

2014  
**Membrane  
Technology**  
CONFERENCE & EXPOSITION



# Low Pressure Applications of Thin Film Nanocomposite (TFN) Membranes

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NanoH<sub>2</sub>O, Inc.



American Water Works  
Association

The Authoritative Resource on Safe Water®

America's Authority in Membrane Treatment



American Membrane Technology Association

Improving America's Waters Through Membrane Treatment and Desalting

# Thin-Film Nanocomposite Membrane Technology



- 50-100% more permeable than existing polymer technology
- Improves best-in-class salt rejection by 25%
- Drop-in replacement for existing membranes
- 5 Patents / 6 Applications in 12 Countries

# QuantumFlux SWRO Product Line

Product Specifications	Qfx SW 400 ES	Qfx SW 400 R	Qfx SW 400 SR
Permeate Flow Rate, m <sup>3</sup> /d (gpd)	<b>52 (13,700)</b>	34 (9,000)	24.6 (6,500)
Minimum NaCl Rejection, %	99.7	99.75	99.75
Stabilized NaCl Rejection, %	99.8	<b>99.85</b>	<b>99.85</b>
Active Membrane Area, m <sup>2</sup> (ft <sup>2</sup> )	37 (400)	37 (400)	37 (400)
Feed Spacer, mil	28	28	28
Stabilized Boron Rejection: %	89	93	93

*Performance differentiation of the membrane enables energy savings, OR flux increase, OR enhanced water quality*



# Proven Technology

## Fuerteventura, Spain

6,500 m<sup>3</sup>/day  
378 membrane modules  
2013



## Palmachim, Israel

110,000 m<sup>3</sup>/day  
8,448 membrane modules  
2012-2013



## Antofagasta, Chile

7,500 m<sup>3</sup>/day  
630 membrane modules  
2012



## Curaçao, Netherland Antilles

7,100 m<sup>3</sup>/day  
455 membrane modules  
2012

 **QuantumFlux Installations**

# Third Party Independent Test

## 1-hour Test Conditions:

- 2,000 ppm of NaCl
- 225 psi of feed pressure
- 15% recovery
- pH: 8
- 25° C

NanoH <sub>2</sub> O Element	Element Flow (gpd)	Rejection (%)
TFN Element #1	10068	99.82%
TFN Element #2	10129	99.74%
TFN Element #3	10864	99.75%
TFN Element #4	10887	99.60%
TFN Element #5	10270	99.81%
Average	<b>10416</b>	<b>99.75%</b>
Standard Deviation	365	0.079%
Competitor Element*	11264	99.38%

