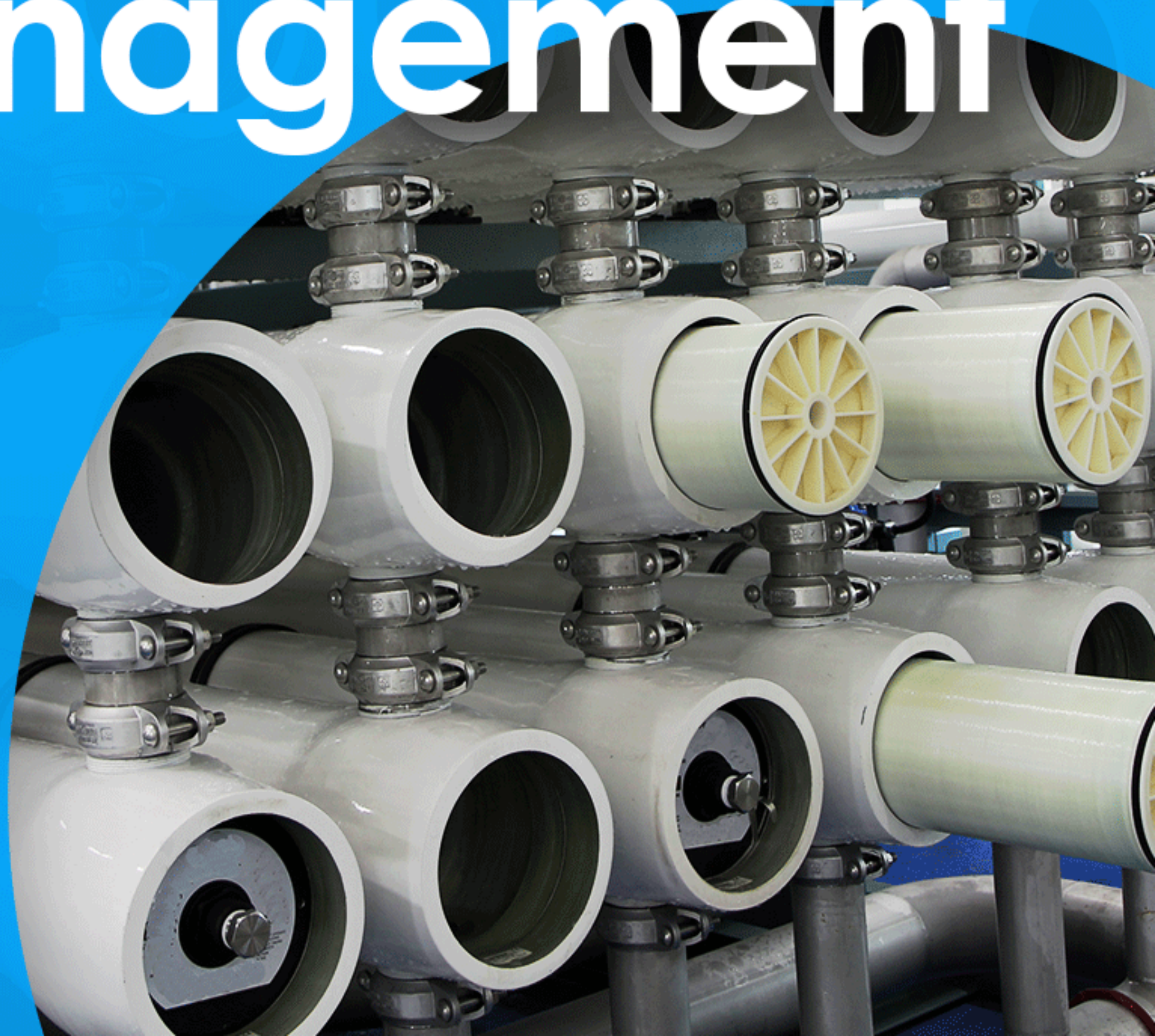


A QUICK GUIDE TO

# Fouling Management



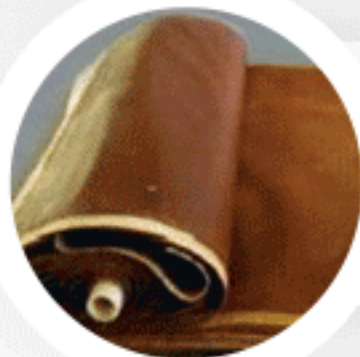


# WHAT IS FOULING?

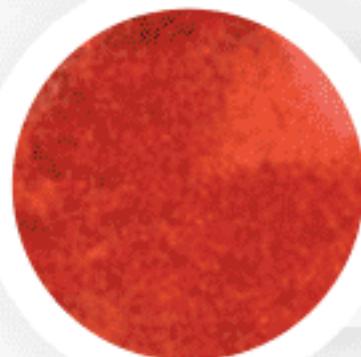
A process that results in loss of **membrane performance** due to the deposition of suspended solids on its external surfaces, at its pore openings, or within its pores.



