



Crystar® FT ceramic membrane filters from Saint-Gobain offer longer life, corrosion and erosion resistance and the highest flux of any membranes on the market.

Advanced silicon carbide membranes from Saint-Gobain can remove total suspended solids, hydrocarbons (oil) and bacteria. Crystar® FT filters offer the highest flux of any membrane materials.

Advanced silicon carbide membranes are chemically robust, and abrasion and erosion resistant. These membranes can be run in high temperature conditions and exhibit minimal fouling. Membranes can be cleaned in place to maintain consistent flux. This results in consistent output, reduced maintenance, and lower equipment and labor costs.

Saint-Gobain Performance Ceramics & Refractories manufactures recrystallized silicon carbide (R-SiC) microfiltration membranes in crossflow and dead-end configurations with several membranes pore sizes, for a wide range of demanding applications. Using advanced R-SiC membranes from Saint-Gobain significantly increased the productivity of filtration processes, reduces the equipment footprint and operating costs and decreases chemical and water usages.

Features & Benefits:

- Excellent corrosion resistance vs. concentrated lyes and acids
- Ability to withstand high frequency back pulsing cycles
- Thermal stability up to 1000°C in air
- High chemical and pH compatibility
- Excellent permeability and ability to handle high solid concentration, e.g. SiC slurries with up to 75% solid content
- Easy cleaning by a variety of methods, e.g. thermal and chemical treatment or back pressure pulses
- High pressure stability
- High flux
- Long operational life

Crystar® FT recrystallized SiC membranes

Saint-Gobain Ceramic Materials is an institution in the field of advanced engineered materials, providing unmatched expertise when it comes to ceramics technology. More specifically, Saint-Gobain Performance Ceramics & Refractories have been providing unique and high added value silicon carbide-based solutions for decades, including the first-to-market recrystallized silicon carbide (R-SiC) product. This outstanding ceramic forms the basis of our Crystar® filtration technology (FT).

Products

	<p><u>Crystar® Dead-End Technology</u> Crystar® dead-end filtration components are monolith components with a unique honeycomb structure allowing great compactness and efficient operation. They are certified for swimming pool and drinking water according to USA norm NSF 50/61.</p>
	<p><u>Crystar® FT Cross-Flow Technology</u> Crystar® crossflow filtration components comprise tubular components fabricated from multiple layers of recrystallized silicon carbide. They have the most permeable carriers on the market, which enables high permeate transfer and very effective backwash or back flush operations. They are certified for food contact according to EU regulation 1935-2004.</p>

Crystar FT® silicon carbide membranes for filtration applications

Crystar® FT membranes, using porous re-crystallized silicon carbide (R-SiC), have everything a liquid filtration membrane needs. They are chemically robust and withstand high corrosive solvents, such as strong acids, lye or concentrated NaOH solutions (pH 0 to pH 14), they endure high temperatures with excellent thermal shock resistance and exhibit low fouling behavior, especially to organic matter.

Thanks to these outstanding properties, Crystar® FT filters are optimal for a wide range of filtration applications, including wine and beer clarification, municipal drinking water treatment, oil and gas produced water cleaning, industrial wastewater purification, swimming pool water preparation, as well as other liquid treatment processes.

Crystar® FT membranes can withstand harsh clean in place (CIP) chemical cleaning to fully recover their initial permeability. The cleaning cycles, typically at 40° C to 80° C, can be performed with fast temperature ramp-up and cool down so as to reduce the filtration system downtime. Following cleaning, the filters are practically in an “as new” state. This results in consistent output, reduced maintenance and lower equipment and labor costs. Back flushing or backwashing with air or permeate can also be efficiently carried out thanks to very high permeability of the carrier. These intermediated cleaning operations allow extending the filtration cycles in between CIP's.

Saint-Gobain manufactures Crystar® FT filters via a multi-step process where the membrane is applied onto the channel walls of a porous R-SiC carrier structure. The carrier material is extruded to form honeycombs or multi-channel tubular shapes. The tailored, multi-layer membrane on top of the carrier consists of R-SiC as well, and serves as the functional layer in the filtration process. Two configurations are available.

Cross flow filtration:

Tubular crossflow filters are used for the clarification of wine and for the treatment of industrial effluents, among other applications. Source: Saint-Gobain Performance Ceramics & Refractories

- Crossflow filtration uses a selective porous membrane that filters highly loaded liquids for purification or clarification. Tubular crossflow filters have been used for the clarification of wine, along with the filtration of dairy, fruit juices and water, for chemical recovery and for the treatment of challenging industrial effluents.
- Crossflow filtration gets its name because the majority of the feed flow travels longitudinally along the surface of the filter channels, whereas the filtered permeate flows radially through the carrier porosity. The structure of the traditional crossflow filters is tubular and consists of a carrier that is the base material, and on top of it is the filtration membrane, which is a thin, porous layer applied on the carrier.

