Nitto
Innovation for Customers

HYDRANAUTICS

NANO-SW

Nanofiltration Membrane Technology for Sulfate Removal Process in Oil and Gas Industry

When high rejection of sulphate is required under demanding conditions, the NANO-SW membrane from Hydranautics sets new standards for high sulphate rejection.

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 arises when sea water injection is used in offshore oil wells. The presence of sulphate in the sea water leads to problems like scale formation and reservoir souring.

The NANO-SW offers the perfect solution for this problem. It is a significantly robut membrane offering a high rejection of sulfate at 99.8%. This translates into fewer number of cleanings and reduced downtime for the oil well's operation.

Key features:

- **High sulfate rejection – 99.8%**
- **Superior selective membrane chemistry**
- **Maximal flow**
- **Low-fouling feed spacer design**

Seawater injection in offshore oil well: In offshore oil production, seawater 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_4. This can lead to scale formation and/or reservoir souring in the following manner.

Scale Formation:	Sulfate in seawater	+	Barium and strontium in reservoir formation	=	$BaSO_4$ and $SrSO_4$ scaling
Reservoir Souring:	Sweet reservoirs initially void of sulfate	+	Conversion of seawater sulfate in hydrogen sulphide gas by sulphate reducing bacteria (SRBs)	=	Reservoir souring

Features and benefits:

- **High sulfate rejection** prevents scale formation when the permeate mixes 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
- **Lower fouling and easy cleanability** ensures that the membrane provides optimal and consistent performance throughout the membrane's life



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Performance:

$MgSO_4$	
Permeate Flow (Nominal)	11,000 gpd (41.6 m^3/d)
$MgSO_4$ Rejection	99.8% (99.6% minimum)
Seawater	
Permeate Flow* (Nominal)	6,500 gpd (24.6 m^3/d)
Cl Rejection* (Nominal)	25%
SO_4 Rejection (Nominal)	99.8%

*All elements are tested with $MgSO_4$ in Hydranautics' wet test QC. Seawater performance is for reference purposes.

Test Conditions:

$MgSO_4$

- 2000 ppm $MgSO_4$
- 130 psi (0.9 MPa) Applied Pressure
- 77 °F (25 °C) Operating Temperature
- 15% Permeate Recovery
- 6.5 – 7.0 pH Range

Seawater

- 35,000 ppm NaCl + 8000 ppm $MgSO_4$
- 200 psi (1.4 MPa) Applied Pressure
- 77 °F (25 °C) Operating Temperature
- 15% Permeate Recovery
- 6.5 – 7.0 pH Range

NANO-SW, High Sulphate Rejection Composite Polyamide NF membranes, for Your Water Treatment Needs!



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, HYDRAcapMAX and HYDRAsub) are used extensively in municipal & industrial water and wastewater treatment.

Hydranautics has over 40 years experience in the membrane technology arena and 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 1,400,000 ft^2 (130,064 m^2). Our world-wide sales and customer service offices are located throughout Europe, Asia, the Middle East, North America and South America.

Solutions You Need.

Technologies You Trust!

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