

CERAFILTEC®

CLEAN WATER. EVERYWHERE.

Made in Germany - disruptive and IP protected water treatment technology

Solving our global water emergency

Lower costs • lower CO₂ footprint • sustainable
• better water quality • innovative • proven



CERAFILTEC's customer advantages

- Better water quality at better price
- Sustainable (ESG / lower carbon footprint)
- More reliable (robust ceramic vs. fragile plastic fibers)
- Fully hands on customer support approach to ensure best results—before, during, and after project execution



Company Profile

CERAFILTEC Germany GmbH is the leading water treatment technology provider exclusively using ceramic flat membrane ultra-filtration solutions. It is headquartered in the Science Park, in Saarbrücken, Germany and has offices in Germany, UAE, USA, Mexico, Thailand, Vietnam, Poland, South Africa; and partner and distributors around the globe.

The Technology pioneers under one umbrella: More than 25 years ago, in 1993, the idea of the ceramic flat sheet membrane was born and patented. Since then, technology specialists have developed several products and processes using the perspective ceramic flat sheet membrane concept and established the technology in many water and sewage treatment applications.

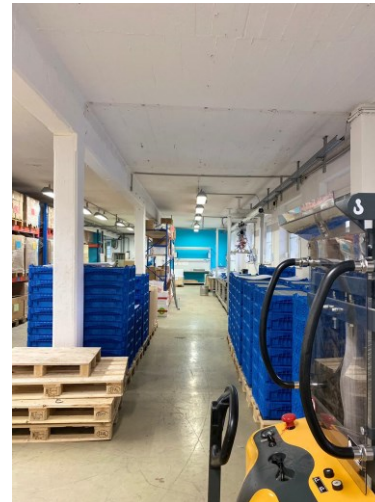
In 2016, leading experts of the ceramic filtration technology decided to combine their know-how under one new umbrella: CERAFILTEC. During the first operating year, CERAFILTEC has developed the latest and most innovative ceramic flat sheet membrane module. Within a short time, the product was successfully applied all over the world.

CERAFILTEC at a glance:

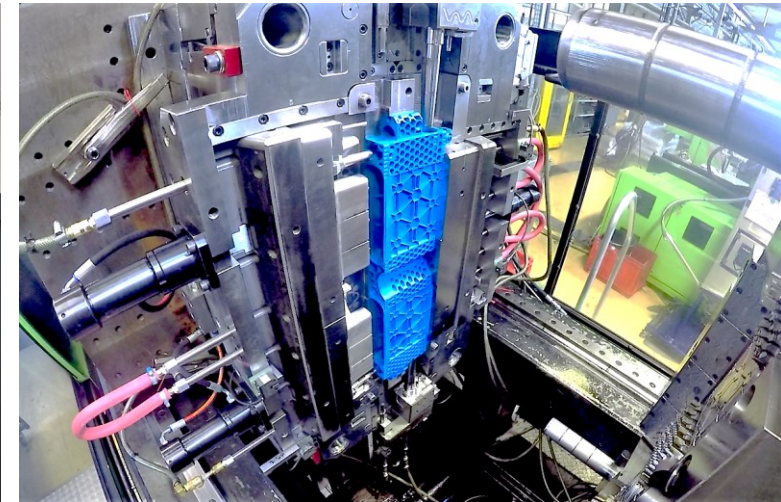
- Germany based - Ceramic flat sheet membrane (CFM) technology experts
- Led all major CFM technology break-throughs: from niche technology to fast growing global standard
 - Invention of CFM design (1993)
 - Invention of available CFM module designs (2005+)
 - Invention of key processes such as: MCP, CapClean, ACLF (2007+)
 - Executed mega projects with >100MLD
 - Successful replacement of Memcor, ZW 1000, Inge and others



Headquarter, Science Park, Saarbrücken



QA/assembly,
St Ingbert



CERAFILTEC module production,
Solms

>750,000 m³/d

Installed ceramic flat membrane CERAFILTEC team experience.

Recently under CERAFILTEC alone:

