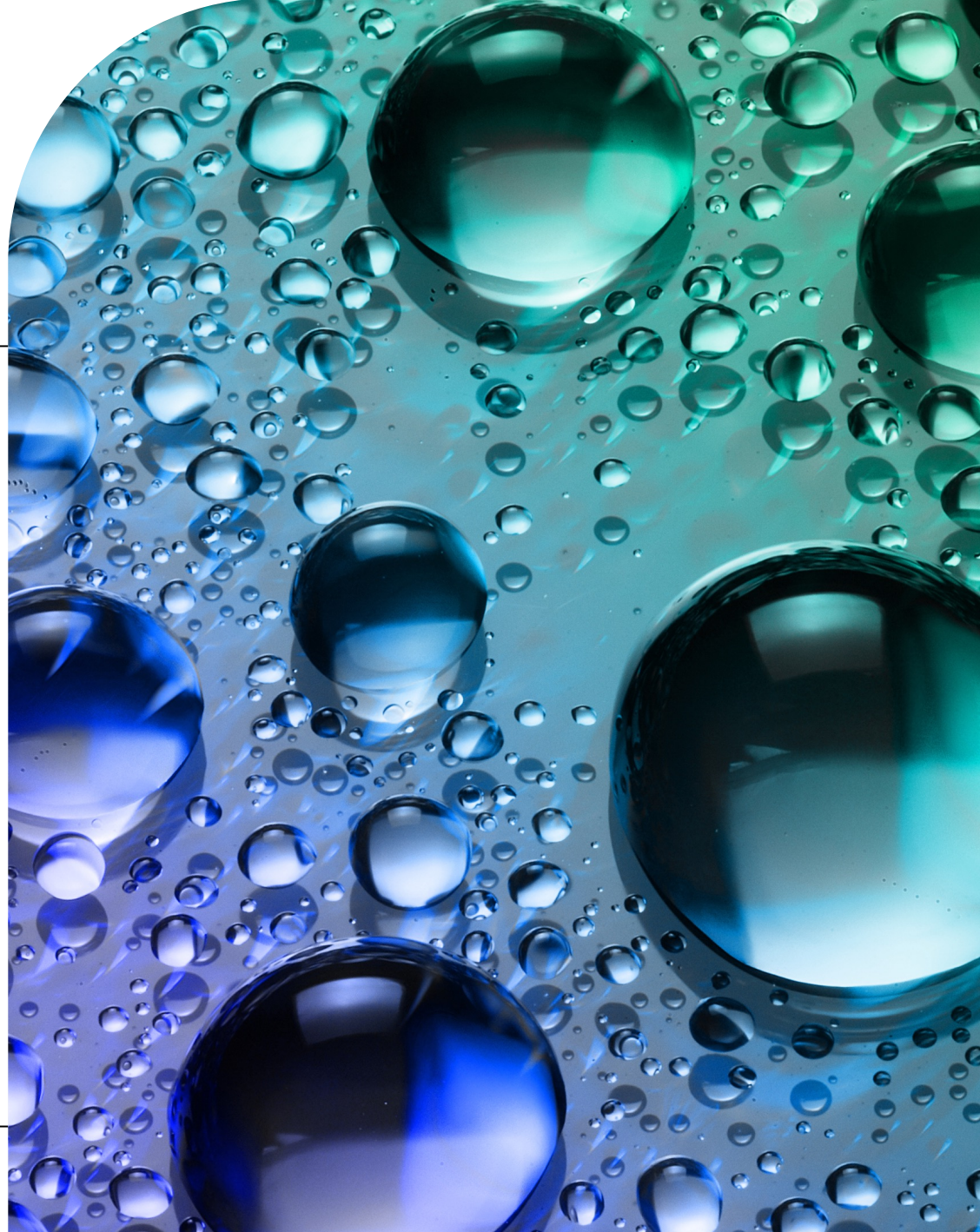


ARKEMA

WATER SOLUTIONS
WITH KYNAR[®] PVDF



Drivers in the Market



CLEAN WATER



URBANIZATION

Poor quality of
ground/surface water

Scarcity of freshwater



PLANT FOOTPRINT

Plants are required to
operate beyond their design
capacity/capabilities



**SEVERE
CHEMICALS**

Cl → ClO₂ , NaOCl, and
Chloramines

Much more extreme
oxidization

A Variety of end Applications

