-in among the evaluation team, so that they feel they are a knowledgeable part of the decision-making process.”

Asking the right questions is a key part of the selection process. Will the system optimize NO_x emissions, boiler efficiency, or a combination of both? Will the vendor perform control logic modifications, or will the plant staff have to fine-tune the system? Will graphical analysis tools be available on computers throughout plant? By providing an unbiased, third-party assessment, Black & Veatch helps clients define these requirements,

A properly implemented neural network can keep a plant running at optimal efficiency while significantly reducing NO_x emissions. “It’s a win-win situation,” Arroyo said. “The operators want the system to be reliable, responsive, and not trip the unit. Management wants the system to run continuously to keep the plant in compliance. The goals are the same.”

SCALING

Black & Veatch does bigger better than most

By Linda Bond

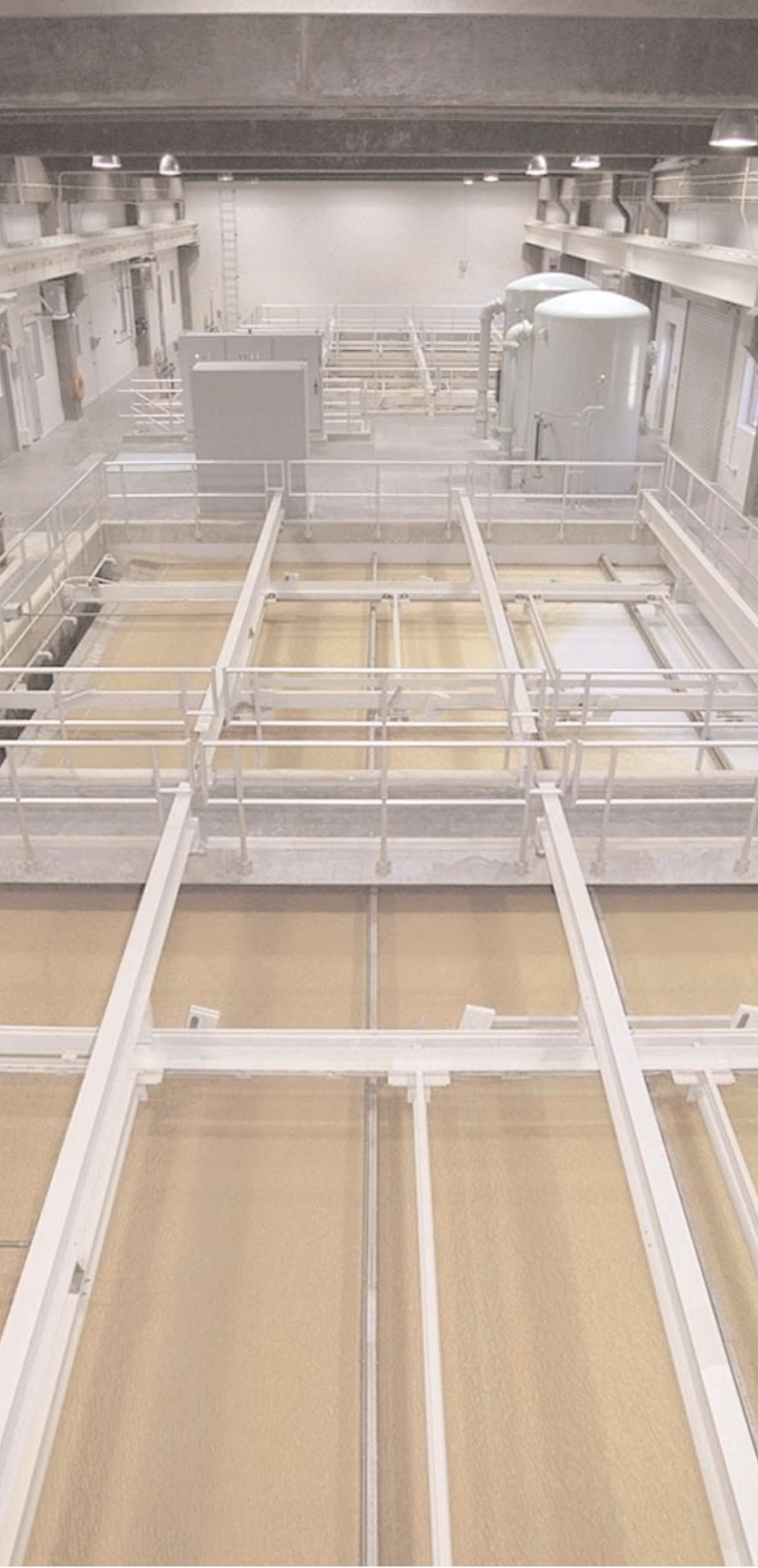
Bigger isn't always better. But when larger-scale solutions are essential to address sizeable demands or are advantageous by providing economies of scale, utilities, government agencies, and manufacturing companies around the world turn to Black & Veatch. They know that the consulting, engineering, and construction giant does "bigger" better than most.

