

Fast Facts

Year Established

1938 (DC government)
1996 (separate Authority)

Service Areas

More than 2 million residential, governmental, and commercial customers in the District of Columbia, Montgomery and Prince George's counties (MD), and Fairfax and Loudoun counties (VA)

Average Daily Flow

370 mgd

No. of Employees

1,000 (approx.)

Type of Plant

Biological advanced wastewater treatment plant, including solids processing

Recent Awards/Recognition

2008 Platinum Award for Utility Excellence
Association of Metropolitan Water Agencies (AMWA)

Gold Peak Performance Award - National Association of Clean Water Agencies (NACWA)

Automation Excellence Through Process Control

In 1996, the District of Columbia Water and Sewer Authority (DCWASA) ushered in a new era. Newly separated from the DC government, the Authority recommitted itself to a standard of world-class excellence that has brought significant change to the organization. It is a renaissance that began and continues under the leadership of General Manager Jerry N. Johnson.

"To be world class, an organization must compare itself to the best in the industry," explained



Jerry N. Johnson
General Manager

Johnson. "We're looking to position ourselves so others are looking to us managerially, technically, and physically. Organizations die when they plateau. You cannot think you've arrived. You always have some place to go and something else to do."

Changes at Blue Plains

Nowhere is this seen more clearly than at DCWASA's Blue Plains Advanced Wastewater Treatment Plant (Blue Plains), where Johnson has

backed his words with action. During the past 10 years, the world's largest advanced wastewater treatment plant has undergone massive renovation. The facility also is moving toward plant-wide, central monitoring and automation.

At a cost of nearly \$1 billion, the ongoing effort is a commitment to the community and the environment. The renovations enable the Authority to maintain its high level of service to more than two million customers. They also help the facility meet the ever-tightening regulations mandated by the US Environmental Protection Agency to improve the quality of effluent released into the Potomac River.

DCWASA's continued improvements are also an investment in the Blue Plains facility and more specifically, to its people, process, and technology.

Renovation, Automation, Process Control

The newly formed Authority began its present plant renovations and automation planning in 1998. This time, however, the Authority approached the project differently, gathering consensus from key departments before the project began in order to move forward collectively. The action has made the project a success.

"Our success is due to the broad and integrated approach we've taken," said Leonard Benson, Director of Engineering & Technical Services.

"We partnered with EMA because of their human approach toward the project and understanding of



Leonard Benson
Director of Engineering & Technical Services

our need to get that buy-in from the workforce. We have been successful with that from top to bottom. That's something that we were not able to accomplish previously. The other reason this project has worked so well is the decision early on to do away with local automatic control. There is none."

Central to all the upgrade work underway is the installation and integration of the Process Control System (PCS) that connects all processes at Blue Plains to a centralized point of control.

Clockwise from upper left: Blue Plains' biosolids building and liming tank; Blue Plains staff at work in the PCS Control Room; an inside look at biosolids processing; the US Capitol - one of DC's many national landmarks; new control panels on one of Blue Plains' 36 primary clarifiers; the facility's chlorination room; welcome sign upon entering the Blue Plains facility.





The Control Room is the heart of PCS at Blue Plains, serving as the centralized point of control for all of the facility's treatment processes.

Blue Plains partnered with EMA before plant renovations began. The assignment for EMA: the planning, design, engineering, programming, and coordination of the installation of PCS. The responsibility included working closely with the nearly two dozen major upgrade contractors on site and Blue Plains staff to link each process.

Starting on the Right Foot

Early in the project, as Blue Plains considered a contractor to carry out EMA's PCS design work, EMA recommended, and DCWASA decided, to move away from the more prevalent low-bid selection process and instead use a **qualifications based selection process** that focused on six key selection criteria: stability, financial, technology, experience, team, and cost. The new method proved an effective way to find the best suited contractor who would be there for the project's duration. DCWASA awarded the contract to Westinghouse Process Control (now Emerson Process Management), who has been a strong partner with both EMA and Blue Plains throughout the project.

Before work began on PCS, DCWASA also made a significant technical decision concerning its operating system. While UNIX was the more prevalent operating system at the time, DCWASA looked forward and questioned what role UNIX would play long term. It was determined that a Windows-based Ethernet solution would better serve the facility down the road. DCWASA's decision was validated in 2008 when Emerson announced it would start phasing out the UNIX operating system.

Process Control

Implementation of PCS at Blue Plains is a complex and lengthy undertaking that is dependent upon the completion of the numerous upgrade projects that continue at the facility today. To move Blue Plains to a centralized mode of process control, every piece of processing equipment on the 150-acre site must be linked to PCS, which can only occur as a contractor finishes upgrades in a specific area. Remarkably, the PCS project has progressed without a single delay claim.

