<table>
<thead>
<tr>
<th>Site</th>
<th>Flow rate</th>
<th>Conventional RO</th>
<th>Flow-Reversal RO</th>
<th>RR Increased by</th>
<th>WQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverage company</td>
<td>264 gpm</td>
<td>65%</td>
<td>85%</td>
<td>20%</td>
<td>High Silica TDS 820 ppm</td>
</tr>
<tr>
<td>Brewery</td>
<td>264 gpm</td>
<td>75%</td>
<td>92%</td>
<td>27%</td>
<td>TDS 300 ppm</td>
</tr>
<tr>
<td>Fracking water</td>
<td>823 gpm</td>
<td>70%</td>
<td>89%</td>
<td>19%</td>
<td>TDS 9000 ppm</td>
</tr>
<tr>
<td>Cooling tower</td>
<td>88 gpm</td>
<td>71%</td>
<td>91%</td>
<td>20%</td>
<td>TDS 800 ppm</td>
</tr>
<tr>
<td>SWRO 2nd pass</td>
<td>44 gpm</td>
<td>90%</td>
<td>98%</td>
<td>8%</td>
<td>Boron TDS 800ppm</td>
</tr>
<tr>
<td>Reuse</td>
<td>66 gpm</td>
<td>80%</td>
<td>90%</td>
<td>10%</td>
<td>TDS 1700 ppm High Ca$_3$(PO$_4$)$_2$, biofouling</td>
</tr>
</tbody>
</table>
Ultra High Recovery Flow-Reversal RO
A conventional RO with a (patented) twist
Innovative, but not new

“The Most Valuable Technology”
Singapore International Water Week 2018
What can Flow-Reversal RO do?

- Increases permeate flow by 20%
- Decreases feed water use by 20%
- Decreases concentrate flow by 60%

Concentrate management $ZLD$
Other things to know about Flow-Reversal...

- Continuous process that works just like conventional RO
- No proprietary equipment, agnostic to membrane type, specs
- No need for special operator training
- Flexibility: suitable for New & existing RO applications
- Low risk - 100% Fallback
- Added value: decreases biofouling, reduces chemical use
Converting a conventional RO to FR-RO

Conventional RO

- Feed
- 1st stage HP
- Block A: 220 gpm
- 2nd stage HP
- Block B: 110 gpm
- Block C
- 1st stage HP
- Product: 330 gpm
- Concentrate

Flow-Reversal RO

- Feed
- 1st stage HP
- Block A: 220 gpm
- 2nd stage HP
- Block B: 110 gpm
- Block C
- 1st stage HP
- Product
- Concentrate
How does Flow Reversal Work?

3 principles

1. Flow Reversal in the PV
2. Block Rotation
3. Continuous process

The results: Scale prevention
Reversing the Flow in the PV

Reversing the flow in the PVS

Continuous process

Signs of scaling

Permeate (product)

Oversaturated

Concentrate/Brine (exit)

Undersaturated

Feed (entrance)

Clean membrane

Oversaturated

Permeate (product)

Concentrate/Brine (exit)

Undersaturated

Feed (entrance)
Block Rotation

Flow Reversal adaptation to tapered flow array in a 2-Stage RO System

Block C is 2\textsuperscript{nd} Stage

Block B is 2\textsuperscript{nd} Stage

Block A is 2\textsuperscript{nd} Stage
Reduced Biofouling

Flow-Reversal Bonus?

• Sheering forces
• Changing water quality

Reuse
Whether it is a new RO system or an existing one, Flow-Reversal Technology will significantly improve Recovery Rate & OPEX

New Systems

Retrofitted Systems

BEFORE

AFTER
Flow-Reversal Reverse Osmosis is a simple process, low risk & is already happening

Join the ROvolution