

# Nano-SW

## NF Membrane Technology for Sulfate Removal Process in Oil and Gas Industry

When high rejection of Sulfate is required under demanding conditions, the Nano-SW membrane from Hydranautics - A Nitto Group Company sets new standards for high Sulfate rejection combined with lower biological fouling.

Everyday new advancements are made in offshore oil drilling technology to keep pace with the rapid increase in global demand for oil. But the operation of an offshore oil well entails a significant investment because of the logistical and operational challenges involved. If the oil well were to face frequent downtime on account of inefficient processes, it would have a significant negative impact on the entire operation, increasing the costs.

This situation can arise when sea water injection is used in offshore oil wells. The presence of sulfate in the sea water leads to problems like scale formation and reservoir souring.

The Nano-SW offers the perfect solution for this problem. It not only offers a higher rejection of Sulfate at 99.8%, but it is a significantly more robust membrane with the enhanced ability to fight off biofouling. This translates into fewer number of cleanings and reduced downtime for your oil well operation!

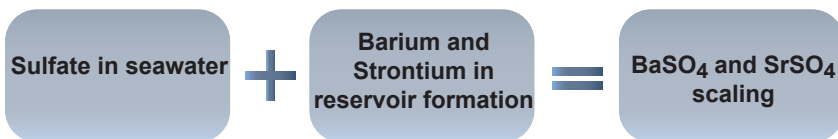
### Seawater Injection in Offshore Oil Well:

In offshore oil production, sea water is injected into the oil reservoir, increasing the pressure and thereby stimulating and increasing the oil production.

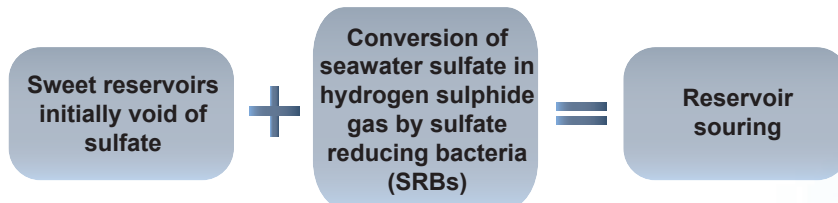
### The Water Injection Technique:

The Sulfate content in seawater is usually 2500 ppm to 3000 ppm SO<sub>4</sub>. This can lead to scale formation and/or reservoir souring in the following manner:

### Scale Formation:



### Reservoir souring:



### Nano-SW Features

- Superior Selective Membrane Chemistry
- High Sulfate Rejection – 99.8%
- Maximal Flow
- Low-Fouling Feed Spacer Design
- HYDRABlock™ Antibacterial Technology

### Performance:

MgSO <sub>4</sub>	
Permeate Flow (Nominal):	11,000 gpd (41.7 m <sup>3</sup> /d)
MgSO <sub>4</sub> Rejection (Nominal):	99.8%
MgSO <sub>4</sub> Rejection (minimum)	99.6%
Seawater	
Permeate Flow* (Nominal):	6,500 gpd (24.6 m <sup>3</sup> /d)
Cl <sup>-</sup> Rejection* (Nominal):	25%
SO <sub>4</sub> <sup>=</sup> Rejection (Nominal)	99.8%

\* All elements are tested with MgSO<sub>4</sub> in Hydranautics' wet test QC. Seawater performance is for reference purposes.



## Test Conditions:

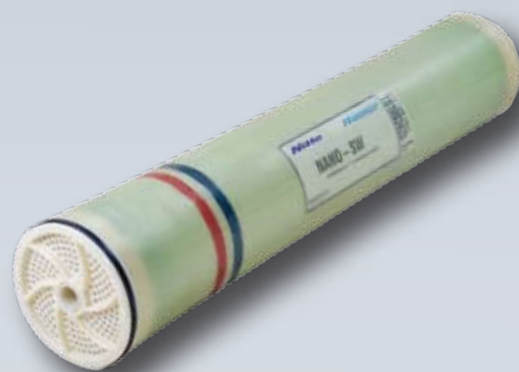
The stated performance is based on the following test conditions:

### MgSO<sub>4</sub>

2000 ppm MgSO<sub>4</sub>  
130 psi (0.9 MPa) Applied Press  
77 °F (25 °C) Operating Temp  
15% Permeate Recovery  
6.5 – 7.0 Feed pH

### Seawater

35,000 ppm NaCl + 8000 ppm MgSO<sub>4</sub>  
200 psi (1.4 MPa) Applied Press  
77 °F (25 °C) Operating Temp  
15% Permeate Recovery  
6.5 – 7.0 Feed pH



## Advantages:

- High sulfate rejection - permeate will not form scale when mixed with groundwater containing barium.
- High sodium and chloride passage minimizes the increase in osmotic pressure leading to lower pressures.
- Innovative feed spacer design prevents trapping of colloidal particles and reduces the colloidal fouling of the NF membranes.
- Novel HYDRAblock™ Technology (patent pending) provides the biostatic properties to retard the growth of bacteria and reduce biological fouling.
- The lower fouling and easy cleanability ensure that the membrane provides optimal and consistent performance throughout the membrane's life.

Hydranautics - A Nitto Group Company is a global leader in research, including reverse osmosis, nanofiltration, ultrafiltration, and microfiltration. Our membrane products (CPA, ESPA, LFC, SWC, ESNA, HYDRAcap, HYDRAcap MAX and HYDRAsub) are used extensively in municipal & industrial water and wastewater treatment.

With a rich experience of 5 decades in the membrane technology arena, we at Hydranautics - A Nitto group company are committed to creating innovative membrane technologies which provide clean water to a thirsty world.

Our global membrane division is headquartered in Oceanside, CA, USA. With three state-of-the-art manufacturing sites located in Oceanside - CA - USA, Shiga - Japan and Shanghai - China, Hydranautics has a combined manufacturing area in excess of 131,000 m<sup>2</sup> (1,400,000 ft<sup>2</sup>). Our world-wide sales and customer service offices are located throughout Europe, Asia, the Middle East, North America and South

America.

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