SIZING UP THE SITUATION

Scaling up water and wastewater processes and facilities is more than a matter of mere multiplication. Whether the challenge is to scale up from laboratory to pilot-scale, pilot- to full-scale, or modest to grand-scale operations, the ability to size up situations and "upscale" solutions requires the following:

- **A full life cycle approach.** Achieving process and operations success at previously undemonstrated levels requires consideration of the full life cycle of potential solutions. Successful scale-ups focus on desired end results and bottom-line goals from a wide-angle perspective that encompasses constructability, operability, and many other issues.
- **A solid understanding of chemistry, biology, hydrology, engineering, applicable technologies, and operations.** What works at a smaller scale often must be altered – or even redesigned – for optimal performance at a larger scale. The ability to implement processes and facilities of any size, tailored to specific needs, requires in-depth knowledge and broad-ranging experience.
- **A history of successfully stretching limits.** Black & Veatch companies have long been entrusted to make ideas work at previously unattempted levels, with many "firsts" and "biggests" contributing to the firm's global reputation for excellence and innovation. From LA to Bombay, examples of our ability to rise to monumental infrastructure and environmental challenges abound.
- **A world of resources.** Ranking at or near the top of *Engineering News-Record's* and *New Civil Engineer's* top water and wastewater consultant lists is indicative of scale-up ability. Such rankings speak volumes about the type, number, and size of design projects completed by a firm in any given year.





“You don’t become a top-ranked firm without tackling some of the world’s tallest orders and applying emerging as well as established technologies at previously unimaginable scales,” says Jim Patton, president of Black & Veatch’s Americas Division. “And we wouldn’t be in this position without a global process design team that includes world-renowned specialists and pioneers.”

DELIVERING SOLUTIONS AND SATISFACTION

Process and operations experts, systems planning specialists, management consultants, and seasoned project managers at Black & Veatch partner with utilities, governments, lending institutions, and manufacturers to deliver solutions and satisfaction.

Sometimes the challenge lies in applying new technologies in new situations at full-scale. Other times, we’ve worked closely with clients to push capacity, productivity, or economies of scale to new heights that benefit facility owners.

Following are just a few examples of how Black & Veatch is helping utilities and corporations around the world make a big splash in the water industry.

continued

PHOTOS THIS PAGE AND OPPOSITE:
Greenville’s Table Rock and North Saluda Water Treatment Plant is the largest operating DAF water treatment facility in the US treating potable water.



WTP INCORPORATES DAF IN A BIG WAY

The Greenville Water System (GWS) in Greenville, South Carolina, U.S.A., is one of the first utilities in North America to apply dissolved air flotation (DAF) to the treatment of potable water. With a capacity of 75 mgd (280 MI/d), Greenville's new DAF/filtration water treatment plant is also the largest operating DAF water treatment facility in the United States.