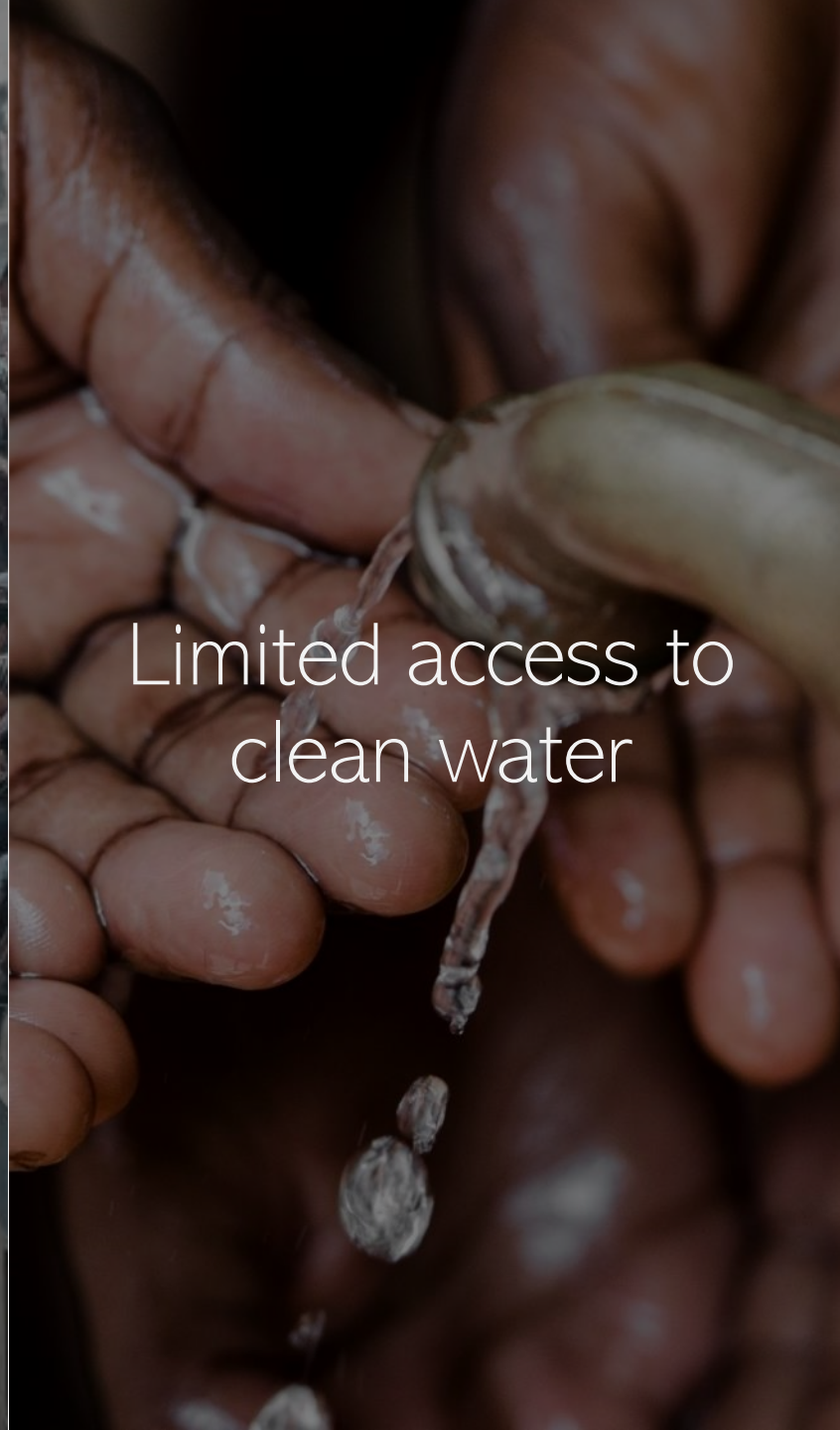
>98
Projects

411,000
m³/d

28
Countries



Rapid population growth



Limited access to clean water



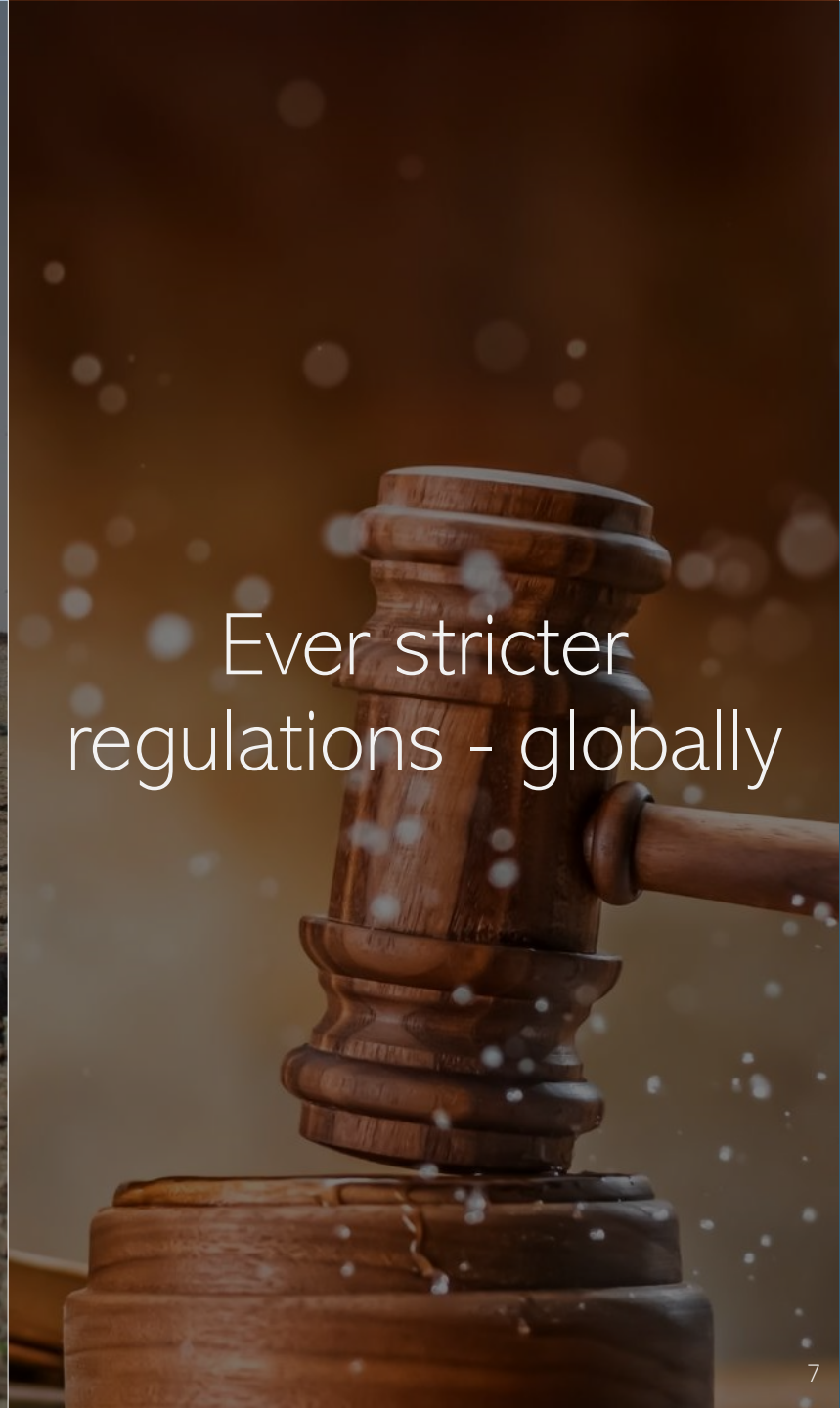
Heavy pollutions - untreated wastewater



Toxic and carcinogenic drinking water sources



Extreme droughts



Ever stricter regulations - globally

Is there a solution?
Yes, there is.

CERAFILTEC®
CLEAN WATER. EVERYWHERE.

Click [here](#)



CERAFILTEC video

Innovative Industrial-scale Filtration Technology to elevate today's global water and environmental standards.

Green

Sustainable →

Disruptive

ESG approved*

Reduces CO₂ footprint - lower power consumption

Sustainable – plastic membranes vs ceramic membranes

Empowering zero liquid waste discharge (ZLD) concepts

Clean water at large scale.

Removal of pathogens/viruses, industrial contaminants

Optimizing water re-use

**certification in progress*

Table of content

- Corporate governance
- About CERAFILTEC
- Superior techno solution
- Better economics
- References and presence

Key Facts

1

Founded 2016 by team that **invented and pioneered** the entire CFM* technology already in 1993

2

Ideal replacement for polymeric membranes (e.g., DuPont, Suez, Koch, LG)

3

Successful installations in over **100 water treatment projects in 28 countries** (400 million liters water per day)

4

Growing **IP/ patent** portfolio

5

Strong **ESG** advantages

6

Substituting currently dominating polymeric water treatment filtration technologies (> \$8bn high growth annual market)

7

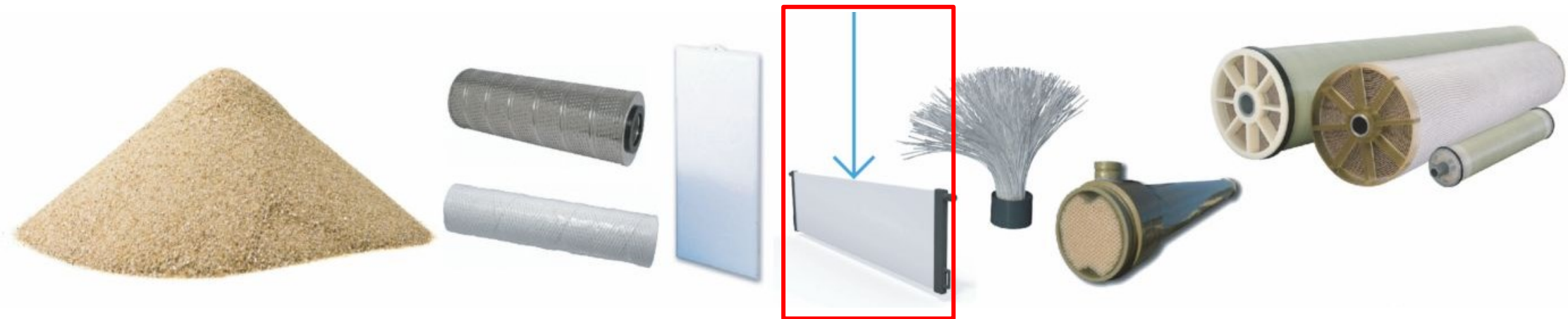
Revolutionizing water treatment sector: superior solution, greater customer value, lower total cost of ownership