“Showers to Flowers”
10% reintegration with potable water



Problematic Cycle in Agriculture Water



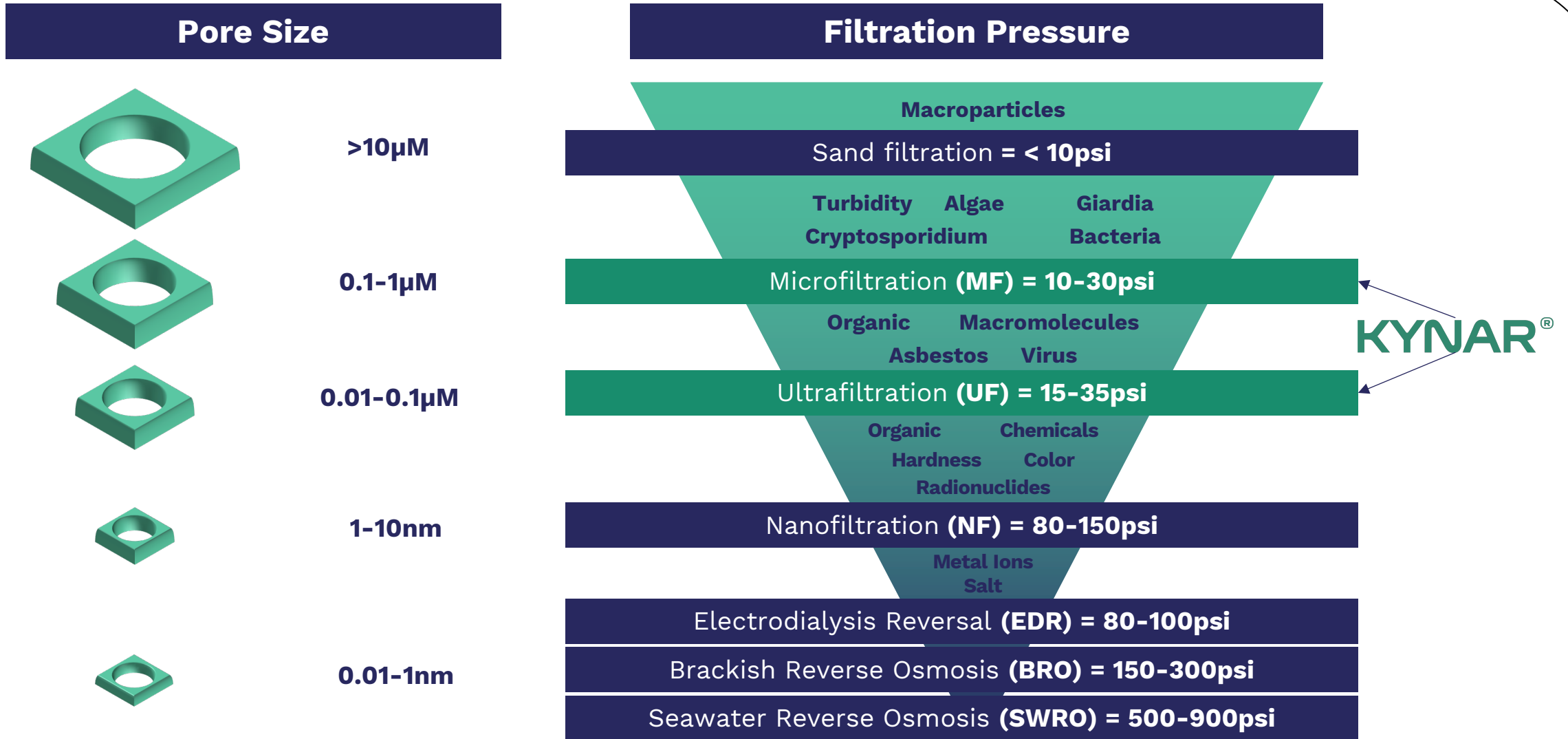
Re-use of polluted water

More pollutants added each cycle

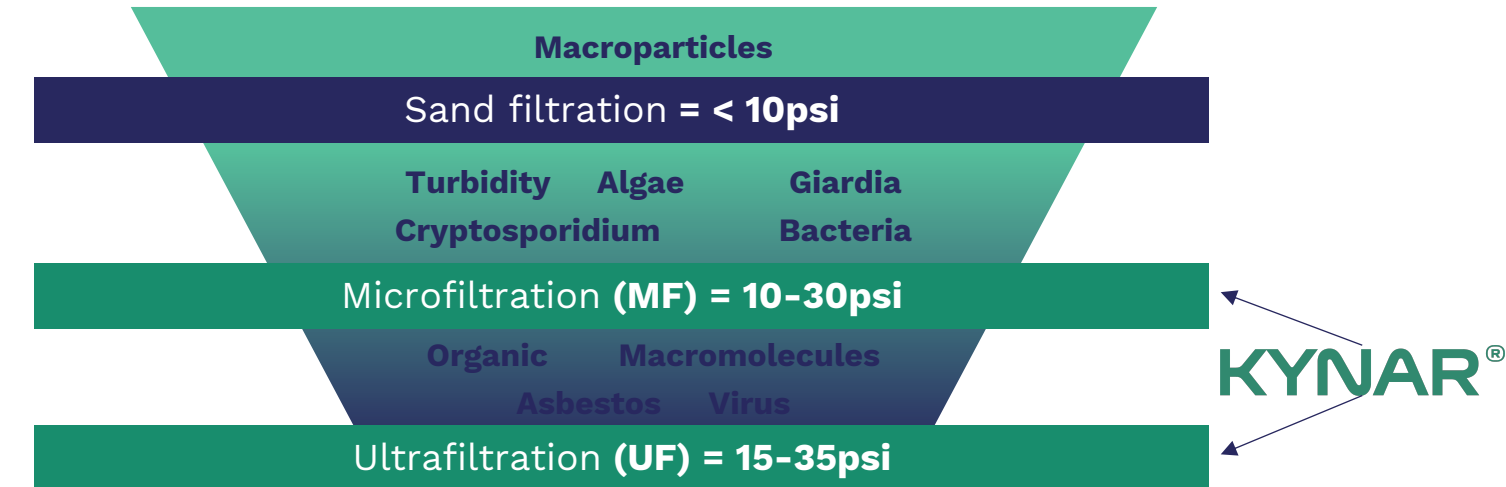
Potential for pollutants reaching our food

Ultra-Filtration can be used here

Classifications of Membranes



Why Do We Need MF & UF?



Sand filtration usually starts with “safe water”