Although DAF technology has frequently been applied to potable water as well as industrial wastewater in Europe, it has rarely been applied – and never at such a scale – to potable water in the United States. As a result, GWS and Black & Veatch went to extra lengths to ensure success. Special measures included:

- Pilot testing to evaluate DAF performance alone and in combination with other treatment technologies.
- Tours of UK installations and consultation with a team of international DAF experts.
- Enhanced design and equipment procurement procedures.
- A project delivery partnering arrangement that called for constructability reviews beginning early in the design process to enhance design quality.
- A permanent DAF pilot plant for ongoing treatment process optimization.

The Table Rock and North Saluda Water Treatment Plant provides a higher level of treatment of waters from the two pristine watersheds than direct filtration because low-density particulate matter such as algae is removed prior to filtration.

Research shows that DAF treatment also provides for the effective removal of *Cryptosporidium* oocysts. Since it began operation in June 2000, the plant has exceeded performance expectations. According to Lynn Stovall, GWS general manager, a first-hand look at similar

facilities outside the US made a world of difference.

“Black & Veatch and Greenville water utility personnel toured facilities and met with experienced operating staff at a number of DAF water treatment plants in the UK to establish how best to apply the DAF technology in Greenville,” says Stovall. “This was so successful that we later sent a team of Greenville plant operators to selected UK plants for operator training prior to the startup of our plant.”

continued





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Lynn Stovall, general manager, Greenville Water System



***PHOTOS THIS PAGE AND OPPOSITE:
Greenville’s state-of-the art facility cost-effectively provides high quality water to area residents.***

UP SCALING

“The SBR configuration proposed by Black & Veatch will give us process operational flexibility. And the sludge hydrolysis process will minimize the quantity of dry sludge product to be disposed of.”

Battie White, project manager, Dublin Corporation

EXPANDING OPTIONS FOR TIGHT SITES

At the Dublin Bay Ringsend Wastewater Treatment Works in Dublin, Ireland, the world’s largest sequencing batch reactor system is now under construction. Sequencing batch reactors (SBRs) provide biological treatment and nitrification on small-footprint sites – especially when stacked, 12-on-12, as at Ringsend.

The space-challenged Ringsend plant upgrade and expansion will result in primary and secondary treatment plus disinfection of a peak daily flow of 260 mgd (980 MI/d) and an average daily flow of approximately half that. Under the first design-build-operate (D-B-O) contract in the history of the Irish Republic, the Dublin Corporation transferred the challenges of building and operating the new wastewater facilities to ABA, a consortium consisting of ASCON, Black & Veatch, and Anglian Water.

Hemmed in by an ancient fort, an easement, and existing facilities, the project has inspired such innovations as the two-tiered design of SBRs by Black & Veatch subsidiary Paterson Candy. When completed in late 2001, the plant will also feature the largest installation of Cambi Thermal Hydrolysis technology. By subjecting biosolids to pressure and temperature extremes, this Norwegian process produces a very dry, pasteurized biosolids product.

Dr. James Barnard of Black & Veatch, world-renowned nutrient removal expert and father of the Bardenpho Process, acknowledges that applying processes at



Dublin Bay Ringsend Wastewater Treatment Works

new scales can be challenging in terms of operation as well as a design and construction. While Black & Veatch’s diverse water and wastewater experience contributes to the consortium’s ability to meet Ringsend project goals, Dr. Barnard believes that the greatest complexity lies with plant operations.

“Operating and controlling the sequencing batch reactors is a bit like operating 24 separate plants. Through D-B-O delivery and the right combination of implementation expertise, the ABA consortium will make this work. We’re running a pilot plant at the site during construction of the full-scale facilities to maximize operations effectiveness when the plant goes on-line.”

