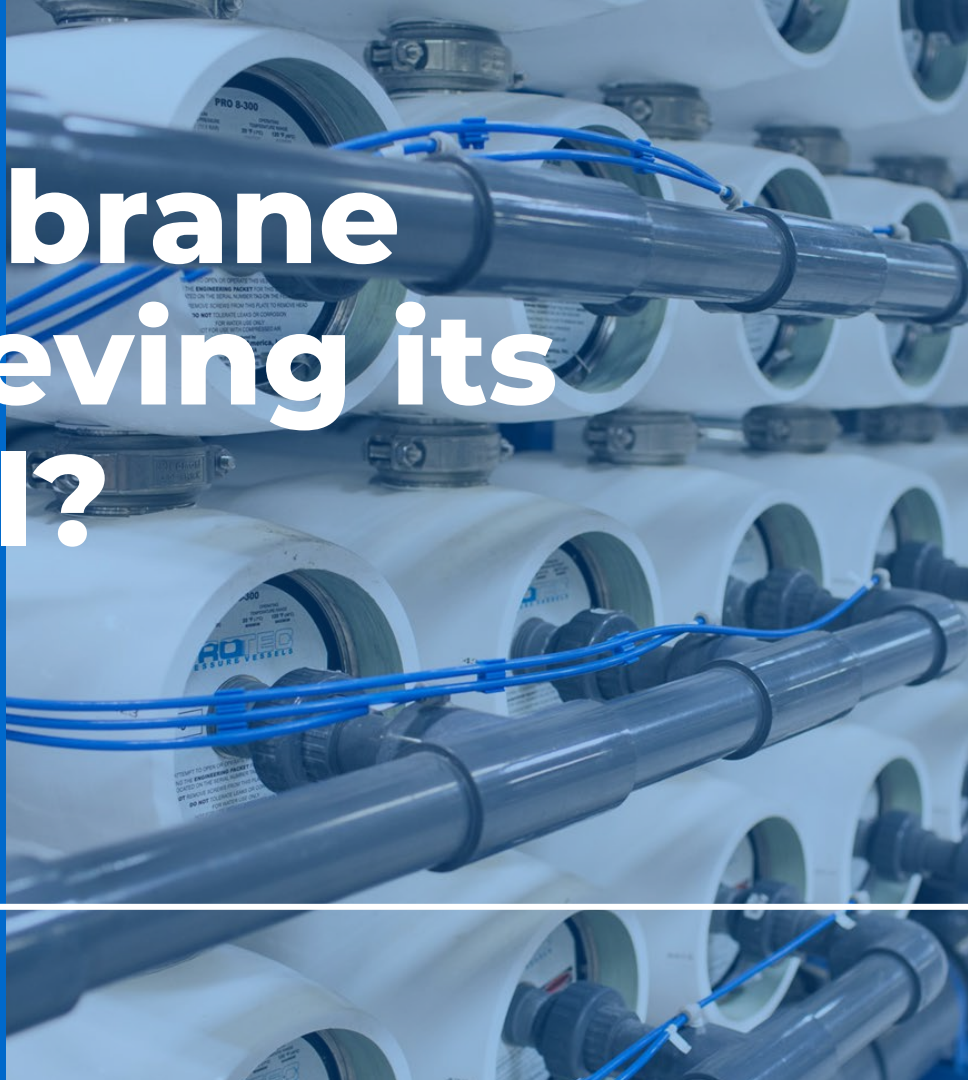


# Is your membrane system achieving its full potential?

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➤ Read our eBook to find out



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# **PART I**

# **What you need to know about membrane system operations**

# Meeting the Challenges of Climate Change and Resource Efficiency

It is now universally accepted that the world faces unprecedented challenges as a result of rapid changes in climate brought about by human activity. This impending global catastrophe has prompted governments around the world to set ambitious targets to reduce and ultimately eliminate carbon dioxide emissions.

To make matters worse, environmental conditions have dramatically increased water stress in many areas, forcing us to reconsider our approach to water efficiency.

These issues, exacerbated by geopolitical tension, mean that the costs associated with energy and water consumption are set to rise in the coming years.