**COLLOIDAL FOULING**



**ORGANIC FOULING**

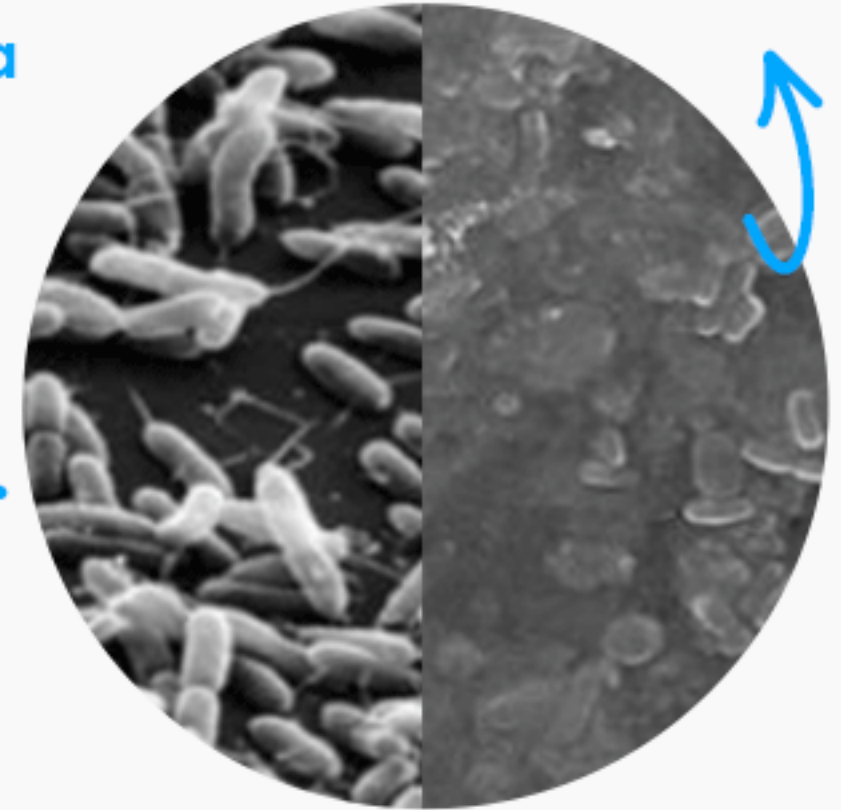


**BIOFOULING**



Bacteria  
without  
biofilm

Bacteria with  
biofilm



## A DEEPER LOOK AT **BIOLOGICAL FOULING**

Biological fouling is the accumulation of microorganisms, plants, algae, or small animals on wet surfaces.

This accumulated mass causes flow restrictions within the membrane resulting in sub-optimal plant performance. In membrane plants, most of the time we are dealing with **bacteria**.



# THE **IMPACT** THAT FOULING HAS ON MEMBRANES

Decreased trans-membrane  
pressure & increased  
differential pressure

- ⬆ operating pressure
- ⬇ permeate flux

Extensive pre-treatment

- ⬆ capital investment
- ⬆ operating expenses

Frequent cleaning


- ⬆ process downtime
- ⬆ waste generation
- ⬆ membrane degradation



HOW TO

# FORMULATE AN **EFFECTIVE FOULING** MANAGEMENT STRATEGY

There is no simple one size fits all solution due the uniqueness of each application with regards to chemistry, application and business drivers.

