

HELPING OIL COMPANIES INCREASE OFFSHORE OIL PRODUCTION



Case study

*Treating seawater at an offshore oil platform
using Hydranautics sulfate removal nanofiltration
membranes*

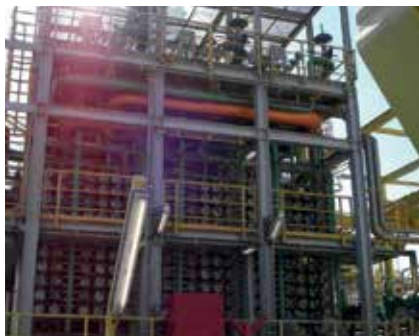
The PROBLEM

One of the top five largest oil producers in the world, operating offshore oil platforms in the Atlantic ocean, was faced with the challenge of scaling and corrosion issues. They injected pressurized seawater into sub-sea wells to increase oil production. But sulfate ions in the

seawater formed scales with the barium and strontium present in the oil formation water. Sulfate reducing bacteria also reacted with the injected seawater sulfates causing souring of the oil and corrosion.



B R A Z I L

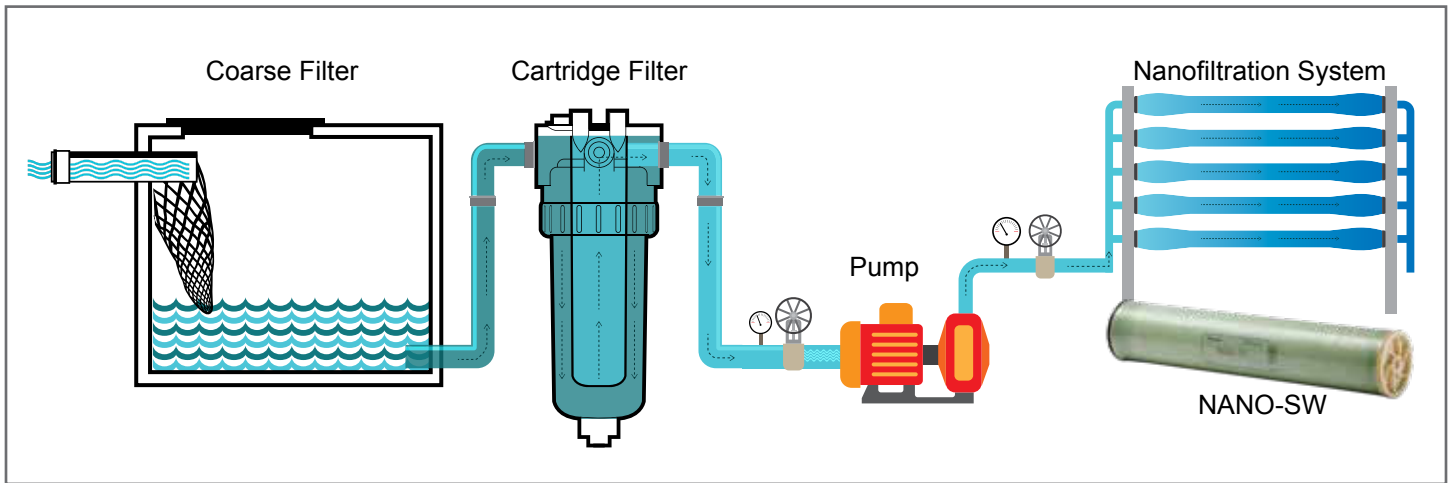


<i>Location</i>	Brazil
<i>Feed water</i>	Seawater
<i>Application</i>	Sulfate reduction from seawater
<i>Capacity</i>	333 m ³ /h
<i>Start-up date</i>	December 2011
<i>NF Design</i>	360 NANO-SW modules

The SOLUTION

The company opted for sulfate removal membrane technology using Hydranautics' sulfate-selective nanofiltration membrane, NANO-SW. A total of 360 membranes were installed in a two-stage nanofiltration system. Each NANO-SW membrane had 37 m² area and 99.8% sulfate rejection.

The NANO-SW has a spiral wound configuration using 34 mil feed spacer to reduce fouling and increase cleaning effectiveness. The treatment scheme is shown on the next page. Feed pressure has been moderately low at 22 to 23 bar. Membranes are cleaned every four weeks with standard caustic and acid.



The nanofiltration system operating data is given in the table below

Parameter	NANO-SW
<i>Feed seawater sulfate</i>	2500 – 3000 ppm
<i>Treated water sulfate</i>	< 12 ppm
<i>Recovery</i>	75%
<i>Feed pressure</i>	22.5 bar
<i>Pressure drop</i>	< 2 bar
<i>Design flux</i>	25 lmh

The IMPACT

Upon commissioning the plant in late 2011, the NANO-SW membranes produced permeate well below the customer's sulfate limits. Since the installation of those first NANO-SW membranes, the customer has repeatedly utilized NANO-SW for sulfate removal.

The NANO-SW system enabled the oil company to use seawater to pressurize the oil formation without the risks of scaling or souring the formation. Pressurizing the formation with permeate from the NANO-SW increased cumulative oil production by as much as three times, thus generating considerable

additional revenues. Since the startup of the first NANO-SW system in 2011, several other oil platforms have installed NANO-SW membranes to treat their seawater for injection.

The close technical support provided by Hydranautics staff has helped solve difficult operation issues to maximize up-time of the injection operation and increase overall oil production for the client. Hydranautics continues to fully support off-shore customers by evaluating data and providing on-platform technical support to improve system operations.



About the author

MR. RICH FRANKS

Rich Franks is working as Senior Manager – Spiral Membrane Technology for Hydranautics – A Nitto Group Company. He is an environmental engineer having more than 17 years' experience in membrane technology. He is responsible for developing new products, applications and simulation software for Hydranautics' membrane products globally.

For more information about Hydranautics case studies, contact us at hy-info@nitto.com or visit our website at membranes.com

About Hydranautics

Since our founding in 1963, Hydranautics has been committed to the highest standards of technology research, product excellence and customer fulfillment. Hydranautics entered the Reverse Osmosis (RO) water treatment field in 1970 and is one of the most respected and experienced firms in the membrane separations industry. We joined the Osaka, Japan based Nitto Denko corporation in 1987 which was founded in 1918 and now has 117 companies in more than 20 countries, with over 30,000 employees worldwide. Our alliance with this global film industry giant boosts Hydranautics to a superior level of technological sophistication, product performance and customer response.

We are not simply product manufacturers; we are your membrane technology partners. As leaders of high quality membrane solutions, we believe our obligations extend beyond manufacturing and selling our products. Our skilled staff of technicians, engineers and service professionals assist in designing, operating and maintaining a robust, reliable and efficient membrane system to meet your requirements and exceed your expectations. Our support is offered from early stage conceptual design and engineering to start-up and maintenance, no matter the location globally whether it is on land or off-shore.

Nitto

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