**It is now imperative that we maximize our resource efficiency in all our processes and activities.**

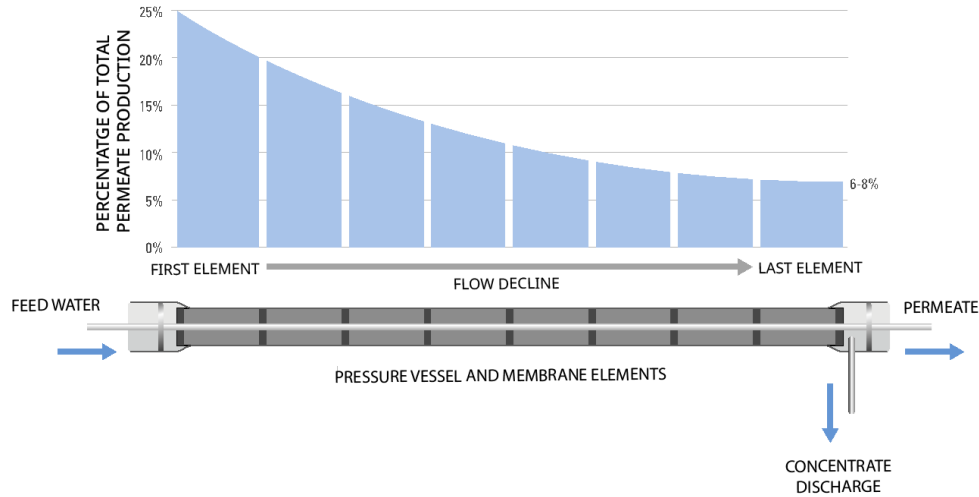


# Your system can produce more water

Understanding system dynamics is critical to optimizing system performance. **Many existing membrane systems are simply not reaching their potential** as a result of:

- Changing site requirements
- Poor hydrodynamics
- Poorly understood operation
- Inadequate monitoring
- Unanticipated or changing feed water challenges
- Improving membrane technology
- Compromises in design
- Ineffective maintenance





# The trade-off between permeate production and cross flow

There is always a compromise to make in spiral wound membrane system design between cross-flow and permeate production. Cross-flow is necessary to minimize fouling and scale precipitation. The problem is that in a multi-element system the cross-flow to permeate flux balance cannot be optimum for every element, so there is always some trade-off.

**This has implications for you in both water production and energy consumption.**

There are many ways to address the cross-flow to permeate flux compromise during design, but as site requirements change and membrane technology improves, reviewing the options can be beneficial.

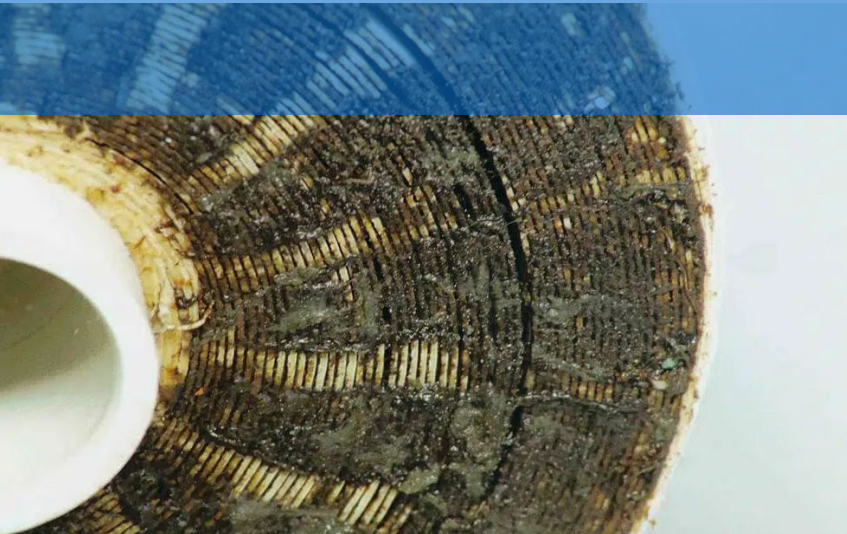
**Many operators are unaware that minor changes to their system and minimal investment may lead to appreciable savings in water consumption, wastewater rejection, and energy costs.**



**Reviewing your operations could lead to critical savings.**



# Membrane fouling costs your business time, money, and water.



**Fouled membranes increase power and water consumption** as well as operating and capital costs by:



**Increasing pumping costs**



**Increasing cleaning frequency**



**Hastening membrane replacement**



**Impairing produced water quality**

**The cost of inappropriate or ineffective treatment or maintenance can be far higher than is commonly understood.**



# The costs add up...

Facility	Annual Water Savings / gallon
Location 1	4,491,981
Location 2	32,299,937
Location 3	17,025,885
Location 4	17,910,069
Location 5	10,199,945
<b>Total</b>	<b>82,927,817</b>

Continuous **operation at sub-optimal conditions can lead to considerable expense** when accumulated over a period of time.