8

Shareholders: experienced and high-profile individuals from leading corporations

CFM Micro/Ultra Filtration Technology

Microfiltration/Ultrafiltration
Typical pore size 0.05 – 0.3 μm



Sand filter

Cartridge
Filter

Submerged
polymer
membrane

Ceramic flat
membrane

Hollow fiber
polymer
membrane

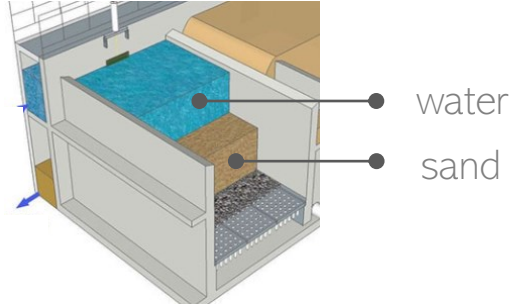
Tubular
pressurized
membrane

Reverse
Osmosis

Smaller pore size

Technology shift from the 2 industry standards (sand and plastic) to ceramic flat membrane already under way

Industrial sand filter.
Cannot remove micro pollutants



- Used for 1000s of years
- Robust/long lifetime
- Insufficient filtered water quality
- Cannot remove micro pollutants (PFAS, radium, micro plastics)

Natural filter medium. Large pores

Plastic membrane.
Interim solution



- Established over the past decades
- Good filtered water quality - but decaying performance
- Sensitive. Short lifetime
- Cannot handle challenging water



Oil based filter medium. Small pores

Ceramic flat membranes
Next evolutionary technology



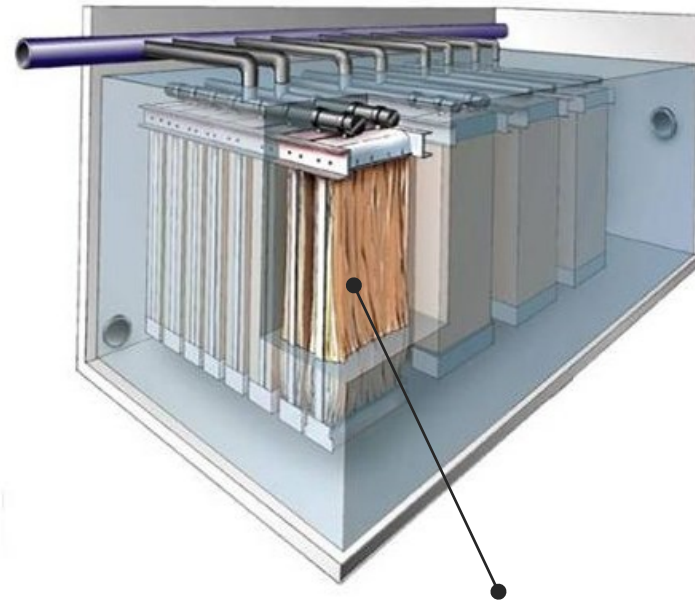
- Long lifetime (3-5x of plastic)
- Constantly good filtered water quality – no performance decay
- Easily handles challenging water
- Removes micro pollutants



Natural filter medium. Small pores

Polymeric (plastic) membrane filters with unsolvable short falls

- ✘ Plastic fibers break
- ✘ Costly maintenance and operating headaches
- ✘ Decaying filtered water quality
- ✘ Short life



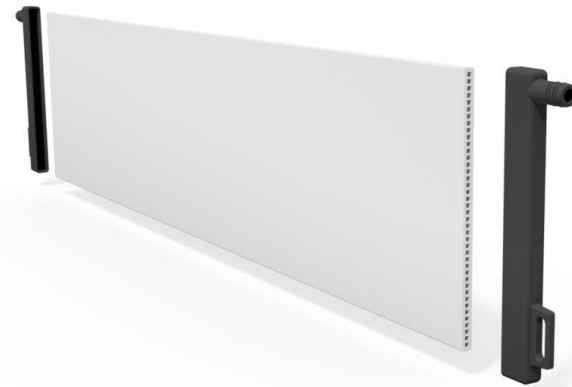
1000s of plastic fiber membranes



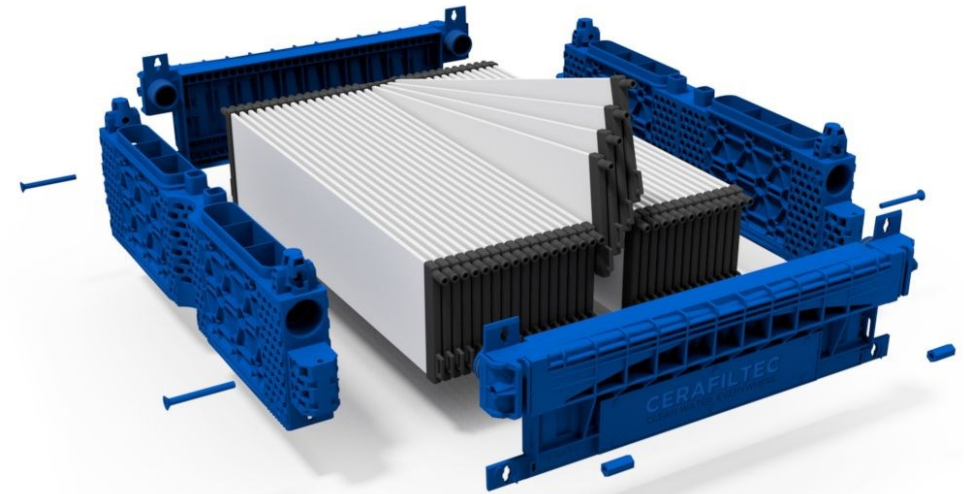
Plastic membranes after heavy use. Fully clogged. Fiber breaking

Material, design and production innovation (IP protected).
Able to purify any water source (from toxic sewage to drinking water)

- ✓ Robust and reliable
- ✓ Easy to operate
- ✓ Consistent filtered water quality
- ✓ 2-5x longer life than plastic filters



Single ceramic plate



Single module
Cleans water for up to 4,000 people

Unmatched Customer Value

How it works: the blue module with the embedded white ceramic membranes are submerged in dirty water. the ceramic plate is highly porous filter. Only clean water passes through the ceramic pores into the inner channels of the plate. The blue module hydraulically powers the membranes and enables the high throughput of ceramic material.

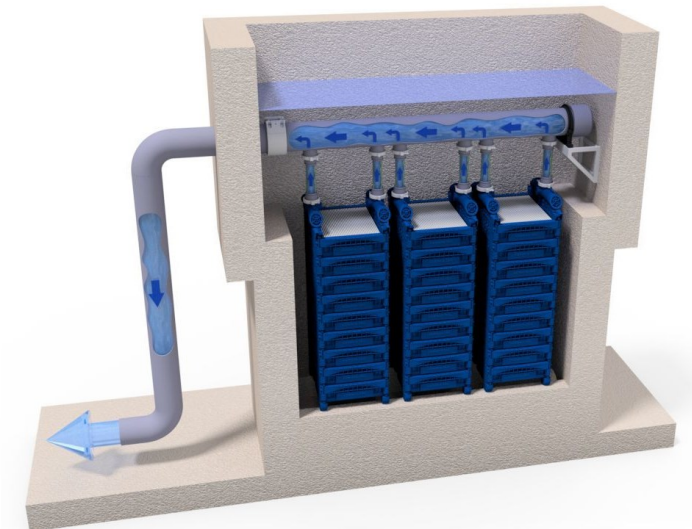
Highly modular and robust ceramic membrane filtration solution.
Essential for decades of reliable operation.