There is wide variability in how safe the “safe water” really is

Sand filtration CANNOT remove potentially harmful bacteria and viruses

A Common Thread of Requirements



**Chemical
Resistance**



**Flexibility &
Toughness**



**Process
Flexibility**

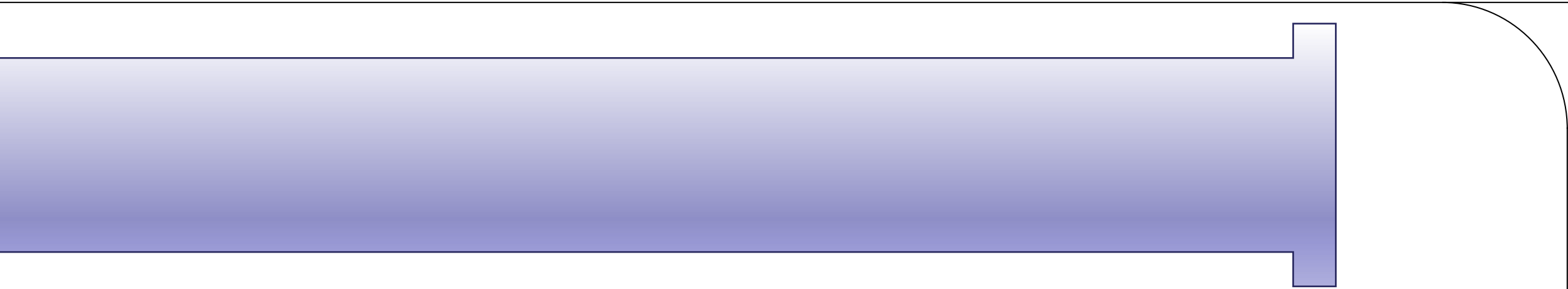
Regulatory Certifications

PFOA Free



Fluorosurfactant Free

Halogen Resistance



**Chlorine
resistance**

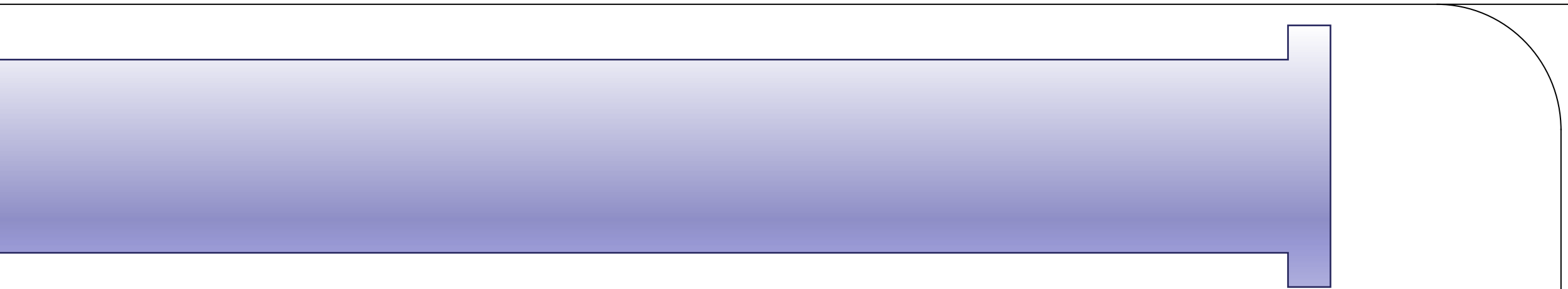
**NaOCl (Bleach)
resistance**

**Chloramine
resistance**

**Chlorine dioxide
resistance**

Far better halogen resistance than PSU and PES

Acid & Oxidizer Resistance



**Hydrochloric
acid resistance**

**Sulfuric acid
resistance**

**Hydrogen peroxide
resistance**

**Citric acid
resistance**

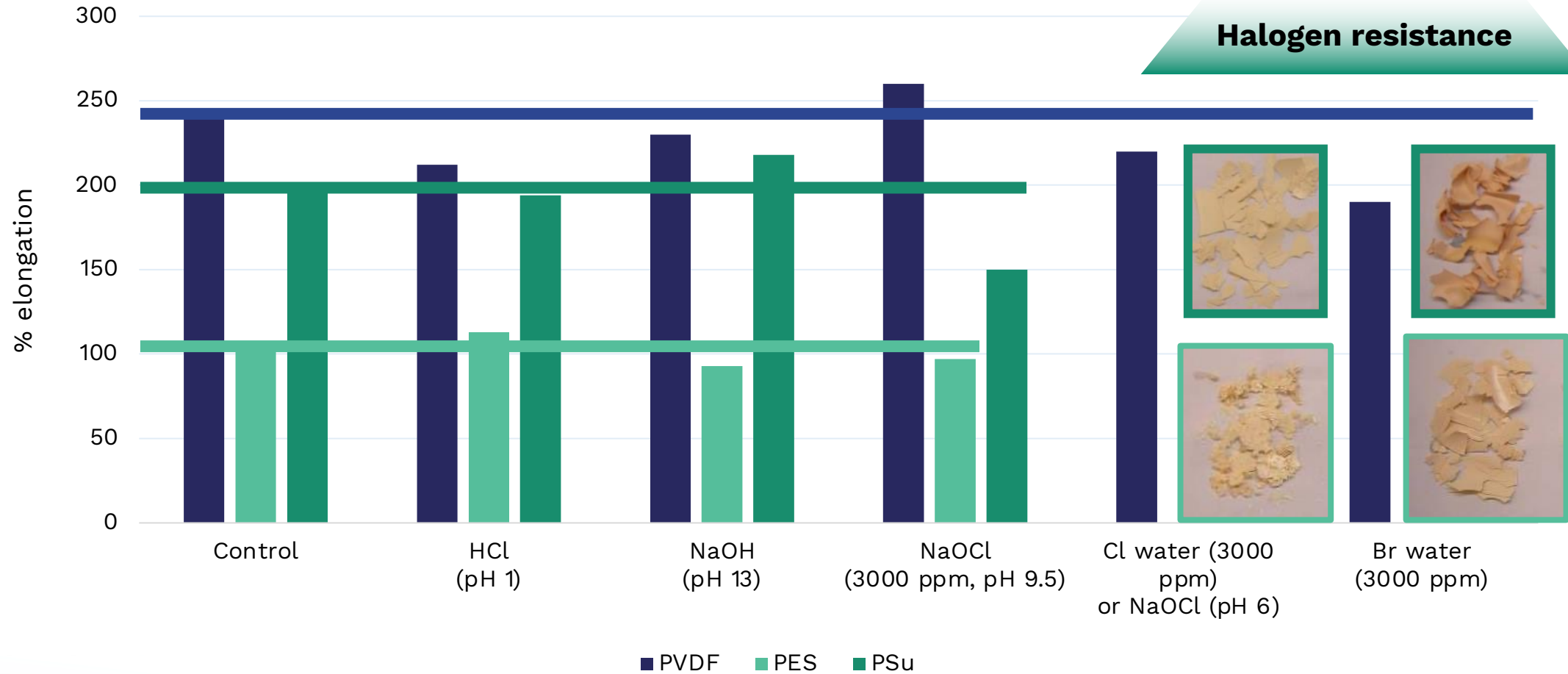
Also good resistance to **aromatics, chlorinated solvents, and hypochlorous acid (HOCl)**

