

CASE STUDIES

Advanced Oxidation Processes



Raw Water Production Facility (RWPF) Big Spring, Texas

PROJECT BACKGROUND

In an effort to reduce reliance on scarce surface and groundwater supplies in Texas, the Colorado River Municipal Water District (CRMWD) constructed a new Raw Water Production Facility (RWPF) in Big Spring. Big Spring is a 27,000-member community located in West Texas approximately 300 miles west of Dallas. This RWPF treats secondary wastewater to a standard that allows it to be re-introduced directly into the raw water supply for the water treatment plants of Big Spring, Odessa, and other communities in the region.

Treatment at the RWPF utilizes a multiple-barrier approach consisting of microfiltration and reverse osmosis (RO), followed by advanced UV oxidation (UV AOP) for the further removal of organic contaminants and final microbial inactivation. The result is advanced treated, “synthesized” raw water capable of being combined with the “natural” surface raw water from the E.V. Spence Reservoir or other system supplies. The combined raw water supply from the production facility and reservoirs is then



delivered to the drinking water treatment plant of Big Spring, as well as those of the neighboring communities of Stanton, Midland, and Odessa, for further treatment and distribution.

CHOOSING TO REMAKE AND RESUPPLY RAW WATER

CRMWD, recognized that meeting future water needs and ensuring reliable supply in times of significant water shortage required additional sources of drinking water. Reusing treated wastewater for drinking water was considered to be an important new source because it was a cost-effective and sustainable way to augment and preserve the existing water supply.

However, several alternatives were also considered, including:

- Obtaining additional drinking water from groundwater wells and existing reservoirs.

The aquifer has little recharge potential, and therefore did not offer the same long-term sustainability that reuse offered. Additional reservoirs are distant, and the water was subject to high purchase and transportation costs. Lastly, the potential for drought conditions across a wide geographic range in the area made supply from these alternative sources unreliable.

- Reusing treated wastewater for non-potable applications, such as irrigation and recreational use.

Plant Name: Raw Water Production Facility (RWPF)

Location: Big Spring, Texas

System: TrojanUVPhox®

CASE STUDIES

Previous studies concluded that non-potable water reuse would effectively offset the use of drinking water. However, the widely distributed demand for reused water in Big Spring and the surrounding municipalities meant that proceeding with this option would require the creation of new and extensive distribution networks to deliver the treated water. Further, demand for non-potable reuse water for irrigation and recreation fluctuated seasonally and did not provide a dependable year-round solution. As a result, this option was not considered to be economically feasible and was also eliminated.

NEW RAW WATER PRODUCTION FACILITY

Treatment of secondary wastewater to standards that allow it to be re-introduced into the raw water supply involves three independent treatment technologies: microfiltration, RO, and UV AOP. The final treatment step, UV AOP, provides a highly cost-effective additional barrier to contaminants that, due to low molecular weight, can pass through microfiltration and RO membranes. An example is 1,4-dioxane, a probable carcinogen which is effectively broken down by the powerful free radicals generated during the UV AOP process. The final treatment provided by UV AOP enhances the reliability of the potable reuse treatment process.

This three-step treatment train is identical to that used by other successful potable water reuse facilities, including the Orange County Water District (OCWD) in California, to treat wastewater for re-supply into local groundwater aquifers. With the demonstrated success of OCWD, numerous other facilities, including Big Spring, have adopted the proven treatment processes to confidently provide new potable water.

DIRECT USE OF TREATED EFFLUENT

An important design difference between the referenced OCWD site and the RWPF is that the synthesized raw water from the RWPF is pumped directly into the drinking water intake systems of the local drinking water treatment plants. There is no 'environmental buffer' in the RWPF facility design. The direct use of the highly treated wastewater is testament to the Water District's confidence in the treatment process, reliability, and operation.



THE TROJANUV SOLUTION

Trojan delivered UV AOP equipment for CRMWD's Raw Water Production Facility at Big Spring. Two TrojanUVPhox[®] systems, along with hydrogen peroxide (H₂O₂) dosing equipment, treat contaminants such as 1,4-dioxane, NDMA, pharmaceuticals, and endocrine-disrupting compounds that are not removed through upstream membrane treatment. At the same time this system, provides inactivation of microorganisms including adenovirus, Cryptosporidium and Giardia.

“The Trojan system offered a cost-effective additional layer of protection against a number of water quality concerns, with removal/inactivation mechanisms distinct from the membrane separation processes upstream.”

David W. Sloan, P.E., BCEE
Associate & Senior Water / Wastewater Engineer

DESIGN PARAMETERS

- **DESIGN FLOW CAPACITY:** 1.8 MGD
- **DESIGN LOG REDUCTION OF NDMA:** 1.2 Log
- **DESIGN LOG REDUCTION OF 1,4-DIOXANE:** 0.5 Log
- **OXIDATION PRECURSOR:** Hydrogen Peroxide
- **MICROBIAL INACTIVATION METHOD:** UV light

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