- ✓ Scalable to any size.
fits in any plant
- ✓ 20% - 100% smaller
footprint
- ✓ 30% to 100% lower
power consumption

Unmatched Customer Value



Modular Lego-block
concept



Single module
Cleans water for up to 4,000
people

Robust like a sand filter, high water quality like a polymeric UF membrane



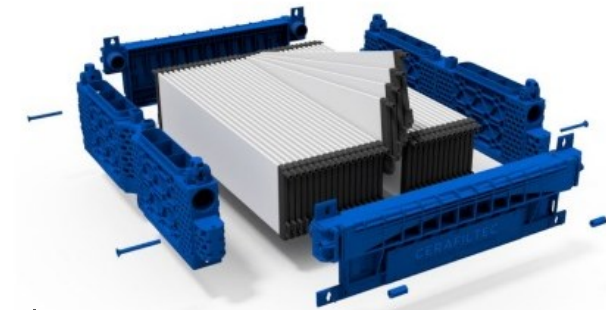
Sand filter

- Robust
- Chemical resistance
- Long life



Polymeric membranes

- High water quality
- High LRV

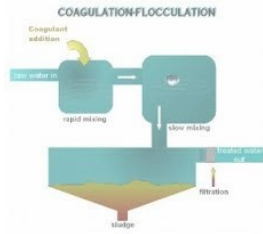


CERAFILTEC

Simplified and sustainable process enabling substantial cost savings



Source water



Coagulation



DAF



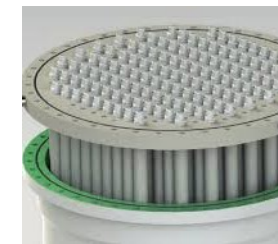
Settler



Sand filter



Polymeric UF



Cartridge filters



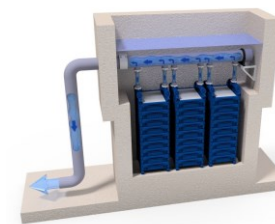
Reverse Osmosis



Source water



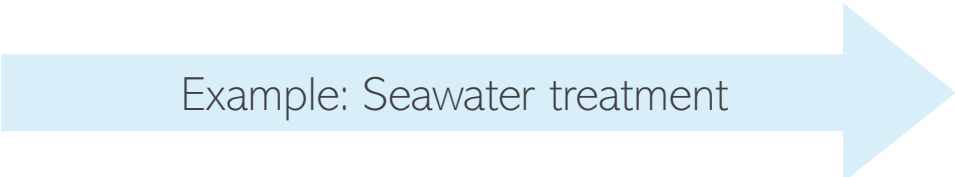
Coagulation



Ceramic UF

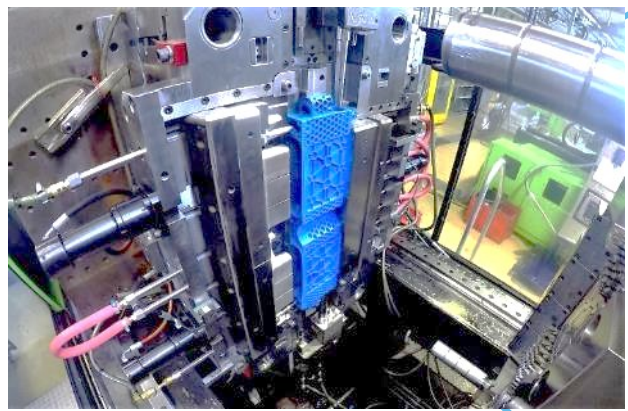


Reverse Osmosis



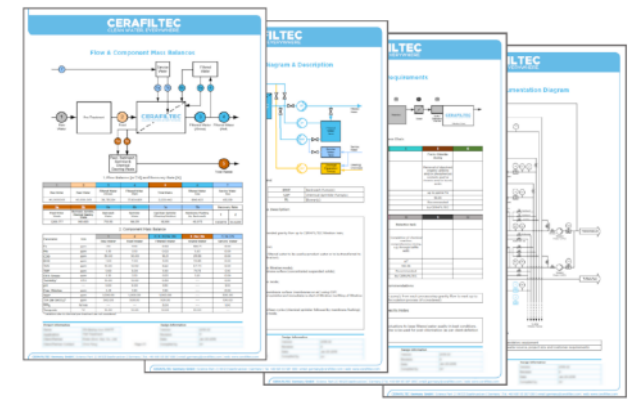
Example: Seawater treatment

CERAFILTEC - Only company worldwide able to integrate the 3 necessary success factors for ceramic membrane technology



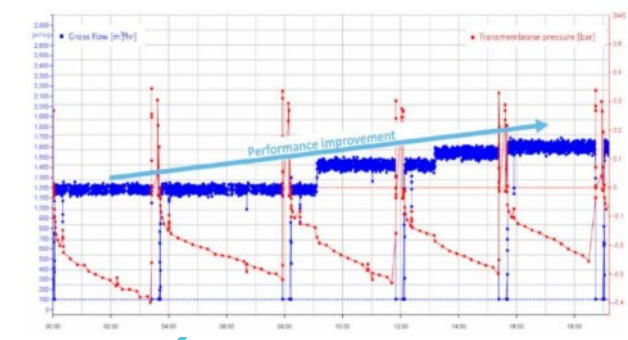
Superior production know-how

State of the art automated production



Unique process know-how

25 years of expertise and data assets of bio/chemical engineering



AI growth-based operating know-how

Adaptive remote monitoring, big data assets, digitization, industry 4.0

CERAFILTEC removes the most toxic contaminants from your water supply

- ✓ Bacteria
- ✓ Viruses
- ✓ Heavy metals
- ✓ Industrial toxins
- ✓ Priority pollutants
- ✓ Microplastics
- ✓ Radioactive isotopes
- ✓ PFAS
- ✓ Oil
- ✓ Arsenic



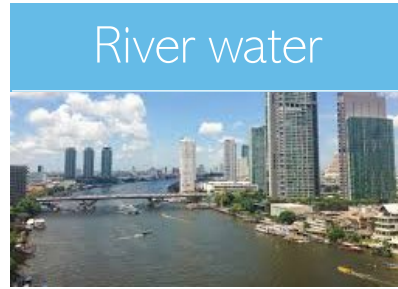
Proof-of-concept delivered at global scale.
References available upon request.

CERAFILTEC superior solutions across most important global water treatment applications

Techno-commercially superiority uncontested*



- Heavy metals
- Radioactive material
- PFAS**



- Bacteria
- E.coli
- Algae
- High turbidity
- PFAS**



- Unreliable operation with conventional systems



- Stricter treatment regulations
- Industrial toxins
- Color, odor
- Microplastics



