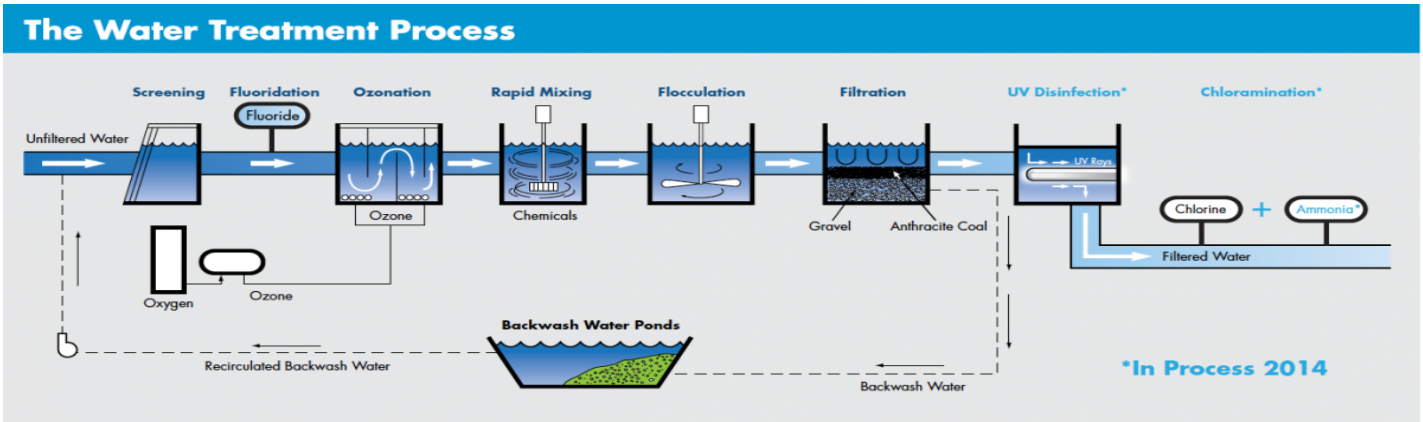
SHOWCASE PROJECT: LOS ANGELES DEPARTMENT OF WATER AND POWER: LOS ANGELES AQUEDUCT FILTRATION PLANT MODERNIZATION – OXYGEN PLANT REPLACEMENT

SOLUTION OVERVIEW

The Los Angeles Aqueduct Filtration Plant (LAAFP) was completed in 1986 and has a treatment capacity of up to 600 million gallons of water per day. In the mid-2000s, the Los Angeles Department of Water and Power (LADWP) began a comprehensive modernization of the LAAFP with a long-range program to upgrade and replace aging equipment. Energy efficiency was a key component of the program. Replacement of the oxygen plant is one of several projects currently in progress that will help LADWP save energy and money, while improving operations.

LADWP is the largest municipally owned and operated retail water utility in the country. It services a population of about four million residents and an area of 464 square miles with an annual water demand of approximately 166 billion gallons. The mission of LADWP's Water System is to deliver a dependable supply of safe, quality water to its customers in an efficient and publicly responsible manner. Water quality and reliability is a top priority. Every day, hundreds of LADWP employees work diligently to ensure that customers receive high-quality drinking water. LADWP achieves this by protecting its water sources, using state-of-the-art water treatment processes, prudently maintaining and operating its facilities, and providing vigilant security and monitoring.



The LAAFP treats all of the water delivered from the Los Angeles Aqueduct and the California Aqueduct. Water flows into the plant by gravity and undergoes several treatment processes that disinfect and remove impurities from the water. The entering water is screened to remove debris, fluoride is added to promote dental health, followed by ozonation to improve the water's taste and appearance. Next, flocculation chemicals are added to enhance the removal of particulates in the filtration process. The treated water is filtered through six-foot-deep filters (crushed coal over gravel). In 2014, LADWP added ultraviolet light (UV) treatment to the treatment process. UV treatment produces fewer disinfection byproducts and aids in achieving compliance with current and

anticipated water quality regulations. After providing treatment to clean the city's water supply, LADWP utilizes chlorine and chloramine as disinfectants to maintain the quality of the water as it travels through the city's pipelines. In March 2015, LADWP covered the reservoir located at the facility with approximately 96 million shade balls to improve water quality and reduce chlorination requirements. The shade balls also protect water from sunlight-triggered chemical reactions, wildlife, and the elements.