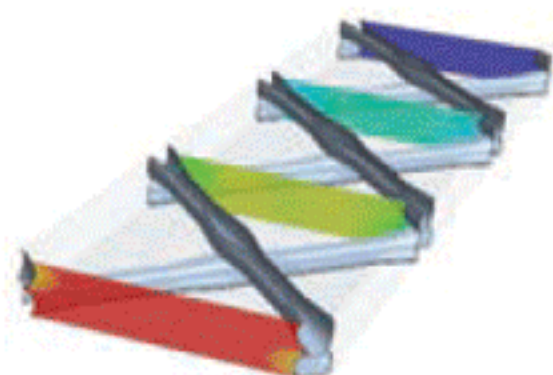




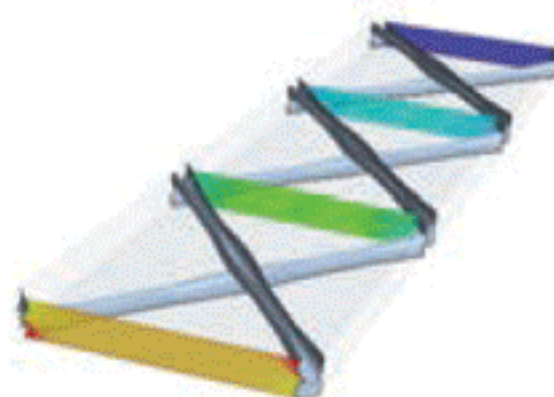
# 1.

# SELECT THE CORRECT MEMBRANE

## FEED SPACER



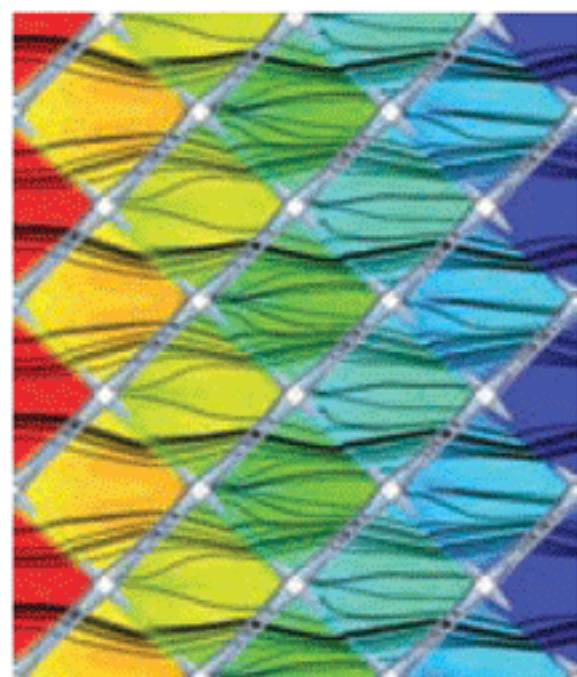
Standard 34-mil Spacer



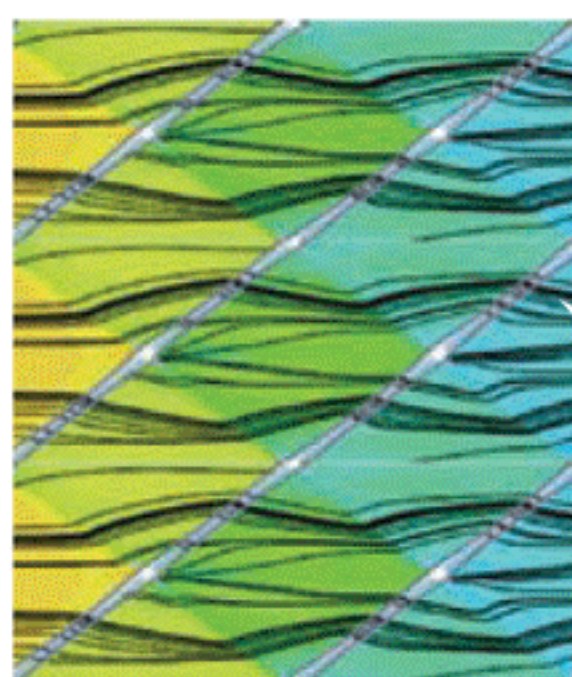
LDP 34-mil Spacer

Operational dP 25% less  
 = **less energy!**

No loss of rejection (constant concentration polarization).



High Pressure Drop



Low Pressure Drop

Flow Direction  
 Static Pressure

Low

High

Static Pressure (Pa)  
 0.00000 120.00 240.00 360.00 480.00 600.00

## SURFACE MANIPULATION

Bacteria

Colloidal Particles



Modified polyamide layer with anti-fouling properties





## 2.

# USE THE MOST EFFECTIVE CLEANING STRATEGY

### STEP 1:

Understand the fouling by performing an autopsy first.

### STEP 2:

Perform labscale cleaning trial to confirm best course of action.