- Oil
- Chemicals
- Heavy metals
- Carcinogenic toxins

Technical
Environment/Health
Commercial

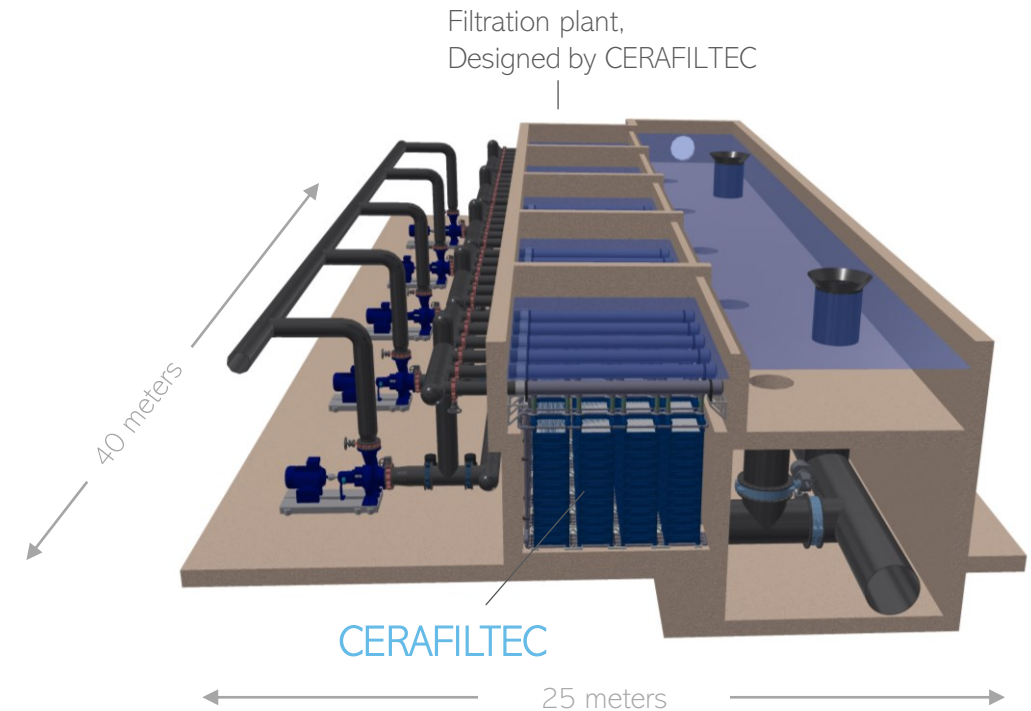
Simpler to operate, and more reliable
Higher water quality. CLEAN WATER. EVERYWHERE.
Lower Total Cost of Ownership (TCO)

*References upon request

Project illustration – water treatment plant in Middle East with water supply for 600,000 people.



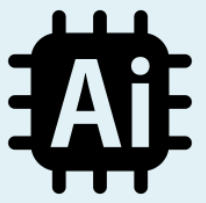


CERAFILTEC project. In operation Q4 2021



Example: Groundwater Treatment - removal of heavy metals and radioactive isotopes for municipal water supply.

CERAFILTEC cutting edge Industry 4.0 cloud solutions – in Beta Version

-  Cloud monitoring
-  Industry 4.0
-  Predictive analytics

CERAFILTEC Smart-Box collecting key operating parameters

- Pressure
- Flow
- pH
- Turbidity
- Temperature
- ORP
- SAK254



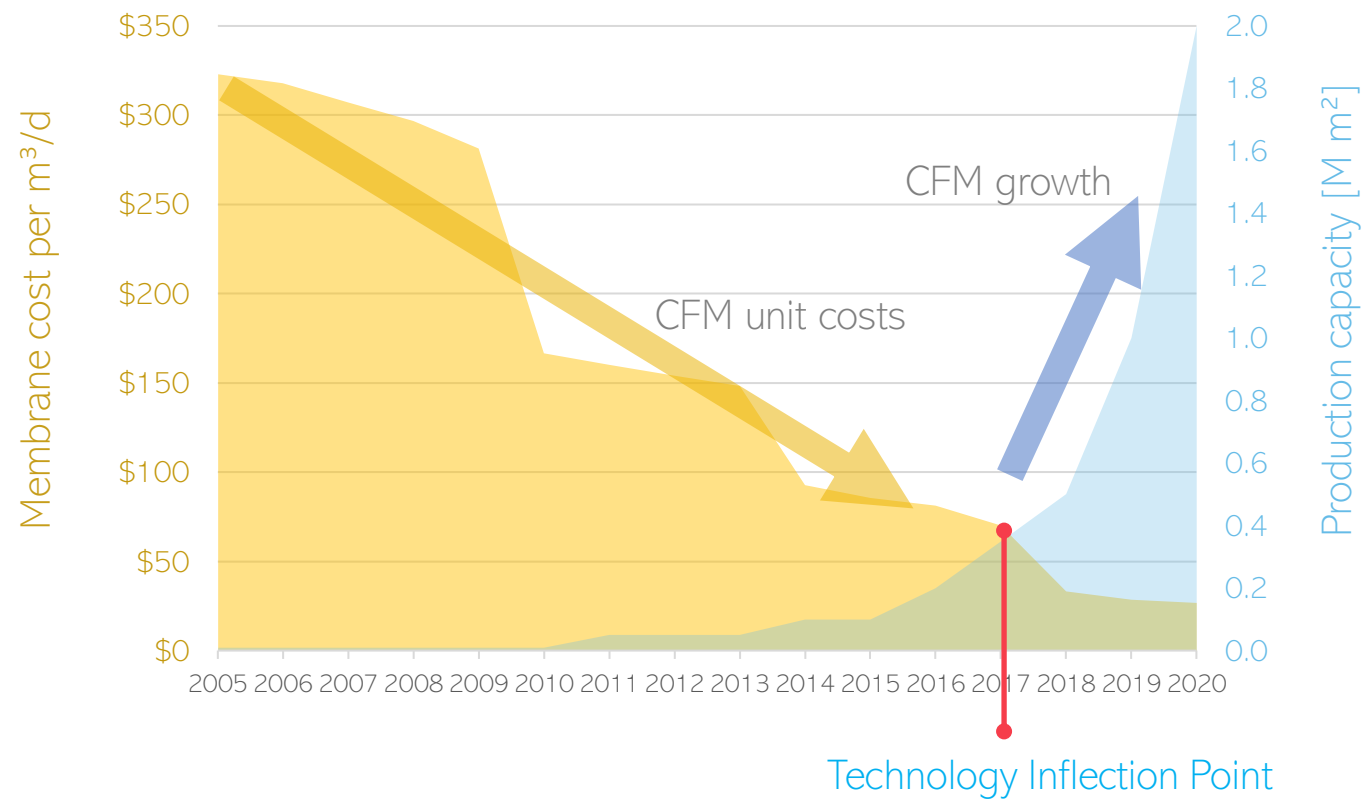
- Online monitoring**
Data assets & with predictive maintenance
- Extended warranty**
- Performance guarantees**

Specific costs of ceramic flat membranes sharply decreasing.

Ceramic membrane price advantage and performance leapfrogging.

Polymeric membranes matured and outdated – periodic replacements.

CFM CAPEX to treat 1,000 liters per day for 10 years vs CFM industry growth



Ceramic flat membrane (CFM) - indisputably best economics and only technology choice for \$8bn market (12% CAGR)

Project example: Seawater project with 99.6 million liters per day capacity

	Polymeric membrane today (matured - no \$ decrease)	Ceramic flat membrane 2010	CERAFILTEC 2021/2022
CAPEX	\$ 2,034,000	\$ 5,6440,000	\$ 1,630,000
Annual OPEX	\$ 857,000	\$ 1,044,000	\$ 471,000