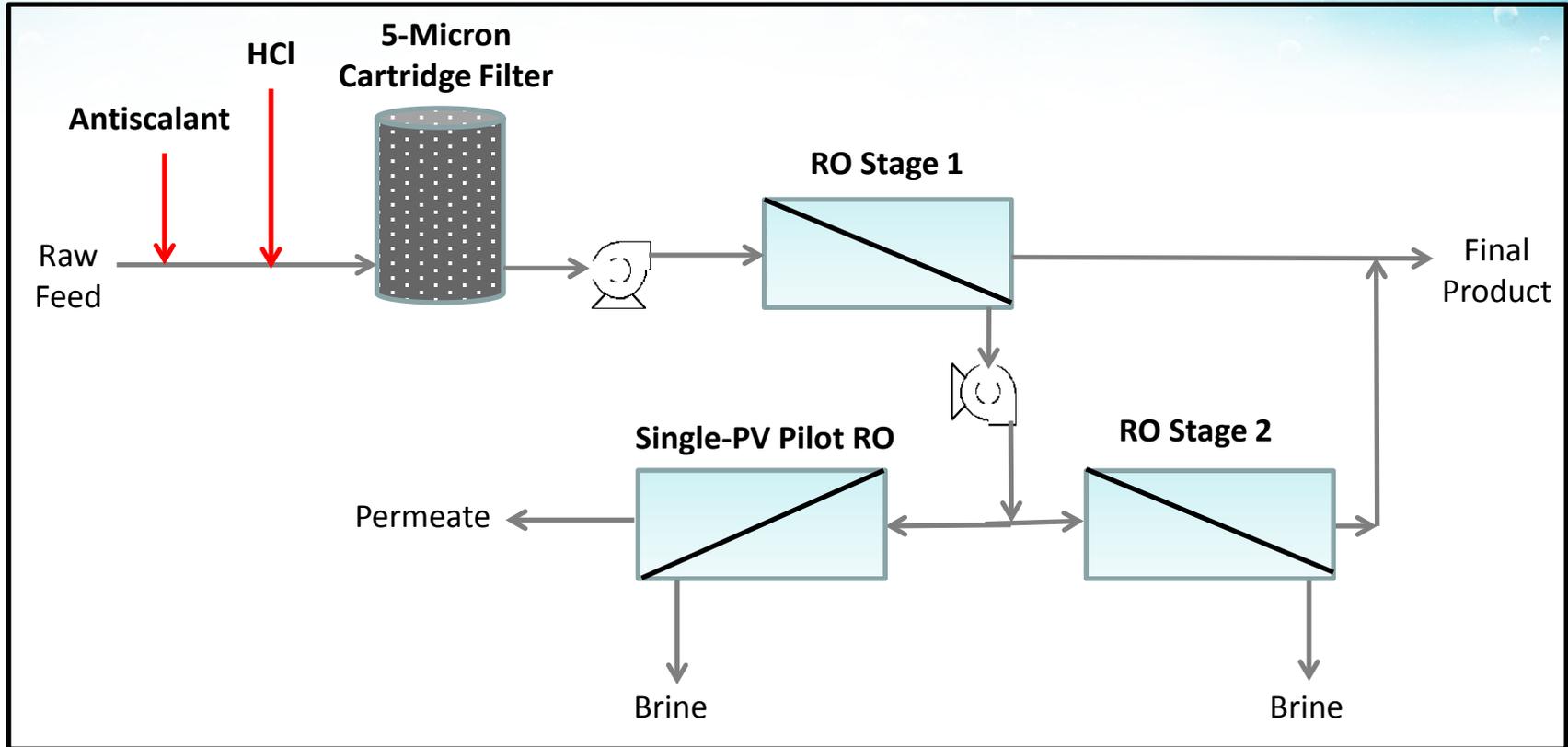
*\*Data sheet specifications: 10,500 gpd, 99.5%*