As an example, Kurita worked with a major beverage producer maintaining five reverse osmosis (RO) systems to improve their operation.

Each system was reviewed throughout the process with system recovery, backwash frequency, cleaning frequency, and rinse times optimized for maximum efficiency. The total annual water savings are outlined in the table to the left.

The price of 1000 gallons of tap water in the U.S. varies in the range of \$3 to \$5 depending on location and tariff. **It is clear that water savings can lead to considerable financial benefits.**

How much could you save?



Consider the costs of water consumption in a clean-in-place (CIP) operation.

A typical 2 stage, 18 element system will require:

Up to **1057 gallons** of heated, high-quality water

Up to **4228 gallons** of flushing water

Up to

**16**  
KwHr

electrical power for heating and pumping

**8**  
hours

of lost production and manpower

Even after all this effort the outcome of the exercise is often still uncertain.

# Membrane cleaning is a cost that you shouldn't take lightly.



# Replacing membranes is a significant expense.

Consider the following:

- The **cost of replacing membranes in a moderately sized RO system is typically in the range of \$22,300-\$66,900**. Specialist membrane modules for nanofiltration, ultrafiltration, and microfiltration can be even more costly.
- And yet in most cases, **the worst of the fouling or damage is concentrated in only a fraction of those membrane elements in the system**. The problem is most operators have no way of knowing how each individual element is performing. Many recoverable elements may be discarded.

**Understanding how your individual membrane elements are performing can be critical to making savings...**



In a well-maintained system, **membrane elements can last five to ten years** or more, but many operators are changing them far more frequently than that.

In addition to the cost of replacement, there is the cost of downtime and disposal, and the environmental impact of sending so much material to landfill.

To make matters worse, disruption to supply chains is extending the lead time availability of new membrane elements to six months or more.

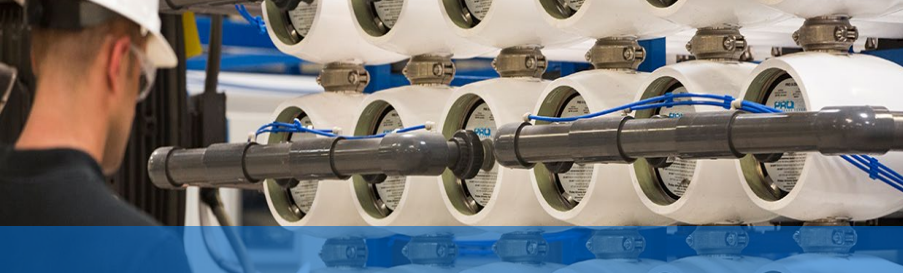
**As a responsible operator, you need to consider the full impact associated with membrane change-outs.**



**Membranes can last much longer than you think when properly cared for.**

## **PART II**

**Kurita can save you  
power, water, and  
money**



# The key to getting the most from your membrane system is to understand it

If you really want to get the most from your membrane system, you need to go back to the beginning and understand what decisions were made at the design stage. Were there any design limitations and how does that fit the current situation?

Reviewing system hydrodynamics can help find ways to optimize production rate, improve efficiency, and reduce water waste.

When you commission a Kurita System Survey, you are taking the first step toward improving your system operation and producing more water.

[Download our Survey Form to get started](#)



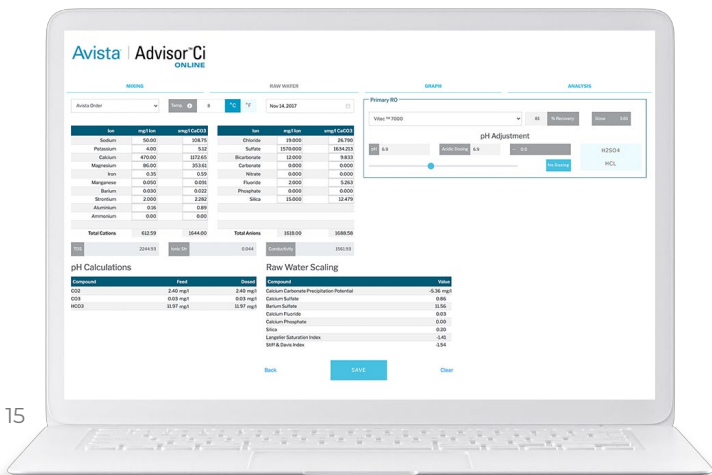
# Feedwater and system design dictates your system's chemical requirements.