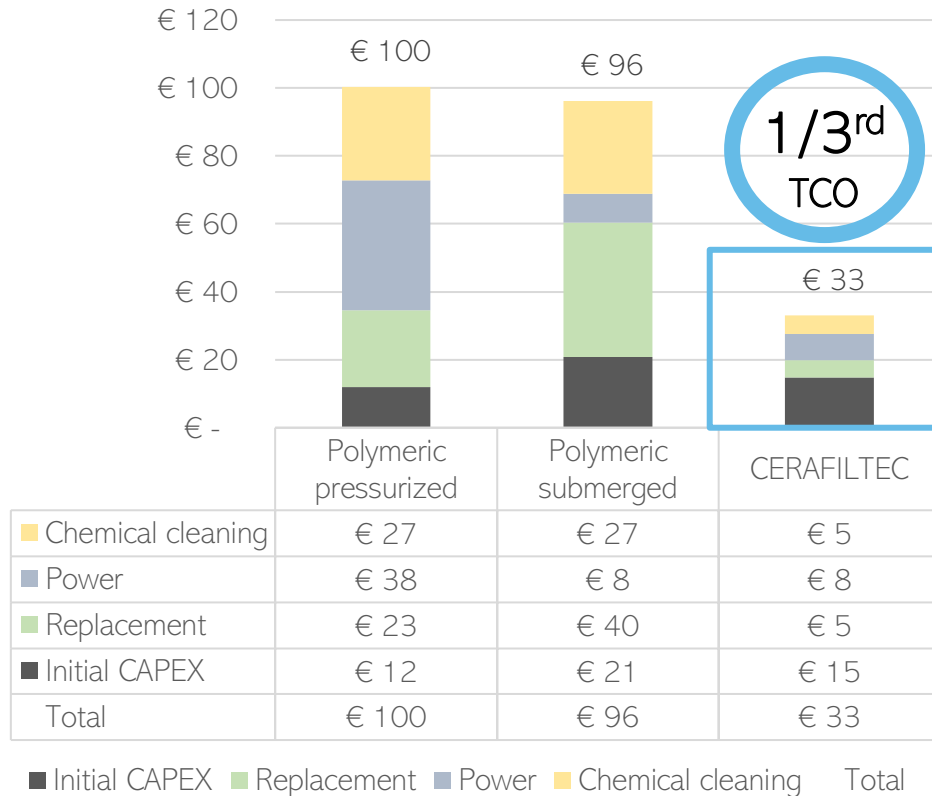
Lower CAPEX and lower OPEX
than polymeric membranes

Ceramic flat membrane unit economics constantly improving. Trend continuous. Polymeric membrane already matured 10 years ago. Therefore, unavoidable technology shift.

Total Cost of Ownership clearly in favor of Ceramic Flat Membranes (example groundwater)

Membrane TCO (15 yrs.)
per m³/d filtration capacity

20,000m³/d
groundwater plant



CAPEX

CFM Membranes	€ 300K
Systems CAPEX	€ 300K
Total Cost	€ 600K

OPEX

Power consumption	€ 0.003/m ³
Chemical consumption	€ 0.005/m ³
Total OPEX	€ 0.008/m³

No sand filter needed; no clarifier needed
10-20 years membrane life

Transformation due to basic economic forces: When you need a cup to drink water for the next 30 years and a ceramic cup now costs less than the plastic cup, then the entire \$8bn “plastic cup market” will start to buy ceramic cups. Precisely analog the current global technology shift in the filtration market.

- Higher costs
- Breaks easily
- Shorter life
- More waste
- Decaying water quality



- Lower costs
- Longer life
- Less waste
- Less energy
- Better water quality

Simply greater value at now
lowest costs, and ESG

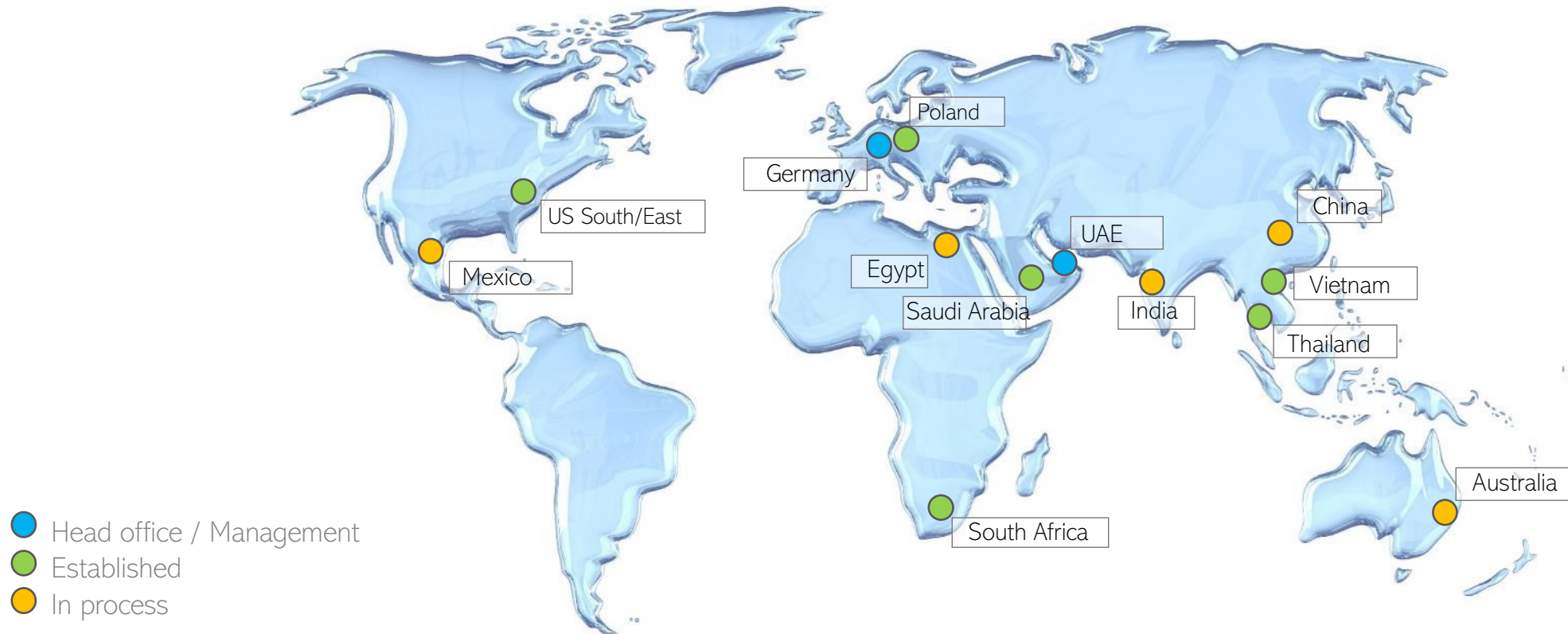
Proven Global Track Record

Region	Application	Water capacity	People Equivalent*
Saudi Arabia	Municipal water supply	143,000 m ³ /d	1.4 million people
Jordan	Municipal water supply	13,000 m ³ /d	130,000 people
South Africa	Coca Cola beverage	4,800 m ³ /d	48,000 people
Thailand	Municipal sewage reuse	3,000 m ³ /d	30,000 people
China	Industrial sewage reuse	2,500 m ³ /d	25,000 people
USA	Municipal water supply	1,250 m ³ /d	12,500 people
South Africa	Seawater private industry	460 m ³ /d	4,600 people
USA	Industrial sewage	200 m ³ /d	2,000 people
Georgia	Mining water/heavy metals	100 m ³ /d	1,000 people

Selected references from 98 projects in 28 countries

* People equivalent considers average consumption of 100 liters per person per day

CERAFILTEC operates globally



Replacement of sand filters. Brownfield BOT. Customer's ROI < 3 years

Project details

Location	Jordan
Capacity	13,500m ³ /d
Water source	Ground/brackish
Use	Municipal drinking



