Rueter-Hess Water Purification Facility

The Parker Water & Sanitation District (PWSD) in Parker, Colorado, is leading the way for communities seeking to diversify drinking water sources and minimize dependence on non-renewable groundwater. Using state-of-the-art technology, the district’s new 10-MGD Rueter-Hess Water Purification Facility (RHWPF) treats surface water, groundwater, alluvial well water, and reclaimed wastewater stored in the nearby Rueter-Hess Reservoir.

PWSD is transitioning from a heavy reliance on groundwater to operating with a supply that is 75 percent renewable and 25 percent non-renewable. Expandable to 40 MGD, the new plant positions the district to manage future customer demand while continuing to protect the region’s natural resources.

A Plan for Growth

Located along Colorado’s Front Range, approximately 20 miles southeast of Denver, the town of Parker has seen rapid growth over the past few decades. PWSD provides potable water to approximately 50,000 residents within its 43-square-mile service area. Like many communities throughout the West and Southwest, Parker has experienced steadily diminishing levels of groundwater due to increased customer demand and the impact of climate change.

Recognizing this challenge early on, PWSD embarked upon a 30-year plan in 1985 to upgrade its infrastructure and transition to a renewable water supply. Declining aquifer levels and well production rates, together with forecasts for a continued increase in population, clearly pointed to the need for a long-term, multi-phase capital improvement program that would include the 72,000-acre-foot reservoir and the RHWPF.

A Breakthrough Transition

By 2015, PWSD had successfully completed all of the major components of the plan. A new diversion pump station now conveys surface water approximately three miles from Cherry Creek to the reservoir, which also contains water from Cherry Creek alluvial wells and reclaimed wastewater effluent. While these sources contain relatively high concentrations of dissolved organic compounds (DOC), the new plant’s innovative, sequential treatment process is designed to yield potable water that surpasses the U.S. Environmental Protection Agency’s drinking water standards.

The RHWPF is the first drinking water treatment plant in North America to incorporate ceramic membrane filtration technology, and the only plant in the world to use an innovative sequence of ballasted sedimentation, recirculated powdered activated carbon, and ceramic membranes. Within just a few short months of its successful opening, the RHWPF has received international attention, with feature coverage in major industry publications and tour group interest from engineers and municipal leaders around the world.
Recognizing the potential for significant concentrations of DOC and trace amounts of synthetic chemicals from its raw water sources, PWSD incorporated a robust sequence of treatment technologies in the new RHWPF. The process removes a high percentage of DOC to minimize formation of disinfection byproducts, removes organic chemicals such as pharmaceuticals, and facilitates the removal of other organic chemicals that may be regulated in the future.

The first two treatment technologies both involve ballasted sedimentation chambers in which suspended particles in the water are forced into contact and bound to microsand particles. The particles then quickly settle to the bottom of the chamber. Next, the treated water is pumped through ceramic membrane filters, removing remaining particles larger than 0.1 microns in size.

Actiflo® Turbo
The first stage of treatment, known as Actiflo® Turbo, features a ballasted flocculation process combined with a lamella clarifier. Developed by Kruger, Inc., the system consists of a compact chamber in which coagulation, flocculation, and sedimentation are conducted to produce a high rate of clarification that removes turbidity, metals, and a portion of the DOC from raw water.

Actiflo® Carb
In the second stage, known as Actiflo® Carb, a recirculating PAC chamber adsorbs most of the remaining organic matter. The RHWPF represents one of the first U.S. applications of the recirculating process employed by the Actiflo® Carb technology. The process sends used PAC back through the system, increasing the contact time between PAC particles and DOC for a more aggressive, efficient treatment.

Ceramic Membranes
In the third stage, the RHWPF’s 560 ceramic membrane filters are used to remove remaining particles, such as algae, bacteria, and any additional traces of microsand or PAC. Developed through a partnership of Kruger, Inc. and MetaWater, the technology consists of ceramic cylinders with parallel tubular channels that extend through the length of the cylinders and are coated with a thin ceramic membrane. The highly durable membranes are able to withstand damage from the abrasive sand and PAC particles as well as repeated cleaning cycles. While polymeric membranes average a 6- to 10-year lifespan, ceramic membranes can be expected to last close to 20 years.