



PERFORMANCE CERAMICS & REFRACTORIES

AQUAVALLEY – JOURNÉE EAU & CÉRAMIQU

MEBRANES CRYSTAR® FT SAINT-GOBAIN

LE 27 JUIN 2023





Commitment to achieve **carbon neutrality in 2050**



**World or European leader** in most of our businesses

Founded over

**350** years ago

Around

**168,000**

employees <sup>(1)</sup>

1) As of 2022/12/31

Locations in

**75** countries

Around

**900**

manufacturing facilities around the world

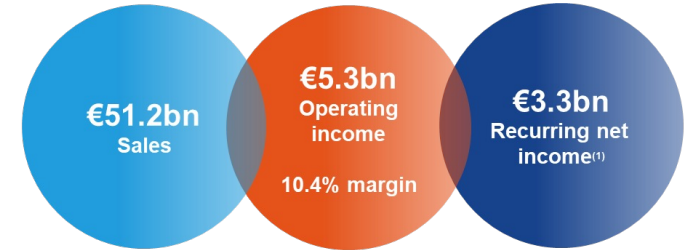
Saint-Gobain Research

**8** cross-business R&D centers

Around

**2,700**

sales outlets



Free cash flow<sup>(2)</sup>

**€3.8bn**



Capital expenditure<sup>(3)</sup>

**€1.9bn**

**4 REGIONS**

- Northern Europe
- Southern Europe, Middle-East, Africa
- Americas
- Asia-Pacific

A UNIQUE PORTFOLIO OF SOLUTIONS FOR LOCAL CONSTRUCTION TRADES

Renovation

Light construction

(new-build residential and non-residential)

**1 GLOBAL ENTITY**

High Performance Solutions

ADVANCED APPLICATIONS FOR GLOBAL MARKETS

Sustainable Construction

Sustainable Mobility

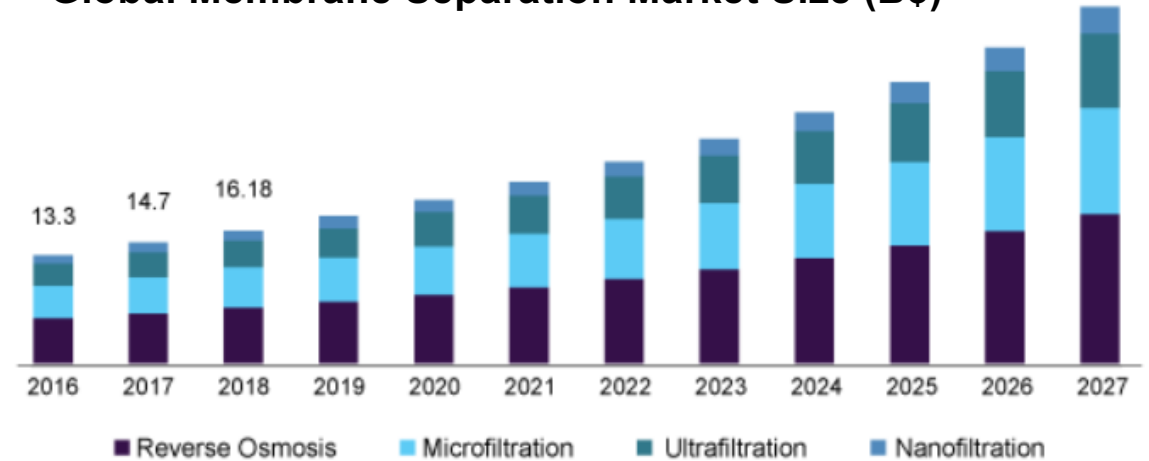
Sustainable Industry

# MARCHÉ DES MEMBRANES

## Increasing demand for membranes:

- **stricter regulations** for drinking water and wastewater treatment
- rising rates of **wastewater recycling and reuse** in response to environmental concerns and increasing water costs
- improvements to **water infrastructure**
- increasing membrane use rates in **manufacturing processes**

