

Case Study

Temporary Pretreatment on River Water, 2006



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Front Range Energy, Windsor, CO went to the well and it was dry. During pre-startup water trials in May 2006, engineers of the 40-million gallon per year (mgpy) ethanol plant discovered the onsite wells didn't have enough capacity to meet the facility's needs.

While Front Range Energy officials sought a long term solution, US Water Services, Cambridge, MN, looked for water options that would allow the plant to continue with startup.

US Water's solution was to draw water from a nearby river and install a pretreatment system using follow fiber micron filtration, a first for the biofuels industry. The pretreatment system was in place in 13 days, leaving six hours to spare before the plant's temporary use of city water expired.

"They helped us bring in river water, treat it to where we could use it in the process so we could get up and running," said Joe Winckler, a general manager of ethanol operations for Pacific Ethanol in Sacramento, CA. Pacific Ethanol owns 42% of Front Range Energy.

When Front Range discovered its onsite wells were insufficient, it had to find another water source. "Off-site wells were available",

Winckler said, "but the process to get water rights in Colorado is lengthy."

"Colorado water rights are hard to come by. It's a long arduous process. We spent a year in water court getting our water rights written down for the on-site wells," Winckler said. "It's more complicated than buying land."

That meant the plant, which ready to start production, would have to sit idle while Front Range negotiated for use of the off-site wells. Other options included an irrigation canal and the Cache de Pourde River. The canal had problems with quality, quantity, and access rights. The river had adequate quantity and negotiable access rights but significant quality concerns.

"Running the river water through the plant's existing two units nanofiltration (NF) pretreatment system would have been problematic. The NF system membranes would have been severely damaged by the suspended solids, organics, and biological matter in the river water", said Monty McCoy, US Water Services. "We would have trashed several hundreds of thousands of dollars worth of equipment quickly without some kind of pretreatment."

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US Water Services created a new, temporary pretreatment system for the plant that included:

- Initial gross straining at the river inlet to knock out fish, moss and leaves. A diesel pump brought the water to the plant site.
- Initial settling of large suspended solids and local holding volume with a 20,000 gallon fractank. A second diesel pump forwarded the water from the storage tank.
- A four-unit media pressure filter installed outside the NF pretreatment building to reduce total suspended solids.
- A trailer-mounted Aria hollow fiber micro filtration / ultra filtration system from Pall Corp. The system was mounted on a semi-trailer adjacent to the NF pretreatment building.

Inside the trailer were two banks of 50 filter modules, for a total of 100 modules. Each module, which is about 8 inches in diameter, has about 400 capillaries made of flora carbon.

Water permeates the capillary tubes and solids are deposited on the outside of the tubes. Clean water is collected from inside the tubes. The material was discharged to a retention pool. Unlike classical media filters, chemical additives did not need to be used to encourage the solids to coagulate. Colorado prohibits chemical discharges to ponds.

The system successfully handled the solids and responded well to on-line clean in place.

There were only a handful of interruptions due to the difficulty in balancing flows between the two diesel pumps intake of large amounts of mud at the inlet strainer. The unit was back online in a matter of minutes following the interruptions.

Front Range Energy ran the system for about 90 days while it negotiated additional water rights. The plant is now getting water from off-site wells that are about a mile from the facility.

Now that the system has shown it works for biofuels applications, it can be used for additional applications at other facilities.

