

Membrane chemistry and service

Manage offshore sulfate reduction with our comprehensive membrane offering that supports successful waterflooding



Waterfloods account for nearly half of global oil production

Waterflooding is the most practiced method to produce oil in conventional reservoirs. The process has two goals: to maintain reservoir pressure and to displace any incremental oil within the formation.

For offshore floods, seawater must first be treated to remove both soluble and insoluble impurities before being used. Consistent seawater quality ensures continuous, steady production as well as protection of the well and reservoir from scale, corrosion, and souring. A Sulfate Reducing Unit (SRU) is a collection of membranes designed to remove soluble and insoluble impurities from seawater. Sulfate Reducing Membranes (SRMs) are the final and most critical step, as they remove the sulfate from the water.

ChampionX membrane services are holistic and comprehensive

ChampionX understands SRMs and the challenges of keeping them protected. When unmonitored, fouling from scale and biofilms can reduce membrane efficiency, resulting in production loss, higher energy costs, reduced safety, equipment downtime, and well/reservoir souring.



Energy challenges are water challenges

Global energy companies want to maximize their output economically, sustainably, and safely to support the growing demand for more and cleaner energy.

With almost 100 years of experience treating utility, influent, and produced water, ChampionX provides a trusted team of experts, technology with impact, and proven supply assurance to help operators achieve peak operational efficiency while mitigating risk, lowering costs, and supporting their sustainability goals.

The ChampionX approach combines our focus on understanding our customers' needs with our robust portfolio of chemistries and data-driven insights to treat water issues, from the most complex to the most routine, while keeping safety at the forefront of everything we do.

System audit and consulting services

ChampionX can perform a comprehensive SRU system audit that collects important information to evaluate system performance. The audit gives operators a starting point to understand what is working efficiently or not in their system, whether industry best practices are being followed, and what the best, most cost-effective solution would be for treatment, if required.

Our approach

1 Understanding the water chemistry

We start with a comprehensive water analysis using our unique onsite testing, which allows for rapid identification of microbes and scaling ions.



- Conventional laboratories
- Labs located around world with state-of-the-art analytical equipment



- Real-time water analysis
- Water Lens provides high-quality water analysis on the platform,



- Real-time microbe analysis
- AccuCount® test kits measure total microorganisms and provide feedback in minutes. This information can aid in preventing souring of the reservoir.

2 Simulating and modeling the system

Our modeling program provides an understanding of the scaling and corrosion potential in the system. With this information, we implement a custom program for treatment.



- Scale and corrosion prediction software
- Once we have a water analysis and understand operating parameters, we can predict scale and corrosion rates and recommend the products needed to successfully mitigate these risks.



3 Selecting the most effective treatment program

We can all but eliminate scaling and corrosion risks, but selecting the most effective treatment program is neither simple nor straightforward, so we've developed a methodical approach backed by our expertise.

Application type	Purpose	Benefits
Pre-treatment	Charge neutralization and oxygen / chlorine scavengers aid in particle separation before it gets to the membrane.	Protects the membrane from halogen oxidation, which can lead to increased cleaning costs and reduced membrane life.
Scale control	Carbonate, sulfate, silicate, and phosphate inhibitors keep the membrane free of scale.	The membrane continues to work as it should.
Microbial control	Biocide keeps the membrane free of fouling.	Maintains flow and reduces souring, therefore preserving the system.
Membrane cleaning	Cleans any scale and biofilms that have formed.	Restores flow, reduces pressure, and saves energy.

4 Maintaining system health

It's critical to maintain membrane health throughout the life of a sulfate reducing unit (SRU). Ongoing maintenance, including cleaning and disinfection, removes microbial fouling and scaling to keep the unit at optimal production to best extend its life.

5 Assessing after decommissioning

Membranes are an investment. After they're decommissioned, important information can be gleaned from their deep examination. Our membrane autopsy program helps determine the root cause of its failure.