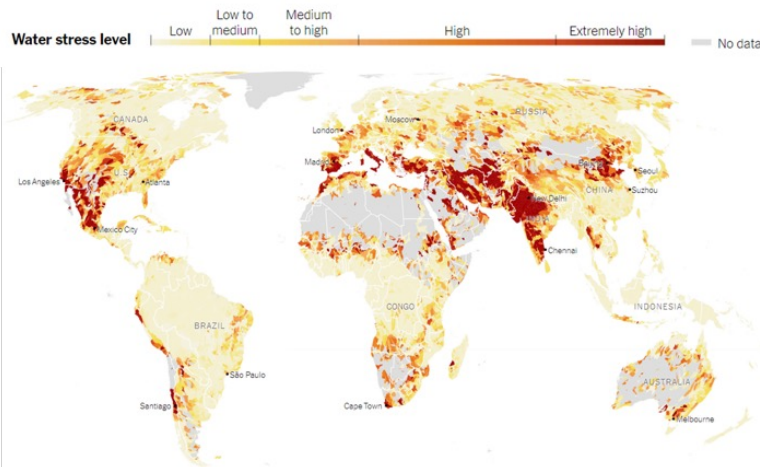
## Global Membrane Separation Market Size (B\$)



Source: www.grandviewresearch.com

## Membrane technologies:

- **Polymeric membranes:** cheaper, more mature → 95% of market share, reference technology
- **Ceramic membranes:** technical advantages, but more expensive → “niche” applications



# AVANTAGES DES MEMBRANES DE MF / UF CÉRAMIQUES

WHAT IS THE REAL TOTAL COST OF OWNERSHIP OF A LOW-PRESSURE MEMBRANE PLANT FOR DRINKING WATER PRODUCTION? THE COMPARISON OF THREE MEMBRANE MATERIALS: PVDF, PES AND CTA

Anne BREHANT\*, Angélique FABRE\*, Reynald BONNARD\*

\* SUEZ ENVIRONNEMENT, CIRSEE, Water Processes and Applications Division, 38, rue du Président-Wilson, 78230 Le Pecq, France.

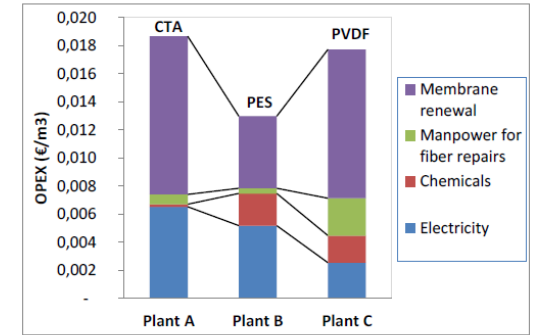
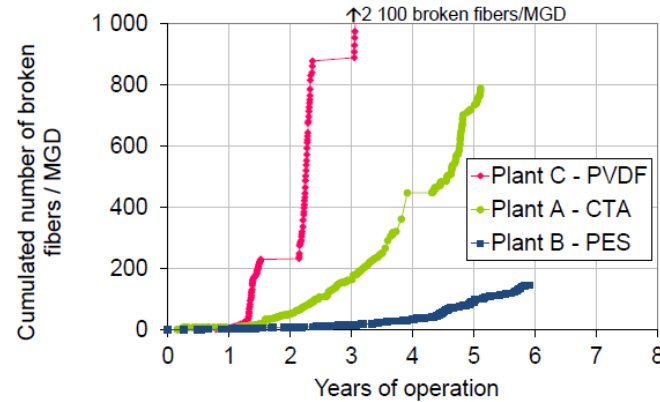


Figure 15. OPEX breakdown for the three membrane installations

Critère	Polymériques	céramiques
Résistance à la température	40-60°C	65-300°C
Résistance chimique	pH 2-12	pH 1-13 (0-14 Crystar® FT)
Résistance mécanique	faible	élevée
Durée de vie	3 – 5 ans	10 – 20+ ans
Flux de filtration	50 – 150 LMH	100 – 1000 LMH