Chemical Resistance of Kynar® PVDF

KYNAR®

Halogen resistance

Chemical effect on elongation



0.2µm samples exposed for 14 days @ 45°C

Longer Lifetime and more Forgiving

PES

50,000

Cl⁻ ppm hours → **3-5 year lifetime**

Replace often

Time/Resource cost

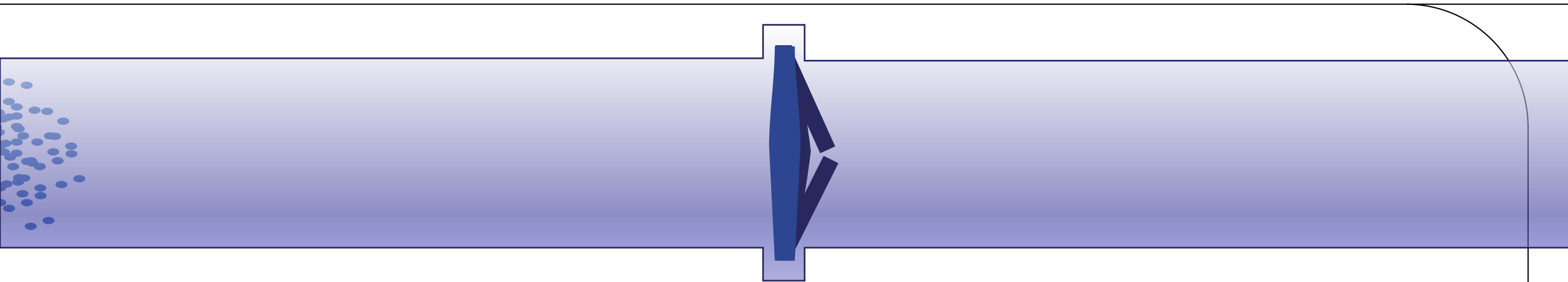
VS.

KYNAR[®] 1,000,000

Cl⁻ ppm hours → **over 10 year lifetime**

Less maintenance

Safe and reliable



Turbulent water flow leads to:

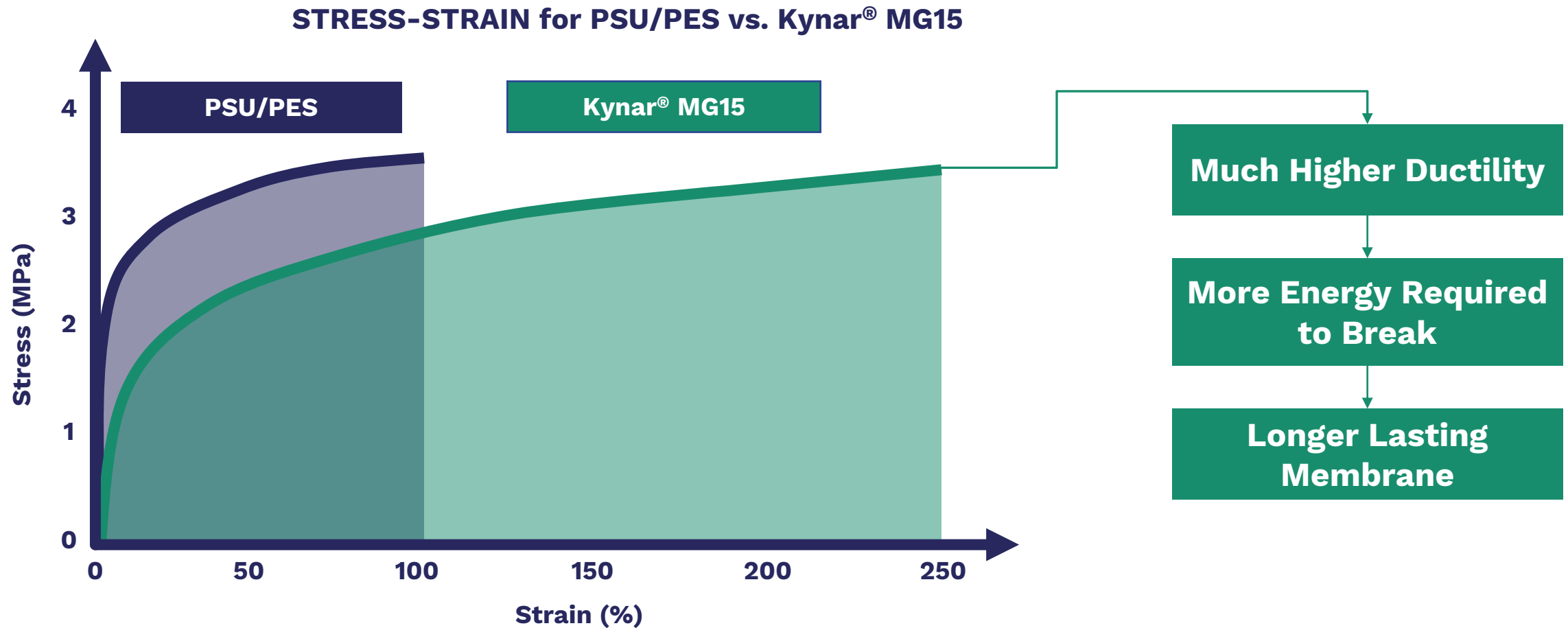
Excessive membrane stress
Cracking of membrane
Broken membrane