“The SBR configuration proposed by Black & Veatch will give us process operational flexibility,” says Dublin Corporation project manager Battie White. “And the sludge hydrolysis process will minimize the quantity of dry sludge product to be disposed of.”

“The fact that the SBR and sludge hydrolysis plants being constructed at the Ringsend site are being designed and guaranteed by an engineering and construction company with the worldwide reputation of Black & Veatch is a source of both confidence and comfort for

Dublin Corporation. We expect that they will provide us with a quality service incorporating world-best practice.”

A NEW TAKE ON INTAKE

Horizontal collector wells can deliver significant water supply benefits for cities located near rivers that are hydraulically connected to alluvial material. Such wells yield water quality advantages by filtering raw water through aquifer materials and providing high-capacity collection in a single location. What is believed to be the most productive horizontal collector well built to date is now in operation at the Board of Public Utilities (BPU) Nearman Water Treatment Plant in Kansas City, Kansas, U.S.A.

Following a comparison of capital costs, operational costs, water quality, and overall reliability – and to minimize potential problems associated with a degrading river channel, icing, zebra mussels, and rapid changes in water quality – the project team selected a horizontal collector well to supply water from the Missouri River as the supply source for the new plant.

Designing a well with an average yield of 25 mgd (95 MI/d) and a potential peak capacity of 40 mgd (151 MI/d) presented several design challenges. The project required extensive hydrogeologic testing

“Black & Veatch offered a strong team approach with design specialists in every area of water supply and processing technology and was the only consultant to discuss the advantages of a horizontal collector well, which is providing an abundant, stable, and easy-to-treat water supply.”

Lanny Uden, director of civil engineering, BPU

to locate ample alluvial material to support the well, and an integrated design approach to size the structure. The structure contains four medium-voltage, large-capacity pumps, electrical equipment, and discharge piping and valves to fit on top of a 20 foot (6 meter) internal diameter caisson located in the flood plain.

BPU director of civil engineering Lanny Uden is as pleased with the project team’s creativity in suggesting the use of a horizontal collector well as he is with the team’s ability to design this type of well at such a scale. “Black & Veatch offered a strong team approach with design specialists in every area of water supply and processing technology and was the only consultant to discuss the advantages of a horizontal collector well, which is providing an abundant, stable, and easy-to-treat water supply.”

SMALL-SCALE RESEARCH PRECEDES GIANT STEPS IN PROCESS INNOVATION

Black & Veatch International Korea is currently undertaking pilot plant trials in Seoul, Korea. The trials are being evaluated by the Environmental Management Corporation (EMC), a government body under the jurisdiction of the Ministry of the Environment. Black & Veatch is one of 25 companies conducting pilot plant trials, at cost, in anticipation of winning approval for full-scale application of our process design. The company is sharing costs with a local contractor, who will receive a limited-usage license if the process earns EMC acceptance.

The EMC arranged for the trials to evaluate and approve a number of non-conventional process designs. The pilot

ALFRED MERRITT SMITH Water Treatment Plant



The fast-track design of the largest ozonation installation in the United States – under construction at the 600 mgd (2,271 MI/d) Alfred Merritt Smith Water Treatment Plant in Las Vegas, Nevada, U.S.A. – required the integration of the massive ozone complex into existing plant processes with minimal hydraulic and construction disruption.

The joint venture design team of Carollo, Black & Veatch is also conducting pilot tests at the site to help the Southern Nevada Water Authority identify final implementation and operational requirements for the ozonation-biological filtration process sequence.



plant trials will give district authorities confidence to accept full-scale process designs with which they are not familiar.

The Black & Veatch process investigates the seasonal use of anaerobic and anoxic basins. During the winter months, one of the three anaerobic basins will be converted to anoxic conditions, allowing additional time during low wastewater temperatures for denitrification. The research team has overcome various challenges, including the familiar pilot plant problem of applying pilot-scale equipment to full-scale wastewater. Low biochemical oxygen demand (BOD),

particularly evident during the rainy season (3 continuous months a year, during which 90 percent of the annual rainfall occurs), is being supplemented with acetic acid.

