

Collaborate To Educate

Planning for Significant O&M Upgrades

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Clear documentation, effective training, and appropriate knowledge-sharing mechanisms are crucial for the successful startup and long-term operation of any new process. That's why the New York City Department of Environmental Protection (DEP) used a programmatic approach to prepare the staff for its new egg-shaped digester facility at the Newtown Creek Water Pollution Control Plant in Brooklyn, N.Y. Due to the complexity of the system — 3000 valves, five different process loops, and 29 million gal (110 million L) of solids capacity — and a continually shifting work force assigned to operate it, effectively preparing plant staff to operate the facility was critical.

The New York City Department of Environmental Protection has used an inclusive and collaborative approach to train operators and develop standard operating procedures for the new egg-shaped digester process at the Newtown Creek Water Pollution Control Plant.

PHOTO: AISHA NIANG

To that end, DEP hired a three-way joint venture (JV) team from Greeley & Hansen (Chicago), Hazen & Sawyer (New York), and Malcolm Pirnie Inc. (White Plains, N.Y.) to provide startup and operations services and ensure a smooth transition during construction of the system. The team's duties included acting as a liaison for the plant with designers, vendors, and construction management representatives. The team also was tasked with preparing plant staff to operate the new digester system.

The Newtown Creek Water Pollution Control Plant is in the middle of a massive upgrade to meet a New York State Department of Environmental Conservation consent order to achieve secondary treatment standards. When the project, which is estimated to cost more than \$4 billion, is completed, the plant will be able to treat up to 310 mgd (1.2 million m³/d) of wastewater from parts of the boroughs of Brooklyn, Manhattan, and Queens. The upgrade includes preliminary treatment (screening, raw-sewage pumping, and secondary screening); grit removal, step-feed activated sludge (aeration, sedimentation, waste activated sludge, waste sludge screening, and screening and control buildings); solids handling (centrifuge thickening, anaerobic digestion, sludge storage and digester gas handling, and grit-handling systems); odor-control systems; and disinfection facilities.

The upgrade will require the startup, testing, and acceptance of more than 40 new plant processes, including the new digester complex.

An Inclusive Process

DEP and the JV team both recognized the need to involve plant staff in the development of operations and maintenance (O&M) manuals, standard operating procedures (SOPs), and creation of a startup plan that detailed the sequence of events required for a successful digester system startup. DEP also provided training to give staff an overview of the operation, as well as specific systems training and coordinated vendor training. To engage staff, the JV team used an interactive approach that included meetings, workshops, and a collaborative working arrangement to maximize staff input into the process and deliverables.

In doing so, the deliverables were tailored to DEP's needs, ensuring that the materials provided would be used and useful. For example, one of the early documents created for the

digester facility was the O&M manual. The manual detailed the purpose, biological theory, operation, process troubleshooting, and routine maintenance for the digesters. The O&M team used the manual to familiarize plant staff with the new digester system while the facility was under construction.

Phased Training

Operators were eased into learning the digester system by first learning the basics of the new facility in the overview training. Then they learned how to operate, monitor, and control the digesters in the systems training. Splitting the training into two sessions helped prevent overwhelming anyone with new and complex information.

As construction progressed and startup approached, the O&M team scheduled vendor training to introduce plant staff to the placement and function of new equipment in the digester facility. Concurrently, staff received a general process overview and more-specific systems training. Due to the magnitude of the digester complex, the overview training not only introduced operators to the system, biological theory, and components, it also included a comprehensive field tour to familiarize them with the location of the equipment within the facility.

The second training program — systems training — discussed how to operate the new digester system and introduced staff to the plant monitoring control system screens and their functionality. After trainers explained the functions of the various control screens, they outlined and discussed topics surrounding process monitoring and control.



BETTY GREEN

Operators at the Newtown Creek Water Pollution Control Plant benefited from a two-tier approach when learning how to operate the new egg-shaped digester complex. They first received an overview of the entire system followed by specific systems training for the individual components.

Defining and Testing Clear Procedures

Following development of the training, the O&M team set their sights on developing the facility's SOPs. While an initial list of SOPs was identified and included in the O&M manual, it was viewed as a living document and was adjusted frequently to reflect acquired knowledge of the digester system and its intricacies. Staff were given copies of the draft digester SOPs to review, use, and test during the system's initial operation.

The final document outlined when to use the SOP, where the equipment and motor control centers were located, any special requirements (for example, the use of valve keys), and a step-by-step procedure for system and equipment startup and shutdown. All of the SOPs included detailed graphics, images, and diagrams to clarify the step-by-step procedures for operators. The graphics proved to be quite valuable, because some of the digester system's components, valves, and local control panels were hard to locate in practice.

The facility startup plan, developed in collaboration with plant staff, outlined the step-by-step procedure on how to seed the new digesters, which equipment was going to be used, and how to position the valves and control panels. The startup plan covered all aspects of the project, including what sequence to use to activate the digester components once sludge was introduced, what level was needed to start the draft tube mixer, what parameters to monitor, and the required frequency to take samples for testing. During facility startup, which, at press time, was anticipated for spring 2008, all O&M materials will be refined and updated based on new findings or lessons learned.



On-site training included a comprehensive field tour to familiarize staff with the location of equipment. Detailed graphics in the plant's standard operating procedures also proved valuable to help locate some hard-to-find components and control panels.



Classroom sessions during the overview training introduced the operators to the components that make up the system and the biological theory of its operation.

Facilitating Knowledge Sharing

Everyone appreciated the need for clear and comprehensive documents in order to best equip operators and other plant staff to continue operations effectively once the consultants completed this work. All of the materials — the O&M manuals, SOPs, and the startup plan — are intended to be used as references for current staff and for training future staff on the consistent use of best practices and procedures for efficiently operating the digesters.

To further facilitate the effective sharing of knowledge, a plantwide information access system is being developed to provide quick access to information on the overall process and specific pieces of equipment via a user-friendly Web-based interface. An easily accessible central information repository also will help DEP provide training to new plant personnel.

Preparing for a successful digester startup requires extensive planning and coordination among the plant staff, construction management, contractors, and the instrumentation and control group — as well as in-depth knowledge of the digester system. Active involvement by plant staff members in the development of O&M materials, policies, and procedures is crucial to ensure that they can operate new equipment with knowledge and confidence.

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