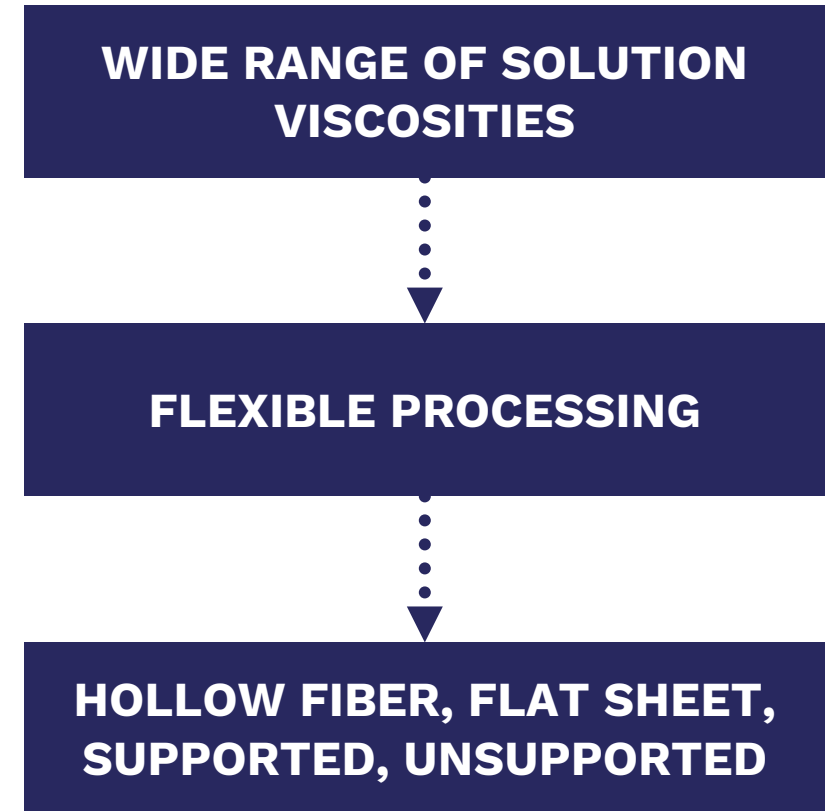
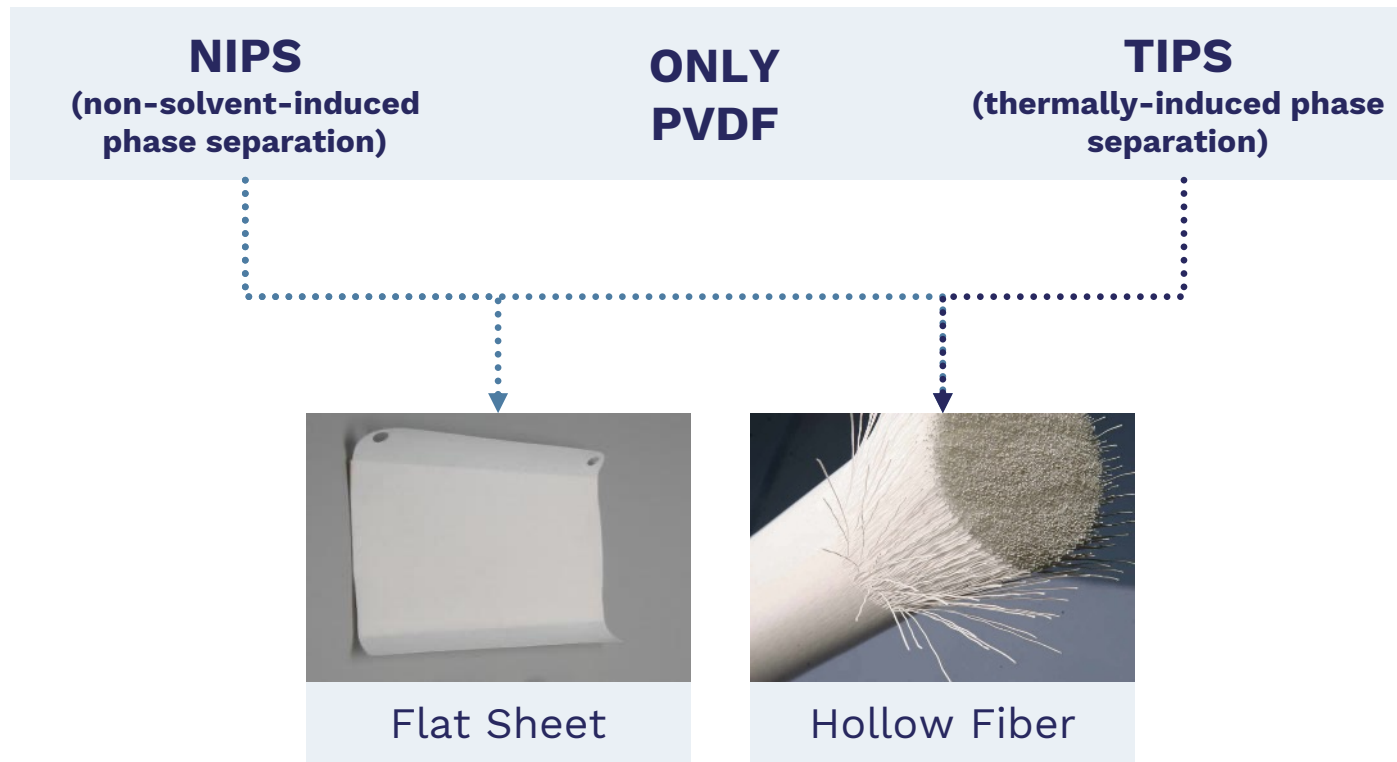
Kynar® PVDF

High ductility
High elongation
Good resilience

Flexibility and Toughness



Classifications of Membranes



Processing Benefits of Kynar® PVDF



GOOD SPINNING PROPERTIES

Hollow fiber spinning

- Stable solution spinning
- Better mechanical properties
- Consistent macro-void-free fibers