After Black & Veatch’s trials are completed in March 2001, a committee of professors will evaluate the results. From March through August 2001, the committee will oversee trials of our enhanced version of the original process. If the Black & Veatch approach proves successful, our process will be accepted as a “new technology” available for full-scale application.

According to John D. Fagan, president of Black & Veatch International Korea Limited, this pilot plant study is an excellent example of international technology sharing, local adaptation, and development of a process variation for full-scale use. “Process experts throughout Black & Veatch are working together to tailor biological nutrient removal (BNR) to the Asian market, where similar nutrient levels but lower BOD levels result in sewage characteristics that differ from those in other parts of the world. We expect this technology to be incorporated in the first full-scale plant design within the next 18 months.”

SUMMARY

The world’s biggest biosolids facilities and largest to-date examples of technology in action may never appear in the *Guinness Book of World Records* nor draw as many tourists as the world’s tallest mountain or deepest lake. But the success and satisfaction such projects have brought to our clients is – in the grand scheme of things – what matters most of all.



Merchant **POWER** Production

Peaking units capitalize
on wholesale power market
in Midwest

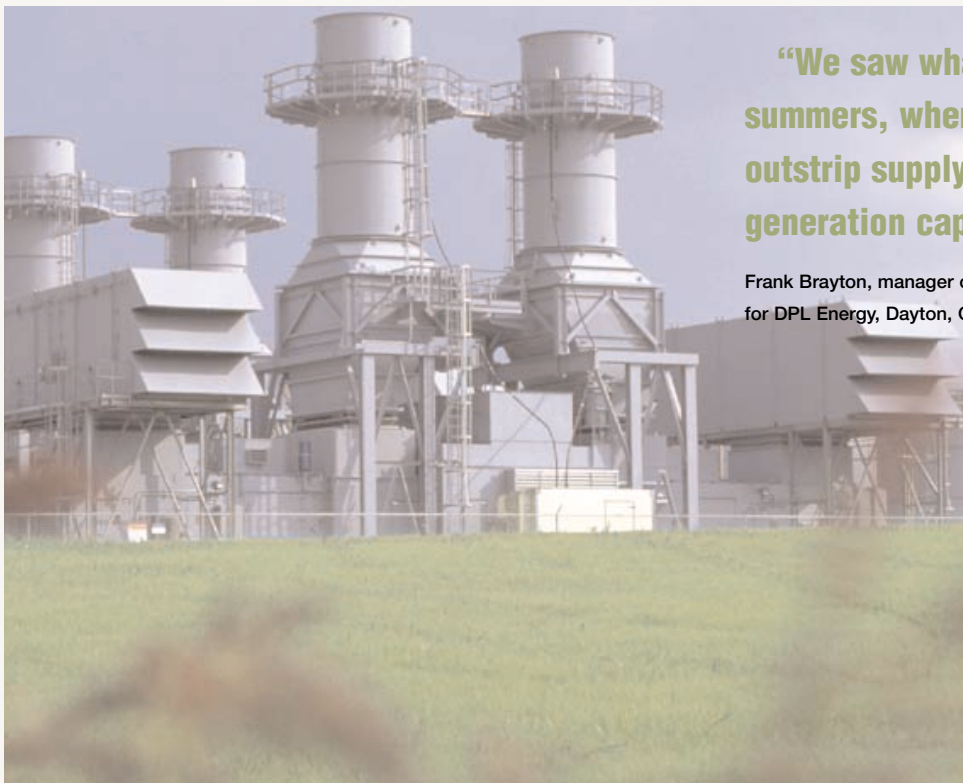
With temperatures soaring above dust bowl era highs and brown outs dimming metro areas from coast to coast, the Summer of 2000 challenged power producers to meet peak electricity demand. Merchant power plant developer DPL Energy, subsidiary of the Dayton, Ohio, USA– based diversified energy company DPL Inc., brought a new 200 MW peaking plant on-line in near record time to capitalize on that demand.