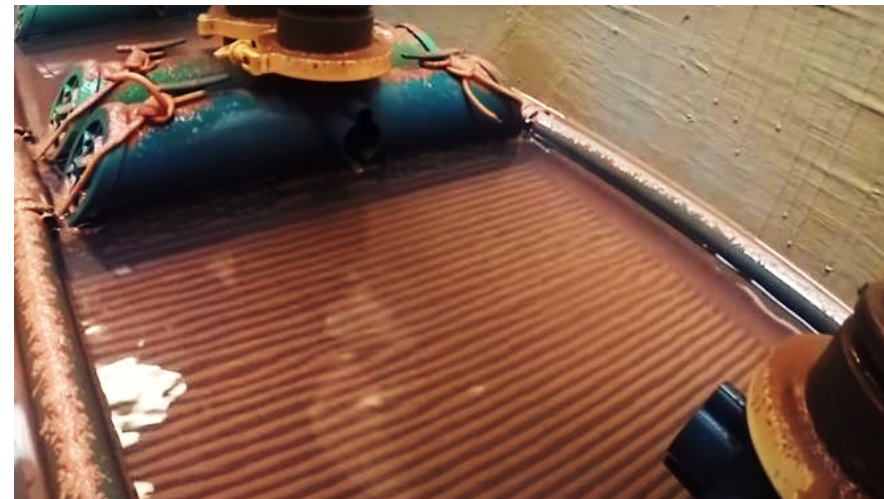
Main Challenges Before Replacement

- Fe >10 mg/l in feed water
- Sand filters failing
- Bad filtered water quality
- High RO replacement costs
- Lower recovery rate

Continued: Replacement of sand filters. Brownfield BOT. ROI < 3 years

CERAFILTEC solution

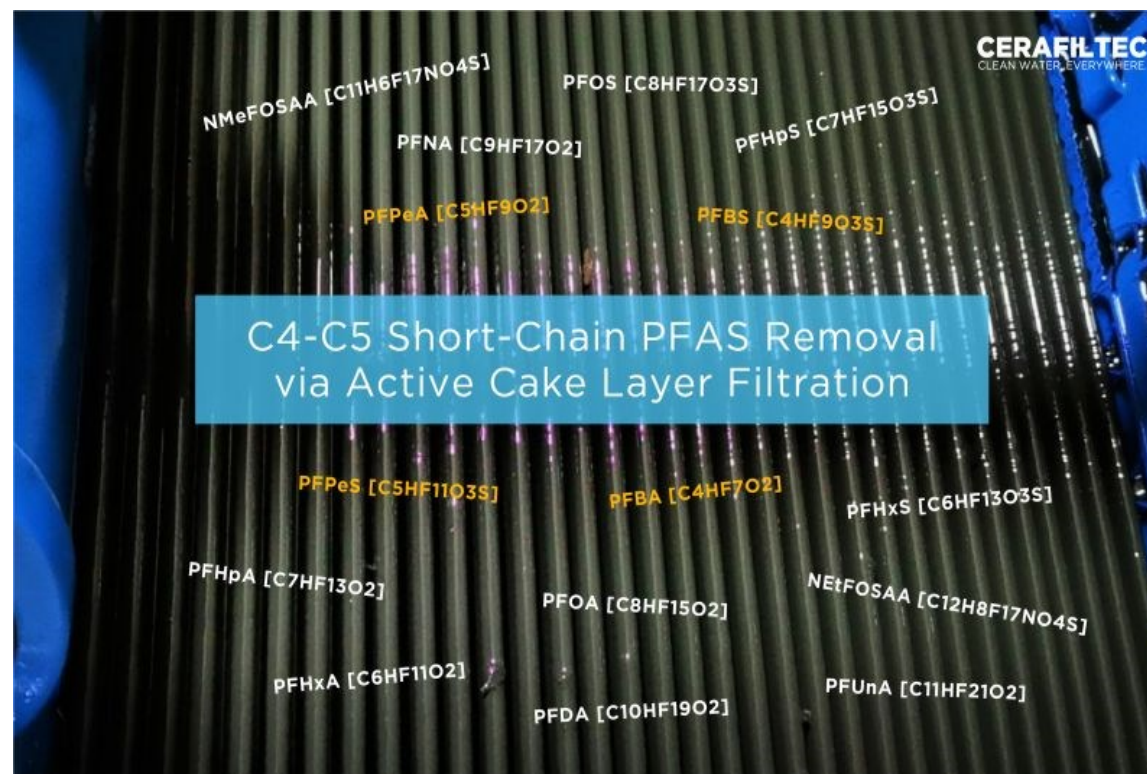
Recovery rate	99.4%
Power consumption	0.025 kWh/m ³
Flux rate	750 LMH (10x higher than polymeric)
Backwash frequency	Every 12 hours
Iron (Fe) – in feed	10 mg/l
Iron (Fe) – in tank	3,000 mg/l
Iron (Fe) - filtered	0.02 mg/l
Turbidity	<0.2 NTU



>99% removal of PFAS (short and long chain)

CERAFILTEC PFAS removal from 4-month continuous flow (6gpm) demonstration with PFAS peak of 1,600ppt

	Feed In ppt	Filtered In ppt	% removal In ppt
Total PFAS	313	0.88	99.7%
PFBS	130	0.65	99.5%
PFBA	15	ND	100%
PFHxA	29	0.23	99.2%
PFOS	54	ND	100%
PFOA	30	ND	100%
PFPeS	0.95	ND	100%
PFPeA	31	ND	100%



Orange = short chain PFAS

Removal of Taste, Color, Odor (MIB, Geosmin), dissolved TOC/COD/BOD

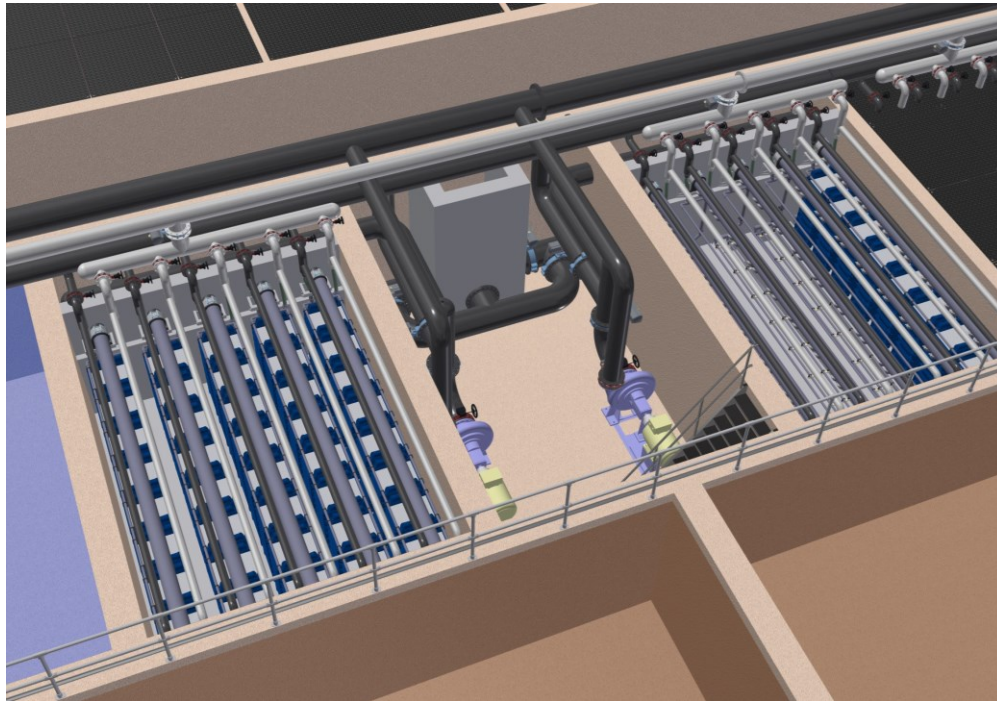
Ideal for drinking water and tertiary treatment

- ✓ PAC dosing on demand
- ✓ PAC directly into the filtration tank
- ✓ No PAC dosing limits
- ✓ No extra GAC or other post treatment required
- ✓ Ultra-filtration + ideal activated carbon treatment in one step



Sand filter rehabilitation (for water and tertiary treatment). 2-4x capacity. Better water quality.