SOLVENT COMPATIBILITY

Strong solvents

- NMP
- DMAc
- DMSO

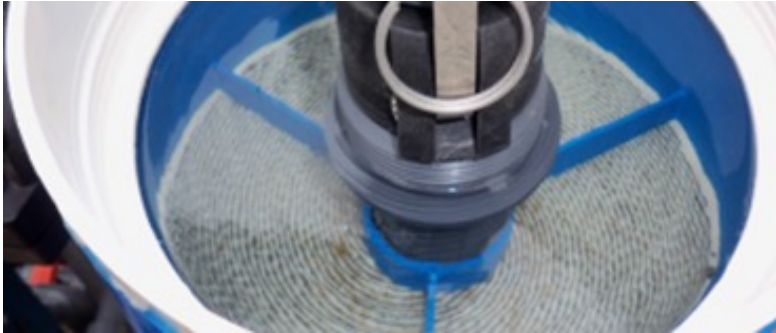


GRANULAR & POWDER GRADES

High bulk density

- Easier flow
- Low dusting

Kynar® PVDF for Filtration Membrane



NIPS – FLAT SHEET

Available grades

- Kynar® 761A
- Kynar® 761



NIPS – HOLLOW FIBER

Available grades

- Kynar® MG15
- Kynar® 761A
- Kynar® 761



TIPS – HOLLOW FIBER

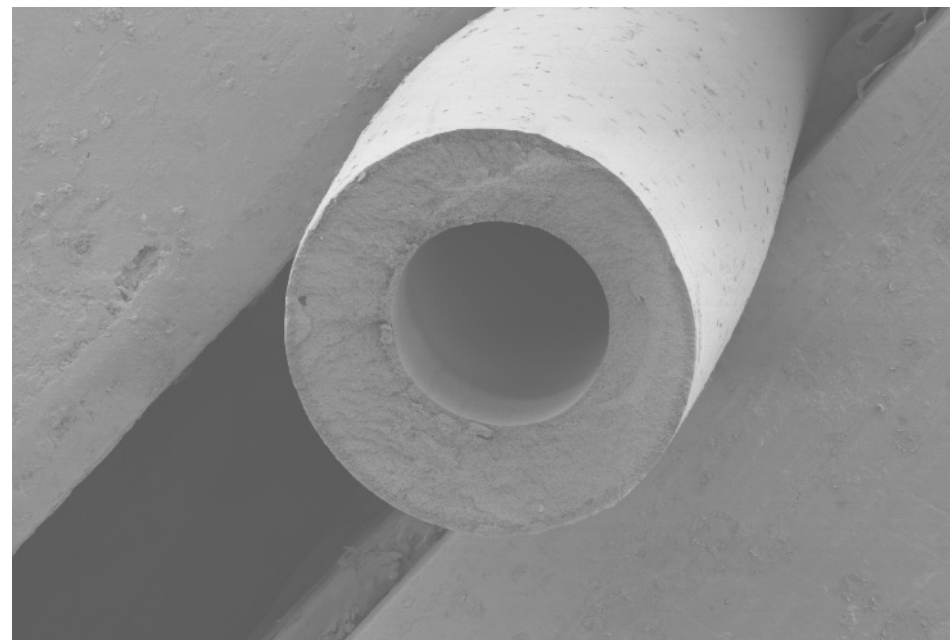
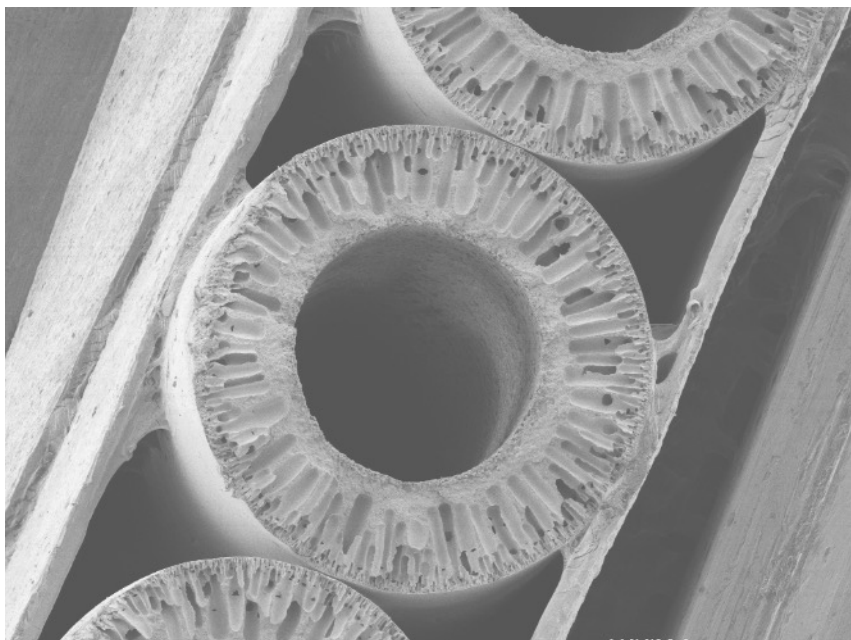
Available grades

- Kynar® 761
- Kynar® 741

Kynar® PVDF for Filtration Membrane

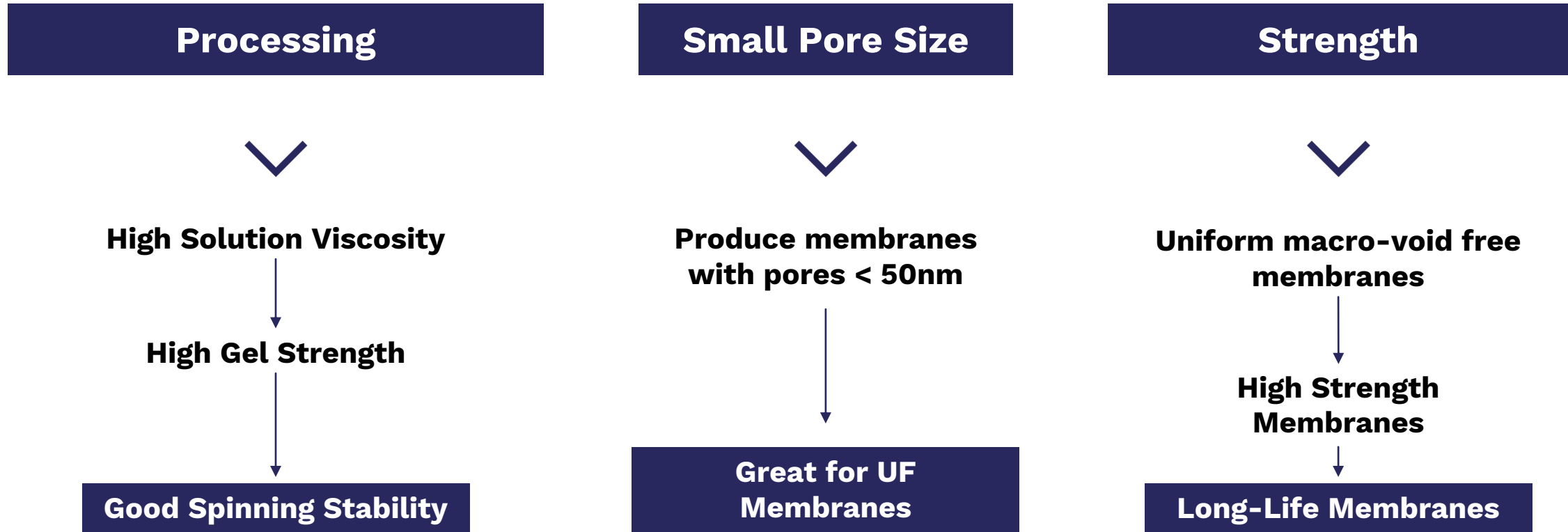
Grade	Melt Visc (kp)	Solution Visc (cps)	Notes
741	16 – 22	100 – 200	Good for TIPS HF
761	25 – 29	300 - 450	Sheet membranes and TIPS HF
761A	30.5 - 35.5	850 - 1400	Sheet membranes or hollow fiber
MG15	35 – 38	1500 – 1900	Ideal for hollow fiber