In any system, an understanding of feedwater and its implications for the whole system is critical. Following the water quality through pre-treatment to product water and reject water is necessary to pinpoint issues or potential weaknesses and suggest remedial or preventative action.

A professional survey of your operating conditions, such as monitoring practices and maintenance routines, can help to minimize fouling issues and maximize periods of operation between cleans.

**Kurita's Avista™ Advisor™ Ci** chemical dosing software and **My Kurita Portal** system data normalization program help you make good decisions about your membrane treatment program.

[Click here to find out more](#)





# To really understand your membranes, take a closer look.



Every system is different and so are its challenges. Sometimes laboratory analysis is necessary to get a clear understanding of system issues.

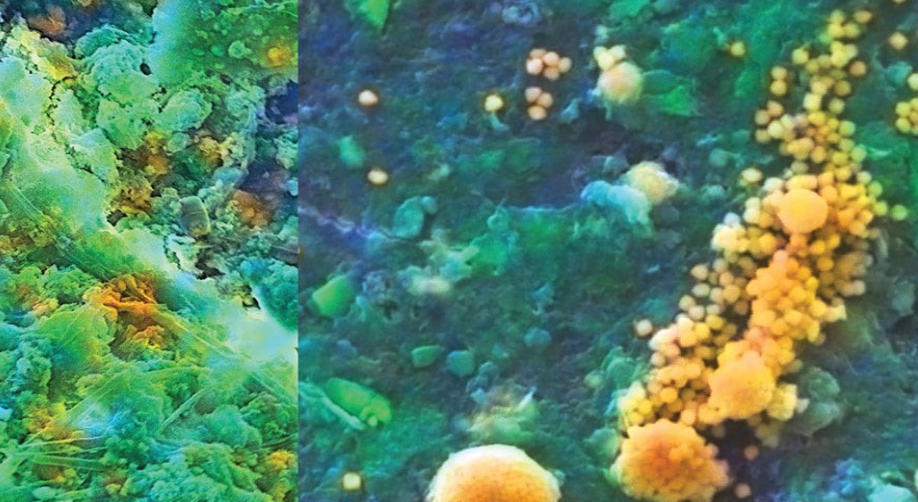
An **Avista™ Membrane Autopsy** can help you:

- identify solutions that restore system performance
- prevent repeated issues
- optimize system performance

Sacrificing a membrane element for an Avista™ Autopsy might be the difference between efficient operation and high operating costs.

**The long-term benefit of understanding your system requirements could be considerable.**

[Click here to find out more](#)



**Solutions aren't always black and white.** Very often operators have more than one issue to contend with and commonly used analytical techniques. The simple Scanning Electron Microscopy and Energy Dispersive X-Ray are not enough to give you the whole picture.

Kurita's advanced analytical facilities include **Avista™ Chromatic Elemental Imaging<sup>SM</sup>** (CEI<sup>SM</sup>) a technique that allows us to identify the location and relative concentration of elements in foulant and scale samples. This provides insights into the layering characteristics of foulants and the sequence of events that led to their deposition.

**When you choose to commission, an Avista™ Autopsy CEI<sup>SM</sup> is part of the package.**

[Click here to find out more](#)

Thinking in color  
can change your  
perspective.

The Avista™ product range provides **antiscalants, biocides, cleaners, and membrane-compatible coagulants**. The extensive offering covers all feedwater challenges, ensuring that a solution is available for your situation.

**Kurita experts provide the specialist advice needed to ensure you get the right products for your system.**

[Click here to find out more](#)

**Avista™ membrane chemicals are industry leaders, delivering the best performance on the market.**

# By using the most effective, formulated products on the market you will:



## Reduce water consumption

Effective cleaners, biocides, and targeted dispersants mean less frequent cleaning.



## Reduce power consumption

Eliminating fouling greatly decreases pumping costs.



## Save on capital costs

- 1) Extensive membrane compatibility testing means our products do not degrade membrane performance even with repeated or continuous exposure.
- 2) Inhibiting mineral organic and microbial fouling means that membranes last longer.
- 3) Formulated cleaners protect the membrane against the chemical damage often associated with generic chemicals.
- 4) Effective, deep cleaning minimizes the accumulation of foulant prolonging the life of the membrane.