# Pilot Test: Location

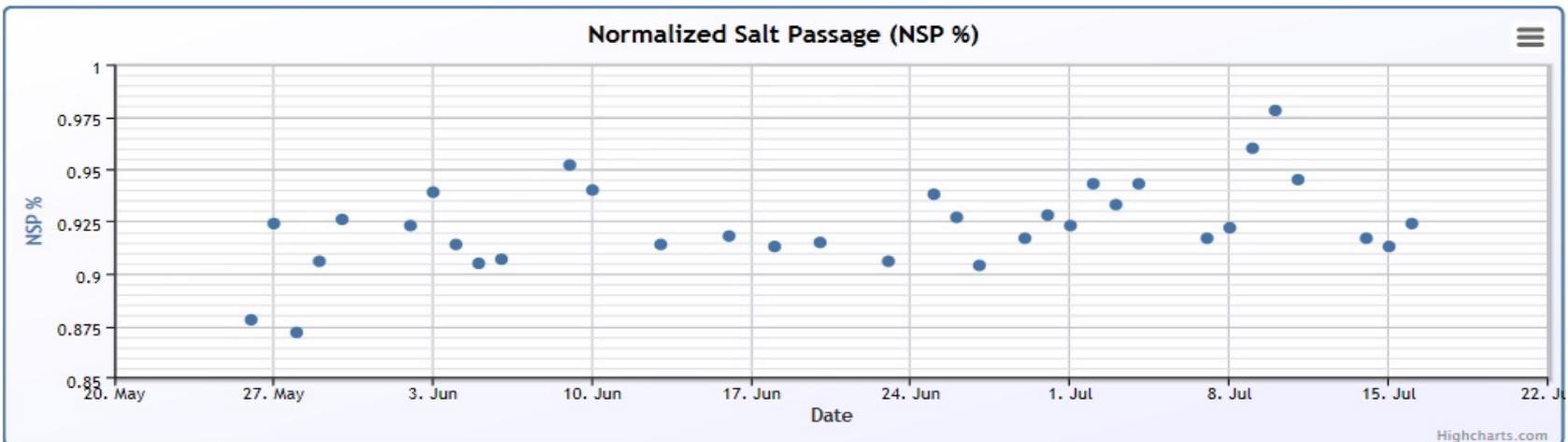
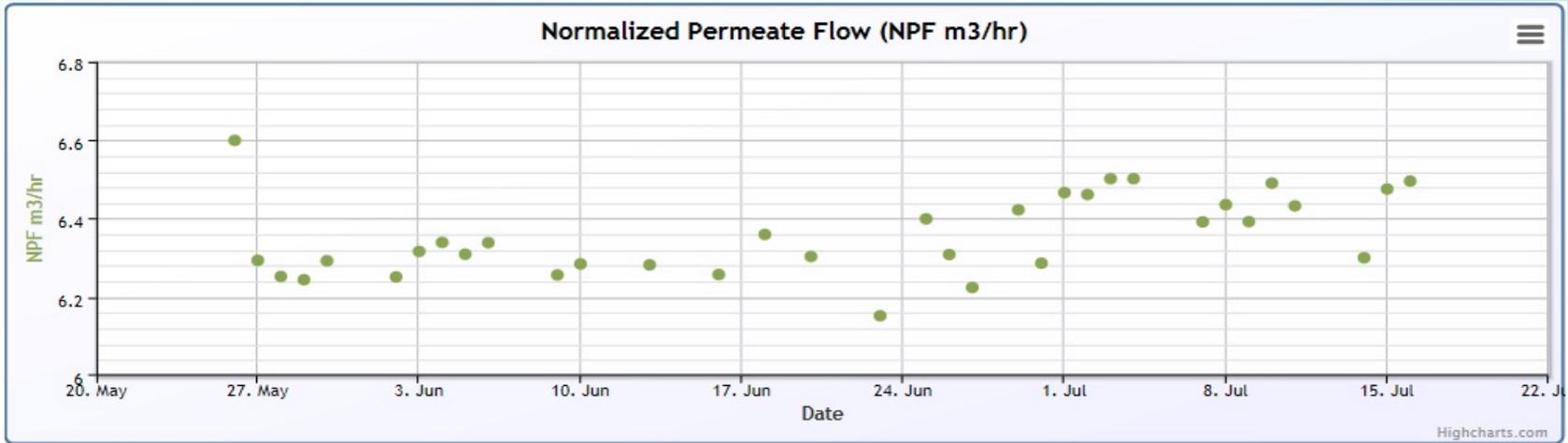
- Lahat Station, Israel
- 225 psi of feed pressure
- 15% recovery
- pH: 8
- 25° C