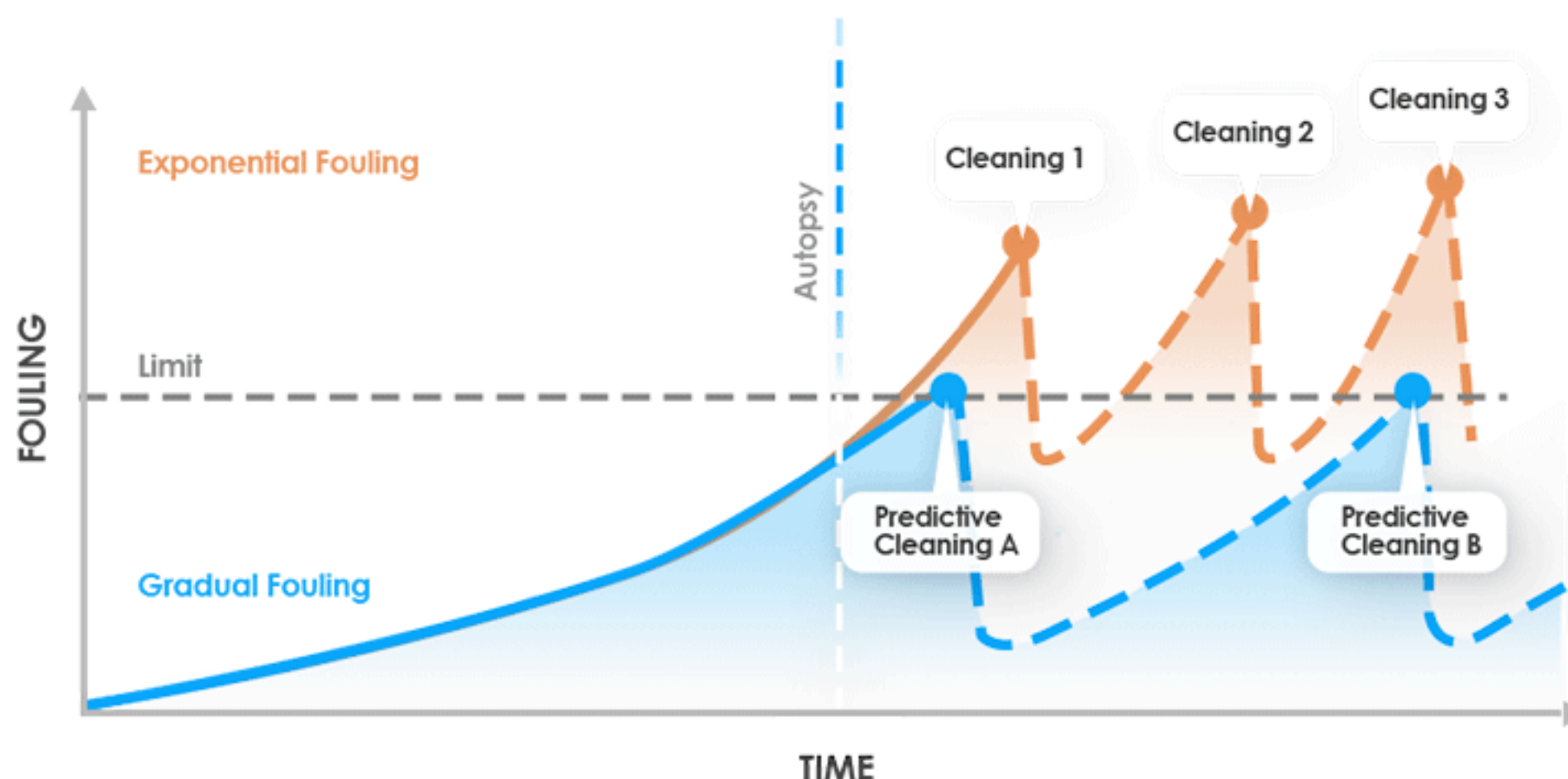
### STEP 3:

Clean pre-emptively to reduce lifecycle cost.

Cleaned with conventional alkaline cleaner



Cleaned with enzymatic cleaner in combination with an alkaline cleaner



By selecting the **correct pretreatment** (physical & chemical), the **correct membrane** and **cleaning pre emptively**, we can:

- ^ **Increase** plant up time
- ✓ **Reduce** membrane plant energy cost
- ✓ **Reduce** chemical usage
- ✓ **Reduce** waste
- ✓ **Reduce** membrane replacement frequency