**When you talk to a Kurita representative, we will arrange a system survey and show you how to get the most out of your system.**

# Even seemingly small adjustments can make a big difference.

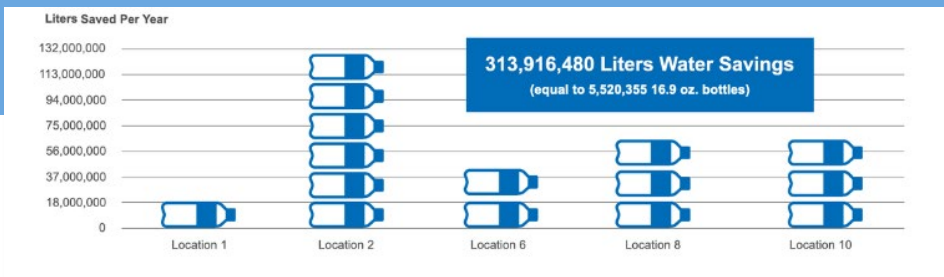
## CASE STUDY

A well-known beverage producer was operating multiple RO systems at different sites.

Water stress was a significant issue in their area and the operator faced significant challenges, which affected production.

Site audits showed that by switching antiscalant products, it was possible to increase the recovery rate of each system.

Even seemingly small changes were enough to conserve huge amounts of water when considered over the course of a year.



[> Read Case Study](#)

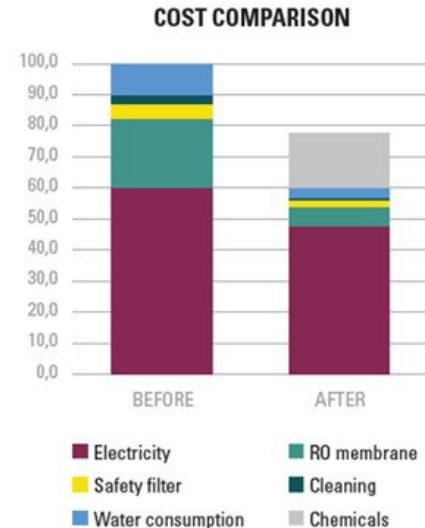
# Investing in the right solutions can mean a global reduction in costs and overall impact

## CASE STUDY

Consider the situation of a seawater system operator dealing with significant biofouling problems. Despite frequent cleaning, they still had to replace membrane elements regularly.

After implementing a biofilm control solution, the operator was able to reduce the frequency of membrane replacements, lower energy consumption, and minimize cleaning events. This led to substantial cost savings and improved operational efficiency.

[> Read Case Study](#)





# Introducing OSCAR: the unique off-site cleaning and restoration service



The Avista **OSCAR**, an off-site cleaning and restoration service, rejuvenates fouled elements, **recovering system performance and restoring energy efficiency.**

OSCAR is specifically designed to provide optimum cleaning conditions for each element, often not possible when applying CIP. Each element is individually performance tested, ensuring that **you know what condition your system will be in at start-up, and you never dispose of recoverable membranes.**

When you use the OSCAR service, you can forget all the headaches associated with CIP. We provide the technicians, the high-quality water, and the chemical handling. We take-on the discharge processing.

[Click here to find out more](#)





Consider the benefits of letting Kurita handle your membrane cleaning requirements with our off-site services:



**Reduce your water consumption.**

We provide the water.



**Keep your elements in better**

**condition.** Our dedicated rig and vast experience in cleaning membrane elements mean we can clean under optimal conditions. There is a much better chance of restoring performance.



**Eliminate the cost to treat and dispose of cleaning and flushing water.**



Gain an **understanding of your system** condition and pinpoint where it is underperforming



**Maximize the potential of your system.**

Testing the performance of each element means we understand what condition they are in when they arrive and when they go out. Since the hydrodynamics of the system can be critical, we use this information to advise our customers on how best to install the cleaned membranes for optimal performance.

[Read a Case Study to find out more](#)



# CONCLUSION

In the current environment, all responsible businesses need to **conserve energy and water**, both from a cost and environmental point of view.

A genuine understanding of your membrane system is **critical to achieving your energy-saving goals**.

**Kurita has the expertise, products, and facilities** you need to get the most out of your membrane system.



# About Kurita

Kurita is one of the international market leaders in **industrial water and process treatment.**

**More than 8,000 employees in 100 countries** strive daily to improve the efficiency of our customers' industrial plants and projects through research, development, chemical production, implementation, and service.

**At Kurita, we are committed to implementing environmentally friendly concepts that conserve natural resources.**



*Study the properties of water, master them, and we will create an environment in which nature and humanity are in harmony.*

