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Steve Ott and Kurt Wells are with the Los Angeles Department of Water and Power, Los Angeles. Christine Cotton, James Collins, and Ben Kuhnel are with Malcolm Pirnie/ARCADIS, Los Angeles. Gil Crozes is with Carollo Engineers, Pasadena, Calif.

Utility Sees the Light: UV Emerges as the Best Option

After exploring several options to reduce disinfection by-product formation, the Los Angeles Department of Water and Power, an integrated team of employees, and consultants are pulling together to plan and build two UV facilities. BY STEVE OTT, KURT WELLS, CHRISTINE COTTON, JAMES COLLINS, BEN KUHNEL, AND GIL CROZES

FOR YEARS THE LOS ANGELES Department of Water and Power (DWP) searched for ways to reduce formation of disinfection by-products (DBPs), including bromate, at the Los Angeles Aqueduct Filtration Plant and Los Angeles Reservoir. DWP also needed to bring the 3-bil gal reservoir into compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2).

To comply with the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2), DWP decided to implement a chloramine residual in its water distribution system and reduce bromate formation at the filtration plant by using less ozone for disinfection credit. Although using additional chlorine for disinfection would create some DBPs, a chlorine contact tank appeared to be the most feasible way to comply with disinfection requirements. The world's largest floating cover was proposed for the 176-acre reservoir to reduce DBP formation and meet LT2 requirements.

DWP began evaluating ultraviolet (UV) disinfection in September 2009. In January 2010, after determining UV could provide the required disinfection at the filtration plant and the reservoir outlet and significantly reduce DBP formation, DWP abandoned other proposals. Currently, two UV facilities—a 600- and a 650-mgd plant—have been planned for the filtration plant and the reservoir, respectively; one is nearing completion.

UV will treat water as it exits the filtration plant and enters the distribution network or the reservoir as well as water from the reservoir before it enters the distribution system. The UV plants are about a mile apart on a 1,200+-acre complex located in Los Angeles' San Fernando Valley.

DESIGN PROCESS

The Stage 2 regulatory deadline required swift progress for the UV facility at the filtration plant. The schedule for the reservoir UV facility follows by 3–4 years under a LT2 Compliance Agreement.

Using an existing on-call engineering contract, DWP obtained the services of consulting engineers to create a project team that was integrated with DWP's design and operations staff. Because they weren't familiar with UV treatment, DWP operators and maintenance personnel were given opportunities to become familiar with different UV technologies, provide input to the planning and design processes, and obtain buy-in on the final design.

The engineering team arranged for plant staff to visit UV facilities in Fallbrook, Calif.; San Francisco; Tracy, Calif.; and New York City. Thanks to the willingness of utilities in those cities to share their experiences, filtration plant operators learned about the ease and challenges of operating and maintaining a large UV facility.

The operators preferred standardized equipment, so utility managers purchased UV equipment for both plants under a single contract. However, the filtration plant's schedule didn't allow personnel to decide before completion of the design and start of construction which UV lamp technology—medium-pressure or low-pressure high-output—would be used. Therefore, the project team prepared two electrical designs, advertised the UV equipment contract, allowed for

UV technology will treat water as it exits the Los Angeles Aqueduct Filtration Plant and enters the distribution network or the Los Angeles Reservoir as well as water exiting the reservoir before it enters the distribution system.

PHOTOGRAPH: LOS ANGELES DEPARTMENT OF WATER AND POWER

either lamp technology, and the treatment operators became familiar with both technologies.

Because of the operator-centered approach, each UV plant and reactor can be controlled from multiple locations to allow for easier operation and maintenance. Each facility will have a control room housing the master control panel for that facility. In addition, each reactor can be operated at its unit control panel and from a local human–machine interface (HMI) panel located at the reactor. The HMI allows an operator to control the reactor while performing routine maintenance, without having to move from the reactor to the unit control panel or master control panel. And, with both UV facilities located on the same property, the design allows them both to be remotely operated from the filtration plant control room. An additional HMI in the analyzer room allows operators or technicians to directly input information from the analyzers into the control system during routine maintenance and calibration.

Compared with previous facility construction and commissioning, the project is progressing smoothly, according to Plant Engineer Vee Miller. "Previously, design and operations were often at loggerheads, with one side saying, 'We've done all we can do; take it,' and the other side saying, 'It isn't ready for operations; we don't want it.' Now we have construction, engineering, operations, and consultants all pulling together, sharing knowledge and resources."

CURRENT STATUS

Although construction of the filtration plant UV building is incomplete, functional testing began in August 2013. The collaborative effort is paying off. DWP's in-house construction forces are building the filtration plant's UV system, and consultants are leading the testing and startup processes and working directly with DWP electricians, technicians, and operators during testing and startup, providing hands-on training. The filtration plant facility is scheduled to go into full operation by the end of March 2014, at an estimated total project cost of $120 million. Training will prove invaluable when the second plant begins testing and startup in a few years.

The operations and maintenance staff has also been involved in designing the reservoir's UV system, which is nearing its 90 percent design review. Using the same UV equipment in both plants simplifies design as well as future operations and maintenance activities. The reservoir facility is scheduled to be online by the end of 2018 at an estimated project cost of $125–$130 million. The two UV plants will save about $300 million compared with previously proposed projects.

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