Modular CERAFILTEC modules fitting into any existing tanks

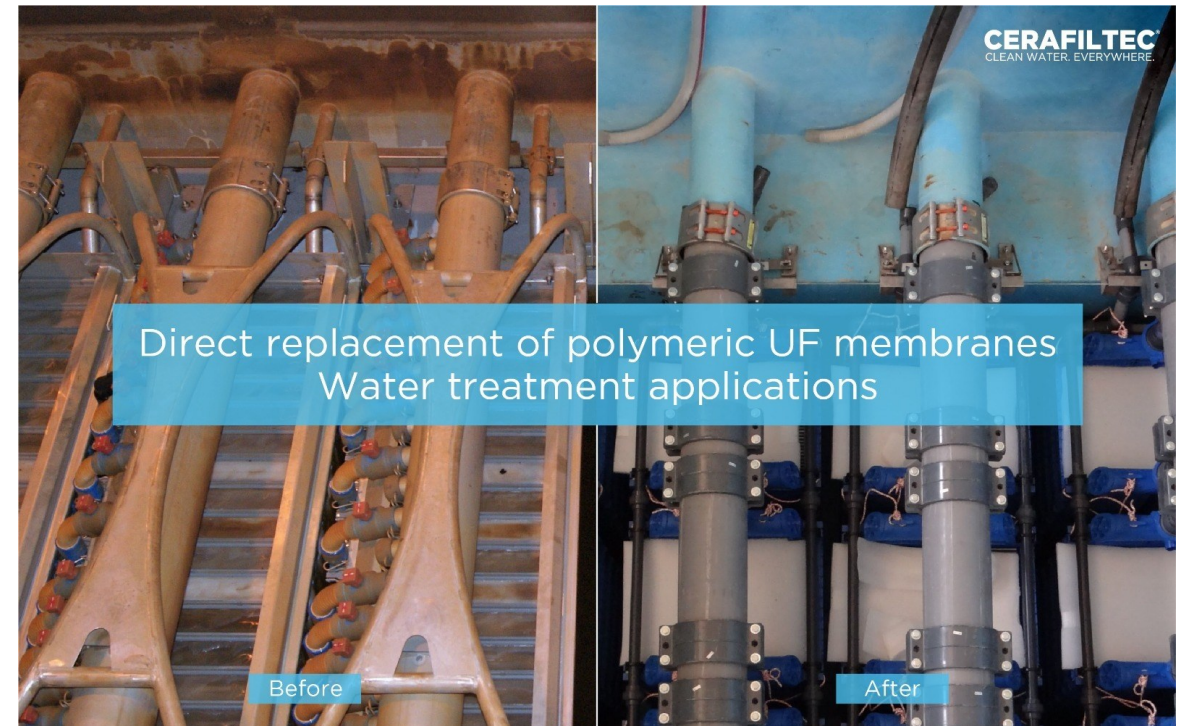
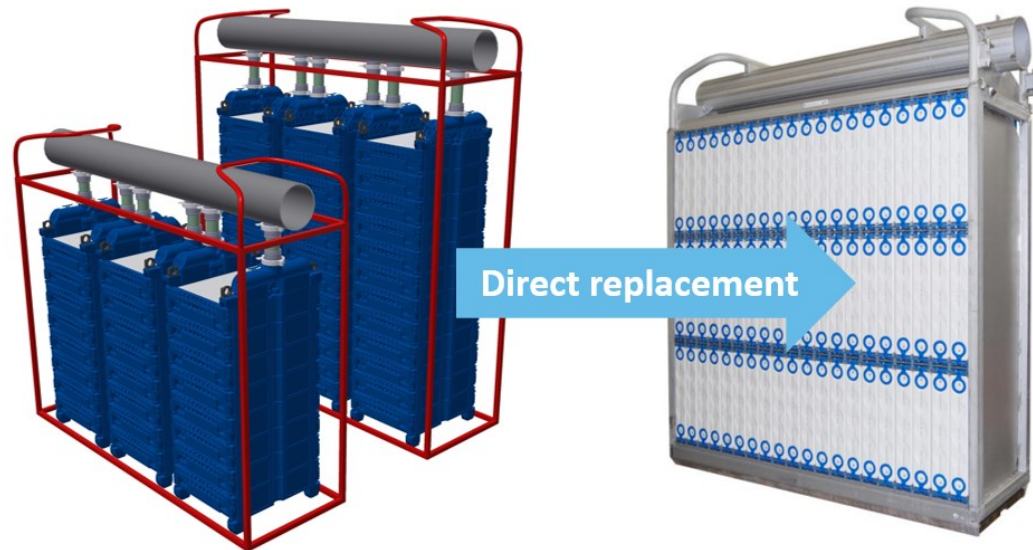


Or tank-in-tank design for fast installation and offsite assembly



Direct polymeric membrane replacement (ZW 500, ZW 1,000, Memcor etc.)

No more fiber breakages. Higher water recovery. Lower chemical consumption. PAC dosing possible. Resistant to peak events and chemicals. Lower Total Cost of Ownership.



Greenfield. Treated sewage effluent polishing for chillers/RO from oily sewage. ROI <4.5 years

- Capacity: 4,800m³/d
- Installed 2019
- Coca Cola, South Africa
- Main challenge: fluctuation in hardness and silica
- Simplified process; achieved reliable operation, increased recovery rate, substantial OPEX savings.
- Recovery rate increase 87% -> 96%
- Alternative solutions failed



Greenfield. Treated sewage effluent polishing for chillers/RO from oily sewage. ROI <4.5 years

- Capacity: 2,400m³/d
- Installed 2019, Thailand
- Main challenge: Treated sewage effluent with 7ppm oil and algae
- Turning unusable water into a reliable water source for chillers.
- Customer saving twice:
 - Reduction tap water bill
 - Reduced sewage discharge bill



Contact us for a techno-commercial benchmark using CERAFILTEC at YOUR plant. *Germany@cerafiltec.com*

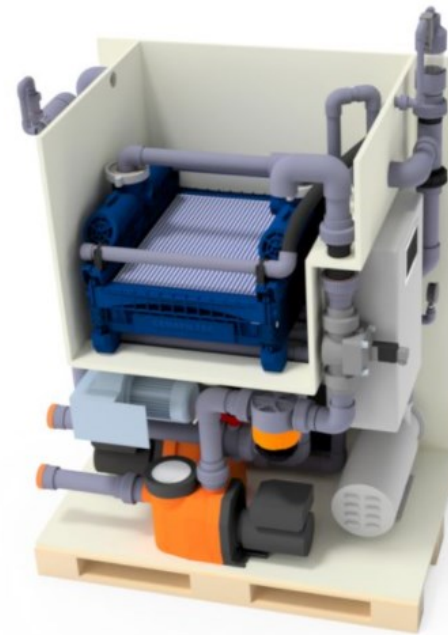
We can come onsite to prove the benefits:



Suitcase unit

3-5L / hr.

1-day onsite
validation



Skid unit

3-5m³ / hr.

Weeks/months long
validation

A dynamic splash of water in shades of blue, with many droplets and ripples, creating a sense of movement and freshness. The water is splashing upwards and outwards from the bottom right towards the top left.

CERAFILTEC Germany GmbH

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[Company video](#)

[Website](#)