# Pilot Test: Setup



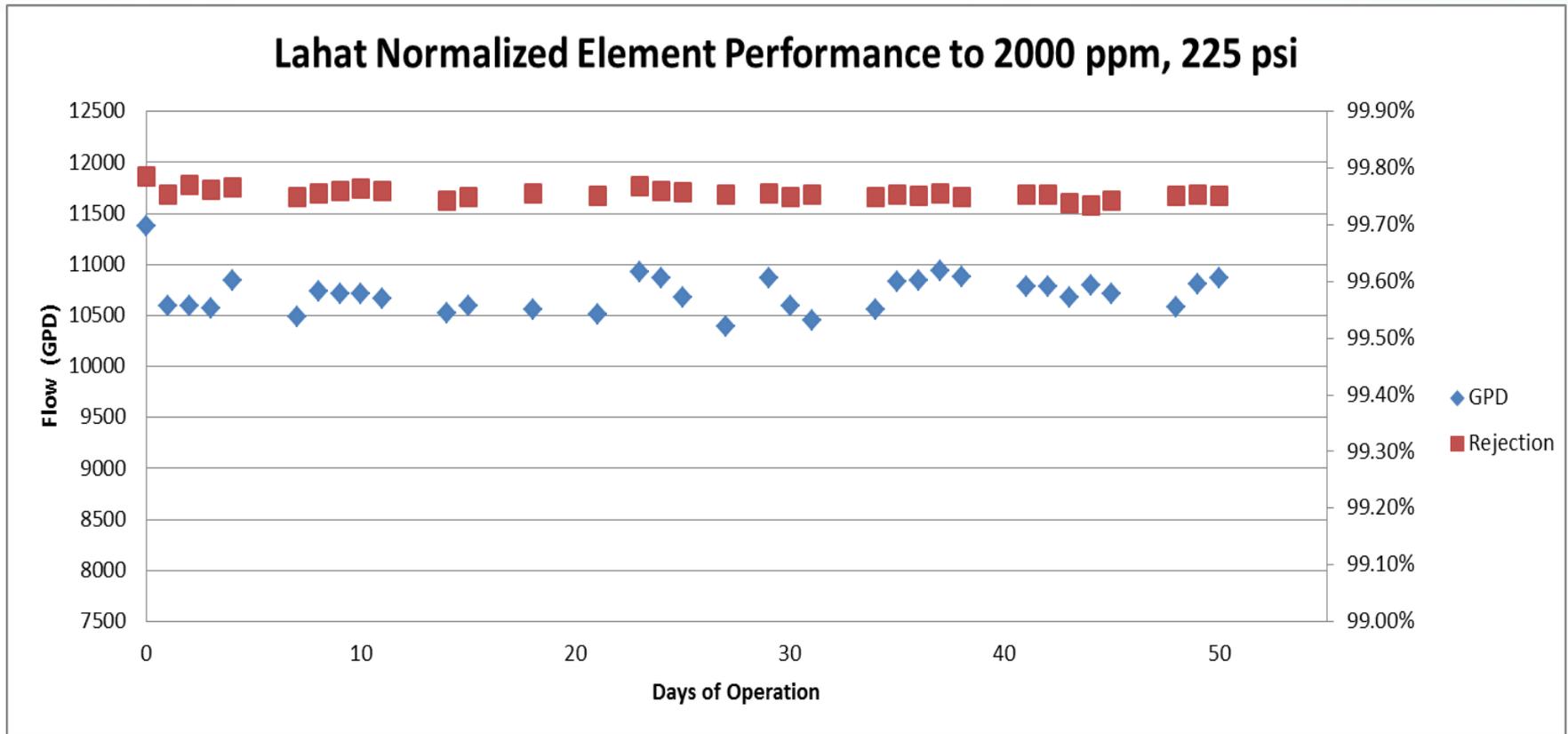
# Pilot Test: Normalized System Performance



# Pilot Test: Water Analysis

Parameter	Units	RO Feed water	Permeate	Brine
Alkalinity	mg/l	678.0	-	-
Bicarbonate	mg/l	830.0	-	-
Barium	mg/l	0.2	-	-
Calcium	mg/l	149.0	-	-
Chloride	mg/l	1460.0	11.0	3774.0
Fluoride	mg/l	3.5	-	-
Potassium	mg/l	10.4	-	-
Magnesium	mg/l	150.0	-	-
Nitrate	mg/l	97.0	-	-
Sodium	mg/l	921.0	-	-
Silica	mg/l	64.0	-	-
Sulfate	mg/l	210.0	-	-
Strontium	mg/l	4.0	-	-
TDS	mg/l	3600.0	~ 25	-
EC	μS/cm	5900.0	56.0	13860.0
Temp	°C	26.7	26.4	26.5
pH	-	7.6	5.5	7.7

# Pilot Test: Normalized System Performance



# Summary

## ✓ Third Party Independent

- Average Element Performance: 10,400 gpd and 99.75% at standard BWRO test conditions

## ✓ Pilot Test at Lahat Station

- Validates the element performance found by the third party test
- Continuous operation demonstrates stability of the system and element performance

