FilmTec™ NF270-400 Element Helps National Park Service Improve Water Quality

The Challenge
From the Denver Service of the National Park Service
- **Raw Water**: 570 ppm TDS and conductivity of 880 µmho/cm
- **Treatment Goals**:
  - Rejection of TDS, Sulfates and Hardness to meet EPA Secondary standards
  - High rejection of organic carbon to meet EPA standards
  - Moderate removal of Calcium and Low Removal of Alkalinity (HCO₃⁻) to maintain corrosion protection and taste (at least 400 µmho/cm in the permeate)
- **Other Objectives**:
  - Retain desired hardness without excessive blending of Microfiltration and Nanofiltration permeate
  - Maximize energy efficiency for lowest operating expense

The System
- Microfiltration: USFilter’s MEMCOR® CMF
- Nanofiltration: 2 x 2 x 1 Array of 8-inch, 4-element vessels
- 100,000 gpd (380 m³/d) of potable water
- Design: Denver Service Center, National Park Service

The Results
- Selective rejection
- Increased mineral passage
- Eliminated the need for blending
- Achieved high rejection of TOC
- Improved energy efficiency
- High productivity at low pressure

FilmTec™ NF270-400 Element selected for future installations at Lake Mead.

Water Quality Results

<table>
<thead>
<tr>
<th>DISSOLVED COMPONENT</th>
<th>FEED (ppm)</th>
<th>PERMEATE (ppm)</th>
<th>REJECTION (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dissolved Solids</td>
<td>573</td>
<td>250</td>
<td>56</td>
</tr>
<tr>
<td>Alkalinity (HCO₃⁻)</td>
<td>134</td>
<td>97</td>
<td>28</td>
</tr>
<tr>
<td>Ca++</td>
<td>5.4</td>
<td>14</td>
<td>74</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>3.6</td>
<td>0.2</td>
<td>94</td>
</tr>
</tbody>
</table>

The conductivity of the combined permeate was 403 µmho/cm after one day of operation and 416 µmho/cm after 3 weeks

Operational Savings

<table>
<thead>
<tr>
<th>OPERATING PARAMETER</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Feed Pressure</td>
<td>50 psi (3.4 bar)</td>
</tr>
<tr>
<td>Concentrate Pressure</td>
<td>25 psi (1.7 bar)</td>
</tr>
<tr>
<td>Average Flux</td>
<td>14.0 gfd (23.8 lmh)</td>
</tr>
<tr>
<td>Recovery</td>
<td>80.0%</td>
</tr>
<tr>
<td>Temperature</td>
<td>78 °F (25.6 °C)</td>
</tr>
</tbody>
</table>

Three weeks after startup, the system produced up to 100,000 gpd (380 m³/d) at a feed pressure of just 50 psi (3.4 bar)
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