

## Case Study

# Membrane Retrofit: City of Del Rio Water Treatment Plant



### Project Details

Location: City of Del Rio  
Water Treatment Plant  
Del Rio, Texas

Application: Water Purification

Capacity: 18 MGD

Commissioned: 2014

### Overview

The city of Del Rio, TX is located on the U.S.- Mexico border created by the Rio Grande River, approximately 160 miles west of San Antonio. Designated as a historical site, the San Felipe Springs have supplied drinking water to area residents since 1722, and later to the Laughlin Air Force Base as well. The springs are classified as Ground Water Under the Influence of Surface Water (GUI) due to historical data indicating that the raw water experienced sporadic high turbidity episodes.

In accordance with the Interim Enhanced Surface Water Treatment Rule (IESWTR), the treatment plant must deliver finished water turbidity of <0.3 NTU for 90% of analyzed samples and <1.0 NTU for all analyzed samples. Also, treatment must achieve a 3-log reduction of Giardia cysts and a 4-log virus reduction by removal or disinfection.

The Texas Commission of Environmental Quality (TCEQ) made a recommendation to the city that an ultrafiltration membrane water treatment plant be built as a long-term solution to the city's water treatment needs. The equipment purchase contract between the City of Del Rio and the supplier would establish a maximum finished water turbidity requirement of <0.3 NTU for all samples and a performance standard of <0.1 NTU for 90% of analyzed samples. The plant's operational capacity was designed at 18.2 MGD.

Raw water is supplied at a feed pressure of 30 psi (2.1 bar) with a maximum of 40 psi (2.8 bar). A pair of 200 micron strainers distributes pre-filtered water to 14 primary and 2 secondary membrane racks sized to provide a total flow of 18.2 MGD (2.870 m<sup>3</sup>/hr). The membrane feed pressure is typically <20 psi (1.4 bar) at a flow rate of 300-1350 gpm (68-300 m<sup>3</sup>/hr) per rack. The primary membrane racks are backwashed sequentially on a timed cycle to maintain production. The filtered water from the membrane system then flows to two clearwells adjacent to the membrane building.

The system's original Aquasource brand ultrafiltration membranes successfully achieved the required water quality results specified by TCEQ, retaining suspended solids and microorganisms. The hollow fiber cartridges utilize an "inside-out" flow pattern and operate normally in dead-end mode. However the system can be switched automatically to cross-flow filtration during high turbidity events in excess of 10 NTU.

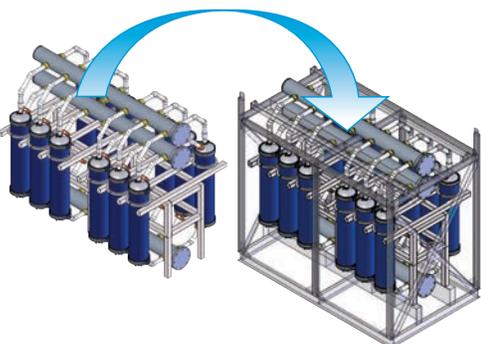
### The Challenge

By 2011, the plant's UF membranes were showing signs of wear, requiring frequent fiber repairs. Ultimately the cartridges were determined to have reached the end of their useful life and needed to be replaced. Replacement costs utilizing the existing specified membranes were beyond the

facility's operating budget, forcing the City of Del Rio to pursue a retrofit project, initially with little success. Most of the ultrafiltration membrane companies contacted could either not match the footprint of the existing cartridges, or the quoted expense for the retrofit project was cost-prohibitive to take on.

**The Solution**

Koch Membrane Systems immediately offered to evaluate the treatment system to see if it was viable to retrofit the plant with KMS Ultrafiltration membrane cartridges. The system designers at KMS offered the city a viable and affordable solution, utilizing KMS' TARGA® II hollow fiber UF membrane cartridges along with the ability to operate a pilot system for in-house testing. As a result, Del Rio Water Treatment Plant management was able to move towards solving their membrane supply problem.

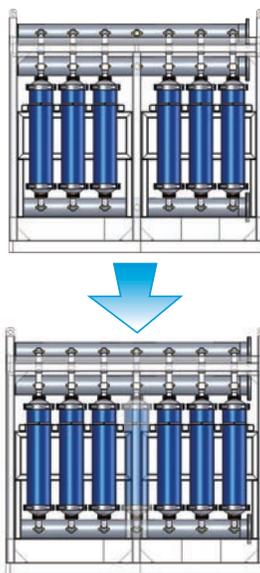


KMS was able to easily replace the Aquasource UF membrane with TARGA II UF membrane and seamlessly retrofit each rack.

A pilot was run with the KMS UF membranes utilizing the existing rack and controls with little retrofitting effort and expense. After successful testing of the TARGA II membranes, it was determined that the retrofit could be implemented with minimal modification to the existing system. Koch Membrane Systems was able to provide prefabricated rack inserts including manifolds, connectors and membrane cartridges that fit within the existing rack framework and utilized existing system controls. KMS also provided installation and startup assistance.

City of Del Rio officials were extremely happy with the performance of the product and the proposed retrofit to the system. The TARGA II product has performed very well in comparison to the original ultrafiltration membranes offering robust fibers with minimal breakage, an efficient footprint, and a cost-effective solution.

Koch Membrane Systems engineers not only developed a custom retrofit design to accommodate the TARGA II membranes, but within the new design, spare positions were incorporated into each rack for future additional ultrafiltration membrane cartridges. This opened up the possibility of 8 additional cartridges per rack, for each of the facility's 16 ultrafiltration racks. Those additional cartridges provide the facility with the capacity to ultimately process an additional 5 million gallons per day (788m<sup>3</sup>/hr).



Within the new retrofit design, extra space was provided for future KMS UF membrane cartridges.

After completion of the pilot program with the new TARGA II product, city engineers and the TCEQ approved the test results and implementation plans for retrofitting the City of Del Rio Water Treatment Plant with the Koch Membrane Systems product. The proposed implementation will retrofit all 768

ultrafiltration cartridges with TARGA II membrane modules. The 672 cartridges within the primary system are to be completed by the end of 2014, and the 96 secondary cartridges will be replaced by the end of 2015.

**Product Overview**

The TARGA II system offers cost effective, high quality water for a variety of treated water applications, from drinking water to seawater RO pretreatment, industrial water treatment, and tertiary wastewater treatment. An available seawater system is able to meet the unique challenges of RO pretreatment for seawater desalination as well and offers consistently good filtrate at low overall costs.

The TARGA II system features several important advantages:

**Optimal System Design**

- Smaller footprint
- Easily expandable
- Reduced capital costs

**Proven 4-log Virus Removal**

- Reliable fiber suited to meet stringent regulations
- Cost-effective drinking water treatment

**Robust Fiber**

- Sturdy PES fibers reduce breakage
- Wide range of pH cleaning – 1.5 to 13

**Intelligent Controls**

- Reduced chemical & energy consumption
- Minimal operator involvement
- Efficient handling of feed water upsets



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