

## Challenge – N03, Fl, As Removal

A west Texas community receives its drinking water from a number of wells which have Fluoride, Nitrates and Arsenic levels above MCLs. Although **Cuf** (Continuous Ultra Filtration) can remove arsenic and fluoride, RO (Reverse Osmosis) is required to reduce the nitrate below MCLs. Integrating the **Cuf** system to RO provides superior pre-treatment to the RO system as it removes RO foulants and provides a pristine feed to the RO system. **Cuf** provides a consistent feed with no upsets. This optimizes RO performance and reduces RO cleaning and membrane replacement.

## Background

In 2014 a successful pilot verification program was performed using **Cuf** (Continuous Ultra Filtration) pretreatment and RO (Reverse Osmosis) which demonstrated sustained purification of Fl, As and NO<sub>3</sub> below MCLs and provided the necessary data for regulatory approval for full scale implementation. Regulatory approval was received and the full scale system is now in production.

## Pilot Performance

During the sustained test program the pilot operated at a flux of nominally 220 GFD with TMP varying between 3-15 psi. The **Cuf** system operated for 200 hours between TMP maintenance rinses.

Parameters (ppm)	Raw Water	RO Permeate
<b>Arsenic</b>	0.04	< 0.01
<b>Fluoride</b>	4.63	< 0.5
<b>Nitrates</b>	6.5	1.4
<b>Total Hardness as CaCO<sub>3</sub></b>	560	0.6
<b>Total Dissolved Solids (TDS)</b>	868	48
<b>Sulfate</b>	259	< 2.6
<b>Chloride</b>	102	0.6

## Plant Capability

The new plant will be capable of producing 1,000,000 gal/day for drinking water distribution.

The **Cuf** /RO system will accept water from any combination of wells and flow rates to produce water with the quality as shown above. The finished water will be a blend consisting of 15% of the feed water to the RO permeate to provide an appropriate hardness level of nominally 80 ppm.

## Capital Works

In 2015 the purification process was approved by the state regulator (Texas Commission on Environmental Quality [TCEQ]). This plant is now under construction and to be operational Q2 2017.





Figure 1: Integrated CUF/RO System in Production



Figure 2: Building & Installation

## Other Benefits

- Reduced operator involvement, the entire process is automated and only audited.
- The **Cuf** provides very pristine and consistent feed water to the RO for enhanced RO membrane life and reduced cleaning requirements.
- For additional information reference document “**Cuf** Continuous Ultra Filtration”.
- NSF/ANSI 61 Compliant