Scale identification	Oxidative damage (Fujiwara test)	Mechanical damage (Dye test)	Foulant characterization
Identifying the type of scale enables ChampionX to choose the correct, most effective anti-scalent and cleaning programs.	This test provides data on the effectiveness of chlorine scavenging. An effective program ensures membrane pores do not enlarge, leading to downhole scaling.	Mechanical dye shows if the membranes were installed properly on both the feed side and the permeate side.	Characterizing the foulant gives insight into why and how the membrane lost effectiveness. The characterization process can include the following analyses: • Microscopic examination • Deposit density • Pore size / oxidative damage • CHN test (organics) • FTIR spectrometer (organic signature) • XRF/XRD (x-ray) • Microbiological speciation study (qPCR)

Optimizing operations

Restoring oil flow

A West African platform was using untreated seawater for a waterflood. The sea and reservoir water were not compatible, resulting in BaSO_4 scale plugging the well, rendering it unable to produce oil. The well was reworked to restore flow at a cost of millions of dollars to the customer.

Using ChampionX's Water Lens, a water analysis was generated and fed into our scale prediction software, allowing us to understand the scaling potential and choose the appropriate anti-sclerant and dosage. Performing a regular water analysis to understand the scaling risks ahead of time could have helped the customer avoid the problem. The well is currently running without incident today.

What could have been avoided?

- Millions of dollars in well rework and loss of revenue
- Increased energy costs to pump through a restricted pipe
- Potential to sour the reservoir due to BaSO_4 scaling

Comingled waters and acid flowback

A contractor was conducting an acid stimulation on a platform in the Gulf of Mexico. The acid flowback was combined with the produced water, followed by membrane treatment, before being discharged to the sea. An immediate rise in trans-membrane pressure and a decrease in water production (flow) was observed. The job was halted as additional membranes were procured to complete the job.

This could have been avoided by using ChampionX's Water Lens water analysis and scale prediction software, which provides an immediate understanding of scaling potential that could be acted on to avoid these types of complications.

What could have been avoided?

- Interruption to production while membranes were procured
- Cost of additional membranes, shipping offshore, and membrane cleaning costs
- Reduced membrane life

Treating bacterial contamination

A West African platform had to replace its 10um cartridge filters every 3-4 days due to bacterial contamination within the waterflood system. These filters would normally be replaced every 3-4 months. After reviewing the data, KPIs, and effects of the operation, ChampionX recommended the system be pickled with THPS biocide for several days to remove the contamination. The treatment was successful, and once the system had been thoroughly flushed, operations resumed.

What could have been avoided?

- Costs of replacing filters every 3-4 days rather than every 3-4 months
- System downtime while filters were replaced and the biocide treatment was applied
- Costs of THPS biocide cleaning program
- Increased risk of well souring due to bacterial contamination

Testing contaminated water before there's an issue

An incoming hurricane in the Gulf of Mexico necessitated the reduction of potable water used for membrane clean in place (CIP) stored in the legs of a production platform. It was decided to CIP the system to solve this problem, but there was insufficient water volume to complete the entire system. Additional potable water was supplied by boat and was later found to have microbial contamination. The fouled water contaminated the membranes and resulted in production problems on restart.

The use of AccuCount® microbial enumeration testing would have alerted the customer to a biological concern and a water remediation program could have been put in place.

What could have been avoided?

- Reduced production and delay due to contaminated membranes
- Increased risk of well souring due to fouled water in the system
- Chemical cleaning costs
- Decreased membrane life

We are ChampionX

We're a global leader in chemistry solutions and highly engineered equipment and technologies that help companies drill for and produce oil and gas safely and efficiently around the world. With over a century of expertise, our 7,000+ global team members are focused on meeting our customers' complex challenges to deliver forward-thinking innovations, unmatched global supply chain capability, and market-shaping solutions while maximizing production and lowering costs.

Experts in oilfield chemical technologies

The energy landscape is transforming, so every day, ChampionX works as a trusted partner alongside our customers to understand and steward their critical operations. With manufacturing, research, and distribution facilities located close to all major oil and gas plays, we are uniquely positioned to meet our customers' service, supply, and chemical treatment challenges.

Our fit-for-purpose chemistries reduce risk and total cost of operations by enhancing production. Our experts are equipped with a global network of data, analysis, and insights to optimize those chemistries, which means they work harder and go further in the field. It's not just the customized chemical treatment program. It's the knowledge and experience behind the chemistry that makes the difference.



11177 S. Stadium Dr.
Sugar Land, TX 77478
Telephone: +1-281-632-6500
championx.com



The safety of our associates, customers and communities is vitally important. From the way we operate, to the products we develop, to how we partner with customers, our goal is zero: zero accidents, zero incidents and zero environmental releases.

At ChampionX, safety is more than a metric, it's a mindset.

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