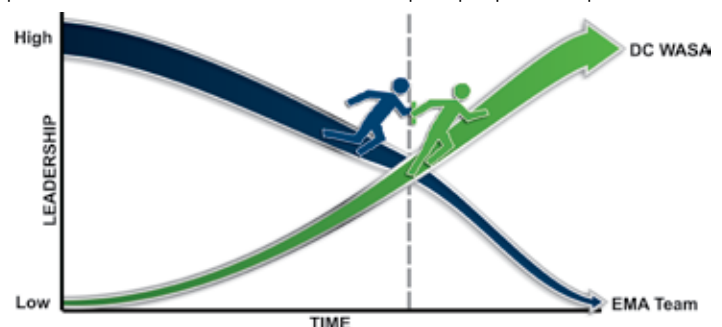
Links from the field to PCS are achieved via Ovation's Interface Termination Cabinet (ITC) units, installed throughout the plant. The work entails hook-up of tens of thousands of Input/Output (I/O) connection points, which must be individually checked. (See "Implementing Process Control," page 9.)

All links lead back to the heart of PCS – a newly constructed Control Room that serves as an on-site process control headquarters. Monitored around the clock, the room is state-of-the-art, equipped with five 100-inch screens, which provide critical process data and alert and alarm notifications. The Control Room also houses work stations, which serve as office terminals, and video screens that allow for constant surveillance of more than 60 different areas of the plant.

Change in Technology; Change in Culture

Central to the success of the PCS implementation underway at Blue Plains is the "human factors" approach to the project, which addresses those human elements that will promote shared vision, commitment, communication, and involvement by staff.

Knowledge transfer is a critical element of "human factors." The bottom line is that any technology implementation must be supported by well-trained people and best practices. EMA continues to work with Blue Plains on the transition of knowledge and leadership to ensure that both management and staff are positioned for a seamless transition upon project completion.



Transfer of knowledge is a critical component of the "human approach."

"It doesn't matter how much technology we introduce, our people remain our most important asset."

General Manager
Jerry N. Johnson

"It doesn't matter how much technology we introduce, our people remain our most important asset," General Manager Johnson said. "And it's critical that the person who does the job every day should be the one who knows it better than anyone else. That involves training people in the different areas, keeping them up to speed on technology, and getting everyone engaged early in the game."

The engagement that Johnson references has been key to the success of PCS. Involving staff early on through close communication and training has instilled a greater sense of ownership, which has proved critical in light of the changes in culture that have taken place as Blue Plains moves to PCS.

"PCS forces a team concept and communication between areas that include Maintenance, Operations, and Engineering," said Wayne Raither, Maintenance Director. "It is breaking down the different silos and getting people to work together. That requires a change in mindset as well as a change in skill set."

Raither is quick to add that PCS means different things to different people at the facility. "From an Operations standpoint, staffing is smaller because they can remotely monitor and control the plant," he said. "From a Maintenance standpoint, it's more work because the maintenance of field instruments becomes much more critical. PCS looks at and controls more out in the field, and there are more alarm points than ever before, which generates more maintenance work orders. It certainly raises the bar."

Benefits of Process Control

One Blue Plains employee explained that "PCS is a tool for us to change the way we do business." The changes have been significant, providing both tangible and intangible benefits.

Labor. Since PCS implementation began, Blue Plains has realized a significant reduction in labor costs. Much of the savings comes from Operations. Through work shift restructuring, work flow streamlining, and employee training and certification, staff numbers have gone from 160 to 60 operators through attrition and reassignment.

Changes at Blue Plains are also creating a more skilled and flexible workforce to complement

the new PCS technology. Training, both in-class and on-the-job, is key to this initiative and includes PCS instruction and cross-training on the different plant processes.



Salil Kharkar
Manager of Process
Engineering

"We used to have staff that only worked in one area of the plant for 30 or 40 years," said Salil Kharkar, Manager of Process Engineering. "With PCS presenting all the plant processes graphically, operators are able to be trained to run different parts of the plant."

Training is ongoing, according to Kharkar, who emphasized that the goal is to have all operators fully cross-trained to work anywhere in the plant. This flexibility will reduce overtime, as it eliminates the need to call in specialized operators when special needs arise in specific process areas.

PCS also establishes greater staff accountability, reinforcing the need to follow best practices. "By measuring data, there is a new level of accountability," said Duncan Mukira, Program Manager, PCS & SCADA. "This is changing SOPs and also enforcing them. So, PCS can help the operator with the amount of data it contains, but also it shows if something did or didn't get done. You have to look at PCS and respond to it."