As aging equipment has been replaced and in the construction of the new UV plant, LADWP has striven to achieve the highest level of energy efficiency in its equipment choices and design decisions.

SECTOR TYPE
Industrial

LOCATION
Sylmar, California

PROJECT SIZE
16,000 square feet

FINANCIAL OVERVIEW
$4 million*

SOLUTIONS

The facility upgrade program is on-going, with upgrades installed incrementally during the annual two-week shut-down that takes place at the beginning of each year. The oxygen plant replacement is one of the newest upgrades and is scheduled for completion in 2018. This project involves replacing the existing cryogenic oxygen plant with a pressure swing adsorption plant, which will utilize molecular sieve technology to produce oxygen for the ozonation treatment step.

This change in technology enables replacing the 700 hp compressor with a 505 hp compressor reducing energy usage by 28%. With the unit operating year-round, the resulting savings are 1,222 MWh and $159,000 per year. As a stand-alone energy efficiency project, the payback for this project would be considered unacceptably long. However, by integrating energy efficiency into the capital improvement program, projects like this provide lasting savings in operating costs that help stretch capital budgets further.

Other capital projects at the facility with energy efficiency benefits include replacing the flocculation paddle mixers with more energy efficient jet mixers, improving the disinfection process by covering the reservoir with shade balls, and upgrading lighting and HVAC systems in facility buildings.

Other capital projects with energy efficiency benefits include:

- Flocculation Mixer Upgrades – Over the past three years, LADWP has been replacing the

flocculation paddle mixers with more energy efficient jet mixers. Each of these replacements results in a reduction in horsepower of the motors from 100 hp to 50 hp. The energy savings for this project is approximately 1,253 MWh per year, with a cost savings of $163,000 per year.

- Disinfection Process Improvement – In March 2015, LADWP covered the reservoir located at the facility with approximately 96 million shade balls to improve water quality and reduce chlorination requirements. The shade balls also protect water from sunlight-triggered chemical reactions, wildlife, and the element. Chlorine use has been reduced by 67% with a corresponding reduction in energy use since the liquid chlorine must be heated as part of the chlorination process. The energy savings for the reduction in chlorine usage is estimated at 132,500 kWh per year, with a cost savings of $17,000 per year.
- LADWP recently began a program to increase the energy efficiency of the building systems at LAAFP. In 2015, the HVAC units at the administration building were replaced with high efficiency units and the lighting system upgraded to LED's. Lighting upgrades are planned for the remainder of the facility including both indoor and outdoor areas. The lighting retrofits for the administration building are expected to generate annual energy savings of approximately 55,000 kWh and annual cost savings of approximately $9,900, with a payback period of less than 3 years. Energy and cost savings for the remaining buildings and outdoor areas have yet to be estimated.

OTHER BENEFITS

Additional benefits of these projects include:

- Reduced greenhouse gas (GHG) emissions – Every MWh saved reduces GHG emissions by 1,135 lbs of CO2. Thus, the oxygen plant upgrade will reduce GHG emissions by 629 tons of CO2 per year.
- Reduced operating and maintenance costs – The disinfection process improvement project reduces chemical costs by 67% in addition to energy cost savings. Replacing aging equipment with new equipment reduces overall operating and maintenance costs.
- Improved work environment – Retrofitting building systems improves workplace comfort through better control of lighting levels and HVAC performance.

*The project cost is a blended cost figure that includes energy efficiency upgrades along with the costs of new oxygenation technology and infrastructure.

Annual Energy Use

Baseline(2014) 5,880 MWh

Expected(2019) 4,998 MWh

Actual() Coming Soon

Energy Savings

15%

Annual Energy Cost

Baseline(2014) $767,000

Expected(2019) $652,000

Actual() Coming Soon

Cost Savings

$115,000

Los Angeles aqueduct filtration plant, Sylmar, California

Dr. Pankaj Parekh ultraviolet disinfection facility

Los Angeles Aqueduct Filtration Plant headworks

Shade balls being used to cover the reservoir

Overhead the Los Angeles Aqueduct Filtratation Plant