

Scottsdale Water Campus: Water Resources Management Facility - Arizona

The plant in Scottsdale, Arizona treats tertiary effluent, as well as Colorado River Water, prior to Reverse Osmosis (RO), for groundwater recharge. This pre-treatment is performed by continuous microfiltration (CMF), a technology that has been proven to significantly reduce fouling and damage of RO membranes.

Background

Scottsdale, Arizona is a desert community with no natural surface water sources and a decreasing groundwater supply, making water one of the most precious commodities. In 1980 the city embarked on an ambitious plan to maximise the use of the available water, developing The Water Campus as a water resources management facility.

Scottsdale, like most other public authorities has historically treated and disposed of their wastewater. As the city has grown, disposal of wastewater presented several problems:

- The city was paying money to dispose of reclaimed water.
- The sewerage system would need upgrading, at a similar cost to the Water Campus.
- Water lost from the city would have to be replaced, at a further treatment cost.

In 1980, the State of Arizona passed the Groundwater Management Act (GMA). This legislation awards withdrawal credits to facilities that recharge groundwater.

Application: Effluent Polishing/Reuse
Market: Waste Water
Country: USA
Client:The City of Scottsdale, Arizona.

Capacity:
CMF:53 ML/d
RO:38 ML/d

Equipment:18 X 90M10C CMF units ,10 X RO trains



The City of Scottsdale, Arizona receives credit by recharging excess effluent, allowing them to withdraw scarce groundwater during peak periods.

The Advanced Water Treatment Plant.

Reservoir B supplies tertiary effluent to CMF units feeding the RO units, and Reservoir A supplies Colorado River Water to CMF units for direct recharge. When all effluent is used for irrigation, all CMF units treat Colorado River water.

This became an attractive alternative for Scottsdale, as groundwater requires only disinfection for potable use.

Most of the city's effluent is used to irrigate local golf courses. During winter months the population of Scottsdale increases, as people move to Arizona to seek refuge from the cold climates. Wastewater flow-rates increase as a consequence.

Under the GMA, the city receives credit by recharging excess effluent, allowing them to withdraw groundwater during peak periods. This reduces their demand on Colorado River water, also reducing their water treatment requirements.

The Water Campus Includes:

- A 50 USmgd (190 ML/day) water treatment plant
- A 12 USmgd (45 ML/d) water reclamation plant
- An advanced water treatment (AWT) facility.

The AWT consists of CMF, RO, and recharge systems. Reclaimed effluent that is not used for irrigation is treated by CMF and RO, then recharged. Colorado River water treated by CMF alone is also recharged.

The city carried out substantial trial work prior to, and during construction of the AWT, finding that:

- The CMF filtrate has a turbidity of 0.1 and a Silt Density Index (SDI) of 1.2.
- CMF runs at a flux of 70 - 140 L/h/em
- Backwash takes place every 15 - 28 minutes, with cleaning-in-place (CIP) every 2 weeks.
- Both cellulose acetate and thin film composite RO membranes performed well, with thin film membranes maintaining a long service life and high quality permeate, at great savings in power.
- CMF produced filtrate virtually free of particles, and which could be directly recharged.

The CMF units

Arranged in 3 trains of 6 units, two trains treat effluent that has been tertiary filtered and nitrified/denitrified.

The effluent is chlorinated upstream of the tertiary filters for algae control. Ammonia is dosed prior to the CMF units to ensure that a combined residual is present. The third train treats Colorado River water. The system is valved so that any train can treat the feedwater.

Although the CMF units were designed to run at a flux of 70 L/h/em when treating Colorado River Water, and 95 L/h/em when treating effluent, the flux is higher for effluent because:

- The effluent stream is up to 10°C warmer than surface water
- It has a lower turbidity than the surface water
- It has a chloramine residual to minimise biological fouling.

CMF units on Colorado River Water run at effluent flux, being cleaned at least monthly when running on effluent. All CMF units are operating with a PDT of less than 0.2 psi/min (1.4 kPa/min): LRV ~ 4.5

Operating costs are approximately half of the pilot trial estimated costs.

The CMF plant does not require a full time operator.

The Reverse Osmosis System

Arranged in ten trains, each unit is designed for a feed flow of 1 USmgd (3.8 ML/day) at 85% recovery.

Each train is a 24x10x5 array containing 156 Fluid System 8832-HR TFC Magnums. Nominal flux is 10.4 gfd.

Feedwater is hard and alkaline, hence both Sulphuric acid and antiscalant are dosed into the RO feed.

The Future

The operators of the AWT expect to be able to increase the operating flux of the CMF units due to their excellent performance and the simple and efficient CIP procedures.

A further 6 CMF units have been installed to upgrade the flow to 18.5 USmgd (70 ML/d) of CMF filtrate.

A further 4 RO trains were designed to upgrade the flow to 14 USmgd (53 ML/d)

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Water Technologies

North and South America
+1 508.849.4600 Shrewsbury, MA, USA

Europe, Middle East and Northern Africa
+44(0) 1332.387300 Derbyshire, UK

Asia Pacific and Southern Africa
+61(2) 4577.6800 Windsor, NSW, Australia

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