“We saw what was happening in past summers, where demand was starting to outstrip supply. There was a need to add generation capacity,” said Frank Brayton, manager of project development for DPL Energy, Dayton. “The timing was right in the market. We decided we would get involved and provide peak power in the Midwest region.”

The new plant is located on the Indiana-Ohio border in Greenville, Ohio, U.S.A. The first of four regional facilities that DPL Inc., has planned, the Greenville

plant sells power on the wholesale market in the East Central Area Reliability (ECAR) Council region, which is comprised of nine east-central states serving more than 36 million people. ECAR is one of 10 Regional Reliability Councils of the North American Electric Reliability Council. These councils improve the reliability of electricity supply by coordinating the planning and operation of generation and transmission facilities among their member utilities.

continued



“We saw what was happening in past summers, where demand was starting to outstrip supply. There was a need to add generation capacity.”

Frank Brayton, manager of project development for DPL Energy, Dayton, Ohio U.S.A.

“We worked 7 days a week, 10 hours a day, double shifts, basically pulling out all stops.”

Gene Churgin, Black & Veatch project manager

GETTING STARTED

DPL Energy retained Black & Veatch and its joint venture partner, Barton Malow Company, to locate and construct the Greenville facility adjacent to an existing substation. Consisting of four simple cycle Twin-Pac Pratt & Whitney 50 MW generating units, the plant was completed in just 13 weeks, from ground breaking to commercial operation.

Site work began in the fall of 1999, with installation of the units scheduled to begin on February 1, 2000, but a delay in the issuance of an air permit from the Ohio Environmental Protection Agency postponed ground breaking until March 21. “Even though the permit was delayed, we still had our sights set on a June commercial operation date. Those months we lost, we just had to make up,” Brayton said.

HITTING THE GROUND

Recent experience working together on two combustion turbine projects gave the BVBM team an edge on the aggressive schedule. While they waited to mobilize, they received equipment and materials offsite, at a nearby warehouse. Then, they hit the ground running. “We worked 7 days a week, 10 hours a day, double



shifts, basically pulling out all stops,” said Gene Churgin, Black & Veatch project manager. Working as one seamless organization, the BVBM team installed the first unit within 9 weeks. “No one has ever installed the machines in the length of time that we did. We compressed the schedule down to a point most people didn’t think we could make.”

Working with the modular Pratt & Whitney equipment was an advantage on the fast-track schedule. The units are readily available, economical to construct and can be brought on-line quickly. “A frame machine has to be brought up slowly, but these Twin Pacs come up to operational speed and carry a full load within a couple of minutes,” Churgin said.





MISSION ACCOMPLISHED

Against the odds, all four units were operational by June 14, keeping DPL Inc.'s peaking expansion program on schedule to meet Summer 2000 demand. Strong economic growth in the Midwest has created a favorable market for DPL Inc. The company's principal subsidiary, The Dayton Power and Light Company (DPL), serves 500,000 residential, commercial, industrial, and governmental customers in a 6,000 square mile area of West Central Ohio, which has been ranked among the top three sites for new investment by *Site Selection* magazine.

Completing the Greenville peaking plant in time for the summer season was a key element of DPL's overall growth

strategy. As part of a four-phase peaking expansion program, the additional sale capacity was immediately accretive to company earnings. DPL president and CEO Allen Hill said, "We expect that the generation capacity increase provided by these units will make a significant contribution to our business growth objectives."

The four phases of DPL's peaking generation buildout represent an investment of \$270 million and will increase peaking capacity by almost 800 MW, to 3,815 MW, by the end of 2001.

Impressed with the BVBM performance, DPL Energy has invited the joint venture team to participate in additional projects.

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