# QUEL AVENIR POUR LES MEMBRANES CÉRAMIQUES?

## Avantages techniques reconnus

### Réduction de l'OPEX démontrée dans plusieurs applications

- Rendement de production d'eau
- Consommation d'énergie
- Coûts de maintenance (réparation, remplacement)

### CAPEX des installations de filtration [ €/ (m<sup>3</sup>/h) ]: le nerf de la guerre!

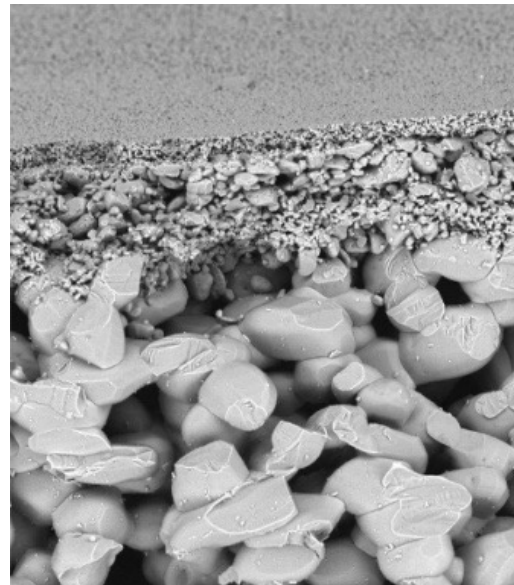
$$CAPEX \approx \frac{\text{capacité de l'installation} \left[ \frac{m^3}{h} \right]}{\text{flux de filtration [LMH]} } \times \text{prix membranes} \left[ \frac{\text{€}}{m^2} \right]$$

- Maximisation des flux de filtration: matériaux céramiques plus performants
- Maximisation des débits de filtration par module: optimisation de la géométrie des membranes céramiques
- Réduction des coûts de production (effet d'échelle)

# TECHNOLOGIE DE FILTRATION CRYSTAR® FT

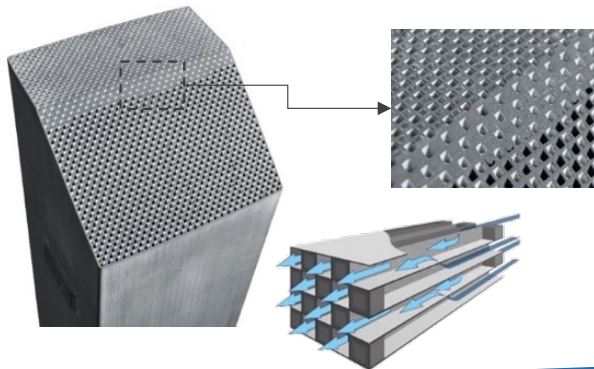
## Crystar® FT – Recrystallized Silicon Carbide (R-SiC) membranes

- Special ceramic material consolidated at very high temperature
- Pure and strong SiC grain boundaries → superior thermal and chemical stability
- High open porosity structure (> 40%), low tortuosity, specific surface chemistry → enhanced permeability
- Available in tubular crossflow and honeycomb dead-end shapes



Membrane layers:  
Pore size 250 – 3000 nm  
Open porosity 40%

Substrate:  
Pore size 25 µm  
Open porosity 40%



## / CONCLUSION

La marché des membranes continuera à croître dans les années à venir.

Les membranes céramiques contribueront aux solutions de « reuse » et / ou de respect règlementaire concernant des effluents industriels difficiles et agressifs.

Dans les applications traditionnelles MF/UF, l'optimisation des matériaux, des géométries et des coûts des membranes céramiques augmentera leur taux d'adoption.



GLOBAL  
WATER  
INTELLIGENCE  
MAGAZINE

11

NOVEMBER 2021

FROM THE CHIEF TECHNOLOGY OFFICER

### Ceramic membranes: From costly to competitive

Tom Pankratz charts the evolution of ceramic membranes over the last two decades, and explores how the value proposition has been refined as the costs have come down.



**MERCI DE VOTRE  
ATTENTION !**