2004 Burbank: Link power, wastewater treatment to conserve potable water, reduce cost

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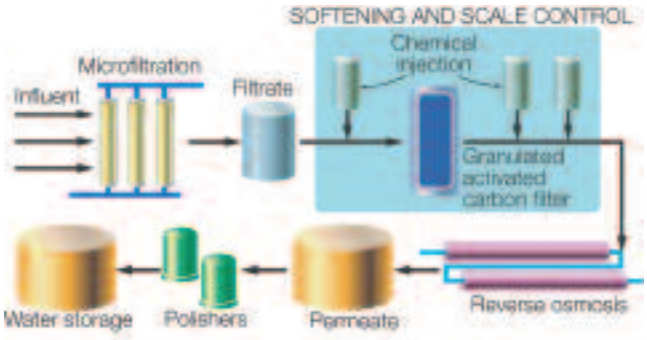
To conserve potable water, California's Water Resources Control Board requires powerplant developers to use what it calls treated reclaim water for cooling-tower makeup or to install air-cooled condensers as an alternative to wet towers. While some developers might consider this restrictive, it's business as usual for Burbank Water & Power which first began using treated wastewater for cooling-tower makeup 35 years ago.



Microfiltration is first step in Burbank's water treatment system, followed by softening, reverse osmosis, polishing

Innovation never stops at Burbank, however. In June 2002, the utility unveiled a treatment system that converts tertiary-treated municipal wastewater into high-quality demineralized water for power augmentation in its new LM6000 gas turbine (GE Power Systems, Atlanta, GA) and for makeup for two existing boilers. This system enables Burbank to operate its generating facilities without using any potable water from the city.

The new gas turbine was installed at the utility's Olive plant in spring 2002. It is equipped with the manufacturer's Sprint+ option which permits water injection to cool compression stages and thereby increase the machine's power output by about 9% at ISO conditions and by more than 20% when ambient temperature is above 90°F. The Mark 6 control system supplied with the LM6000 regulates water injection to maintain the optimum temperature for maximum compression.

Bear in mind that ultrapure water is critical for compression augmentation and for the unit's inlet fogging system. It must be free of all solid contaminants and of dissolved metallic and silica salts. Reason: Impurities will plate on turbine blades, causing efficiency loss, and contribute to erosion and corrosion of nozzles and blades, which can result in premature replacement. Water-quality specifications for gas-turbine applications often surpass those for steam-plant condensate systems. Power Supply Manager Dennis Moran says that injection of demineralized water into the compressor is the least-cost way of generating additional power at Olive, given the site's tight spacing and other considerations.

Executives at the nation's public utilities are particularly sensitive to the reliability and cost of energy services because their retail customers, in effect, own the company and they typically have little tolerance for price increases. So when Burbank began planning a water treatment system for the LM6000 it focused on an influent flexible system—one that could operate on reclaim as well as potable water without modification—and placed a high priority on cost containment.

The treatment system selected yields a product water that has 10 times the purity of makeup water the plant was buying for its steam units before the LM6000 was installed. Puretec Inc., Ventura, Calif, the primary contractor for the project, owns, operates, and maintains the treatment system for Burbank. *Con't*

Treatment begins with microfiltration. An Aria™ MF unit from Pall Corp, East Hills, NY, eliminates all solid contaminants above 0.1 micron in size. MF effluent is essentially free of solids, colloidal silica, and bacteria. It is piped to a temporary storage tank with sufficient volume to permit operation of the RO unit and polishing demineralizers at peak efficiency while the Pall filter undergoes periodic self-cleaning. Next step is chemical treatment for softening and to prevent scaling, and flow through a granulated activated carbon filter to remove residual chlorine. The resultant filtrate, with an average total dissolved solids (TDS) of 650 ppm, is piped to the suction inlet of Puretec's E-frame, dual-pass RO skid. It reduces the mineral and salt load in the influent by 99%, yielding a product effluent with 1.5 ppm TDS. Permeate is piped to a 120,000-gal tank for storage and degasification. On demand, the RO permeate is pumped from the storage tank through a set of mixed-bed polishing demineralizers to remove any remaining ionic material. **CCJ**

Pall's Aria Membrane Water Treatment System.

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Pall Aria microfiltration (MF) systems provide consistent high purity water for plant make-up and feed to RO systems for a wide range of influent water sources and water quality. Used extensively around the world, Pall Aria Systems satisfy any and all water requirements including the ability to produce boiler quality feedwater as well as drinking water that meets today's stringent standards. Pall Aria Systems are influent flexible, meaning they can take influent of up to 1000 NTUs and consistently produce effluent of less than 0.05 NTUs in a single pass.

Pall Aria Systems use uniquely designed filtration modules in a hollow fiber configuration to remove fine particulates, bacteria, cysts and oocysts. Iron and magnesium can be removed by pre-oxidation, and total organic carbon can be reduced by direct coagulation. The hollow fibers are highly permeable membranes resulting in high water flux rates.

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