Chemical and energy usage. PCS has enabled Blue Plains to collect data that will help them manage their chemical usage and energy

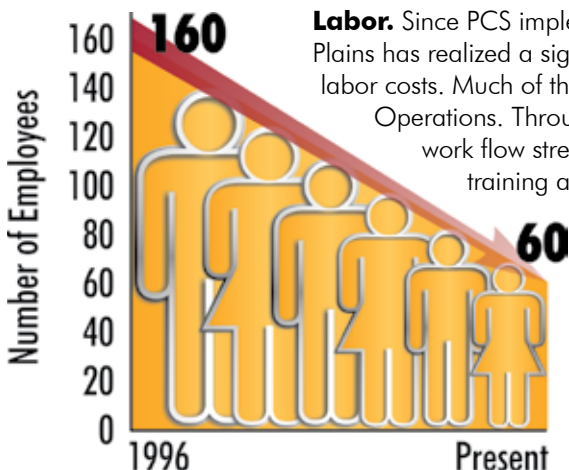


Aklile Tesfaye
Manager of
Wastewater
Treatment

consumption more effectively and significantly reduce chemical and energy costs. Data gathering is ongoing, according to Aklile Tesfaye, Manager of Wastewater Treatment. Once collected, the data will help the facility better understand where cost-saving improvements and adjustments should be made.

"To optimize and control chemical use at the plant, we can establish set points through PCS and will know right away if we are deviating," Tesfaye said. "We are also monitoring power use and establishing a baseline by process area and by each piece of major equipment. We are getting there."

Performance Management. Data collection through PCS also supports DCWASA's recent roll out of its new process improvement and performance management initiative, which focuses on developing both departmental and enterprise performance measures. Data collected through PCS will prove extremely helpful for the initiative, providing historical data for analysis and



Consider the numbers

The Blue Plains PCS is a large and complex project. Just look at the numbers:

40,000 I/O points that will link field equipment to PCS

2,225 Control sheets created to graphically diagram different aspects of process through PCS

1,800 Graphics screens created to date for the PCS display

9.5 Miles of fiber optic cable for the plant's data highway

22 Distributed Control Units (DCUs) installed on site

27 Remote Input/Output (RIOs) units installed at the facility

trending. According to Raither of Maintenance, another goal is to link PCS to DCWASA's IBM Maximo® work management system to share data and move toward more strategic plant maintenance.

Added benefits. The Blue Plains staff recognizes that PCS will have a far-reaching effect that provides additional benefits - some of which have already been identified and others that have yet to be realized.

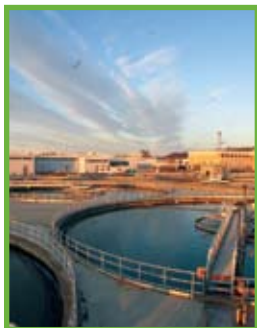
Equipped with alerts and alarms that quickly notify staff when a situation arises in the field, PCS technology supports faster response times.

PCS also enables improved troubleshooting when used as a diagnostic tool. "It's a major tool to piece together issues," Kharkar of Process Engineering said. "Any time there's a problem, you can go to PCS, open up the control sheet where we set the sequence, run any process, and trend the different points to find out what happened."

It is even a tool for engineering design, explained Mukira of Engineering. "I have had someone call me and say, 'Can you show me a trend for kilowatt usage ... just to see the load?' This is information found in PCS that can help in our design work."

Next Steps at Blue Plains

As renovation and upgrade projects wrap up at Blue Plains, the PCS work will continue. New projects will begin as well. Namely, a \$950 million enhanced nutrient removal system scheduled for completion in 2014. This, too, will be connected to PCS. It is another facet of the ongoing progress and continuous improvement at Blue Plains to become more strategic through best practices, organizational development, and technology that is second to none.



Article & Photos:
Wendy Huber-Wichelt,
EMA Communications Editor

On the cover: A view of the primary clarifiers at the Blue Plains Advanced Wastewater Treatment Plant. (Cover photo courtesy of DCWASA)

Implementing Process Control: One Point at a Time

Connecting every piece of treatment processing equipment at Blue Plains to PCS is no small task. In total, the project will include more than 40,000 Input/Output (I/O) connection points – every one of which requires a loop-check test to ensure proper linkage to PCS.

The Loop Check Process

The loop check process presents special challenges at Blue Plains. In addition to the significant number of I/O points to be tested, there is the huge task of coordination between the nearly two dozen renovation contractors, EMA's PCS team, and DCWASA's Operations, Engineering, and Maintenance departments. For a loop to work all the way from the field to the Control Room, everyone must work together to ensure each element is compatible.

EMA worked with Blue Plains and construction managers to implement a testing and approval protocol called the **Witness Combined Loop Test**. Loop tests are held once a process is ready to be connected to PCS. During a loop test, all parties (Blue Plains staff, EMA, and the construction contractor who performed the upgrade work) meet to test and witness a loop in operation. Loop tests vary greatly and depend on the complexity of the area being linked. And the work is not complete until all loops involved are working, and everyone has signed off.

Verification from field device to graphics screen ensures everything is in working order.



One of the numerous Interface Termination Units (ITCs) on site at Blue Plains linking processes to PCS.