Kynar® PVDF for Macro-void-free Membranes



KYNAR®

Kynar[®] MG15 – Key Benefits

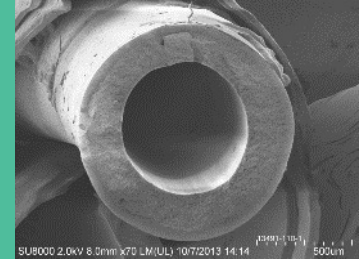


Kynar® PVDF for High Strength Nips – UF Membranes

NEW TECHNOLOGY



**BASED ON
KYNAR® MG15**



Produce high strength hollow fibers without TIPS processing

High Strength

5-7MPa

High Permeability

**>600 LMHB
(L*m⁻² hr⁻¹ bar⁻¹)**

Durable Hydrophilic Membrane Solutions

Patented Arkema Technology

Uniform Macro-Void-Free UF membranes

High Flux
High Strength

Water

Water

Pore
 ≥ 10 nm

Structure of copolymers
Grafted onto Kynar® PVDF

Block miscible
with PVDF

Hydrophilic
block

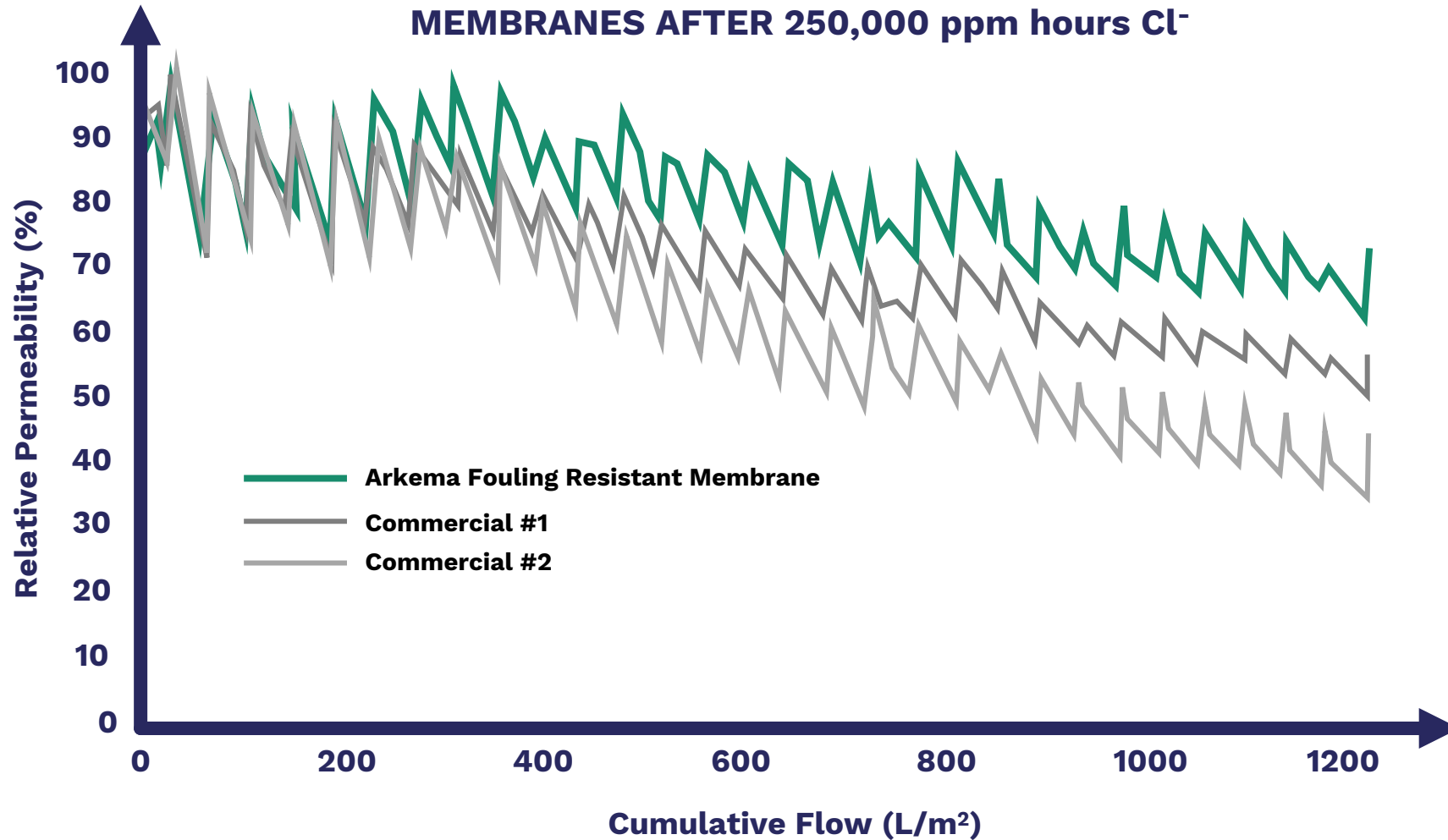
← 10 nm →

Tailored Functionality

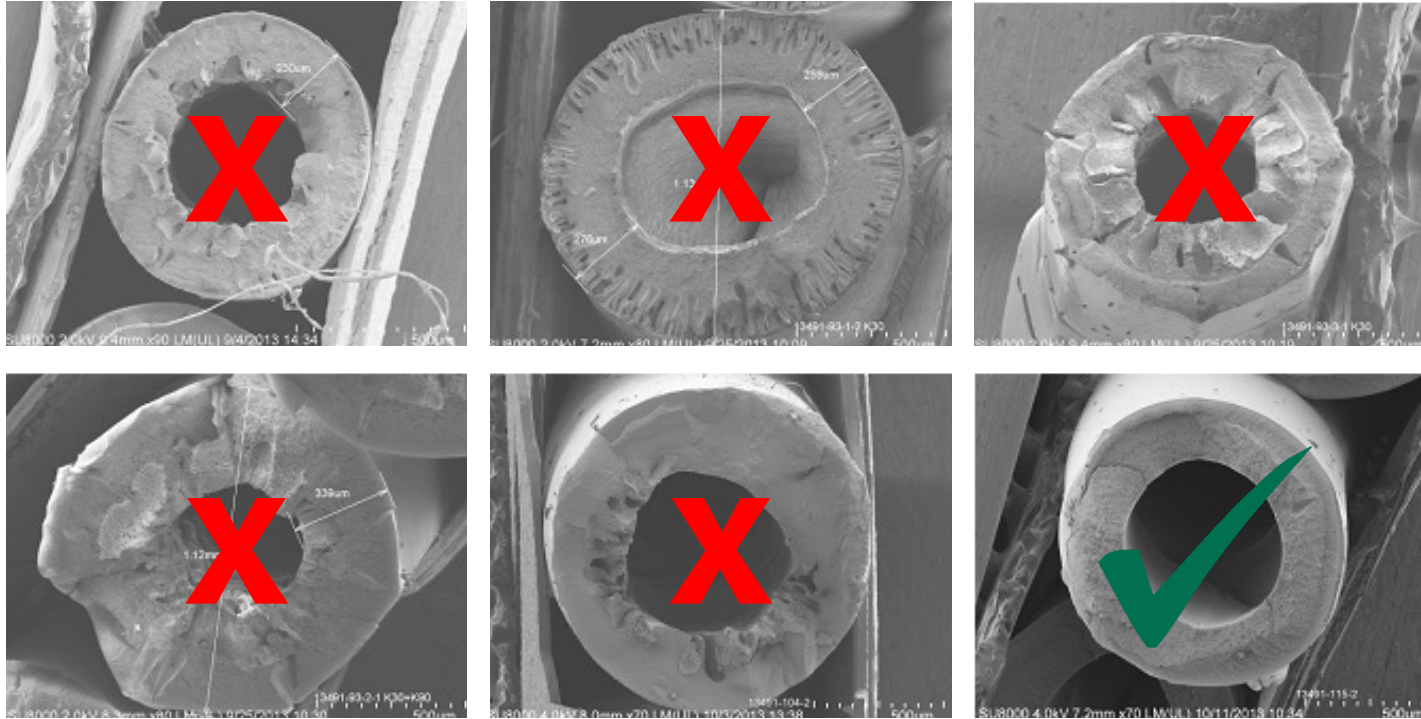
Permanently Low Fouling

Stable performance through
a lifetime of chemical
cleaning

Sustained Hydrophilicity Over Lifetime



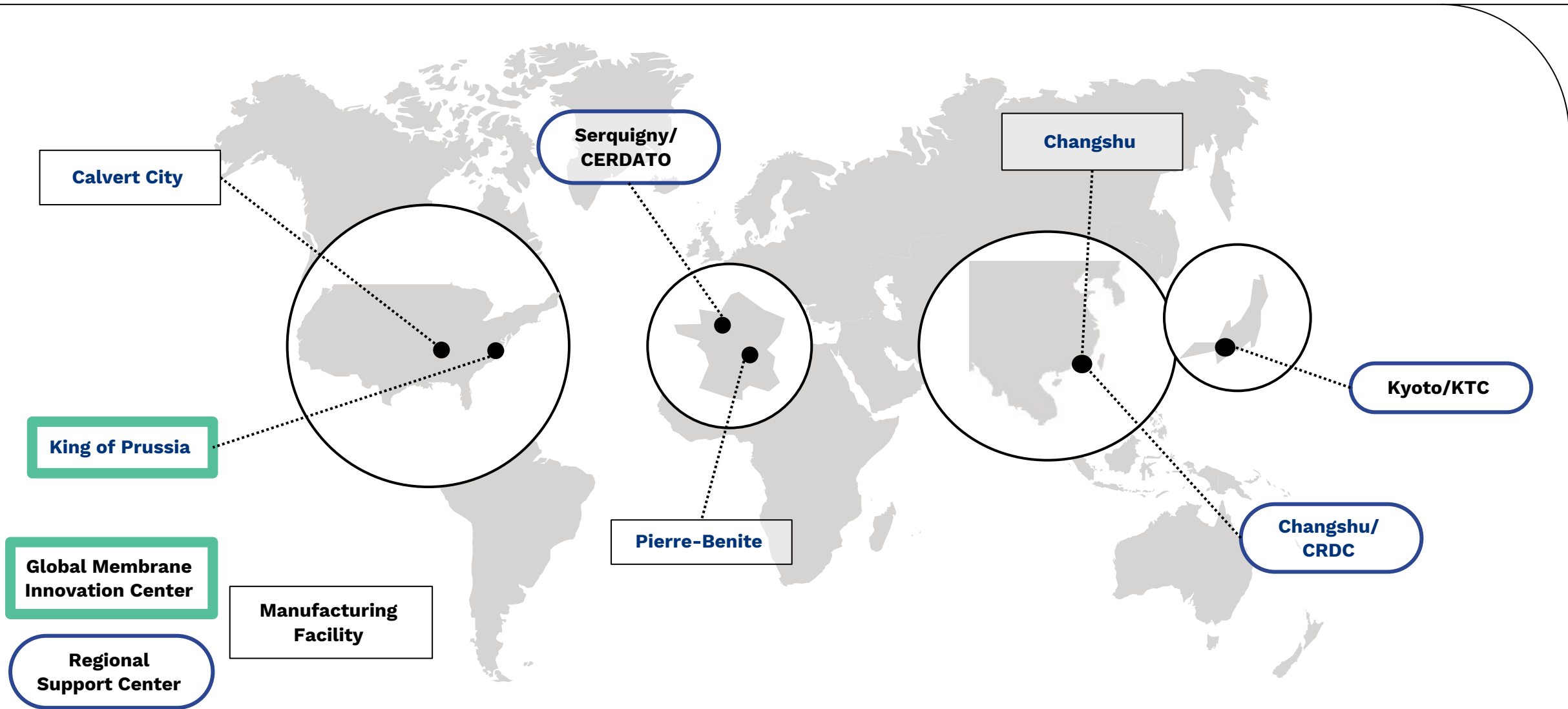
Arkema's Service



- **Model formulation**
- **Membrane spinning conditions**
- **On-site lab trials and training**
- **Field technical support**
- **Characterization**
- **Global support**

Let us save you YEARS of R&D

Kynar® PVDF Global Footprint



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