The efficiency of crossflow filtration technology to treat highly loaded and high fouling streams, makes it widely used in industries around the globe. Crystar® FT ceramic membranes are the next generation of ceramic microfiltration.

Dead end filtration:

In dead end filtration, all the water that enters the channels of the filter is pressed through the membrane. The filters developed by Saint-Gobain consist of multiple parallel channels that are alternately open and closed at the inlet and outlet faces. The water enters through the inlet channels, is filtered by a membrane with fine pores, passes through the wall of the channel and leaves the filter through the outlet channels. Dead end filters have parallel channels that are alternatively open and closed.

Gobain Performance Ceramics & Refractories :

This filtration technology is more economical than the crossflow one in terms of energy consumption. The high surface area honeycomb geometry is extremely compact. Combined with the specific properties of the R-SiC carrier and membrane, high permeate fluxes can be achieved at low operation pressures, with very good filtration efficiency for microorganisms and suspended solids. Water consumption for backwash operations is very low.

Applications include drinking water production from surface water or groundwater, swimming pool filtration and pretreatment for reverse osmosis in seawater desalination.

For more information, visit our new web : www.crystarfiltration.saint-gobain.com.

Crystar® FT Ceramic Membrane Filters

How will you deal with produced water?



From public outcry about the environmental impact of fracking, to disposal regulations, limited number of disposal wells, and trucking and infrastructure issues, the focus on water recycling is becoming more critical than ever.

Water resources are becoming scarce. Cost effective water recycling is critical to the success of the expanding global fracking oil and gas activities.

Using advanced silicon carbide membranes from Saint-Gobain significantly reduces the equipment footprint, capital costs, shortens the water treatment process and reduces chemical usage.

Saint-Gobain is a worldwide leader in combining material and forming process expertise with application understanding to offer standard and customized ceramic membranes for challenging liquid filtration applications.

Ceramic filter applications

- Applications that involve extreme conditions, such as extreme high temperatures, pressures or pressure pulses and high corrosive solvents such as strong acids or lyes.
- Filtration of media containing abrasive particles or for high solids bulk processes.

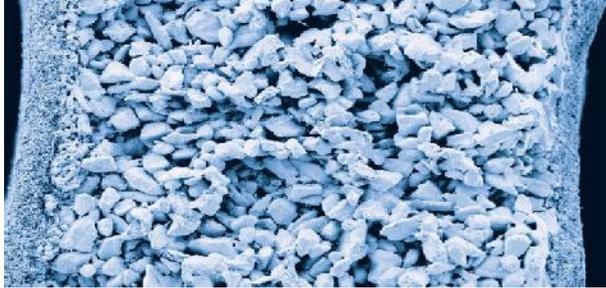
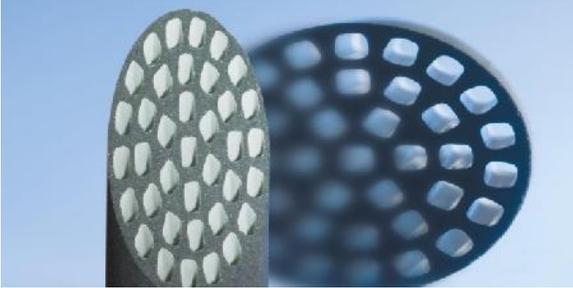
Features & Benefits:

Customers can benefit from Using Crystar® FT ceramic filters instead of Al₂O₃ or polymer systems.

<ul style="list-style-type: none"> • Excellent corrosion resistance vs. concentrated lyes and acids • Thermal stability up to 1000°C in air • Excellent permeability and ability to handle high solid concentration, e.g. SiC slurries with up to 75% solid content • High pressure stability • High flux 	<ul style="list-style-type: none"> • Ability to withstand high frequency backpulsing cycles • High chemical and pH compatibility • Easy cleaning by a variety of methods, e.g. thermal and chemical treatment or back pressure pulses • Long operational life
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Crystar® filter technology (CFT): Ceramic filters are made of recrystallized SiC (RSiC).

Crystar® FT ceramic filters are typically made of:

A multilayer membrane that is the functional layer for the different filtration processes	A carrier material, whose particular features are the high porosity and large pores ($D_{50} > 25$ micron), that provide excellent permeability
	

Specifications

Typical properties of Crystar® FT (Carrier material)	
SiC content	99%
Chemical resistance	0 to 14 PH value
Maximum application temperature	< 1000°C (in air)
Porosity	40%
Thermal expansion (20° - 1100°C)	4.8 K ⁻¹ *10 ⁻⁶
Pore size	30 micron
Flux (carrier)*	140 m ³ /m ² */bar/h
Back pulse pressure	max. 6 bar
Cracking pressure	> 100 bar
Tolerable transmembrane pressure	max. 6 bar
Filter area (Ø = 32 mm, L = 1000 mm)	0.42 m ²
Weight	< 1000 g/m

* Area of filter carrier: tube of Ø 30.5 mm (mean Ø of outer wall)

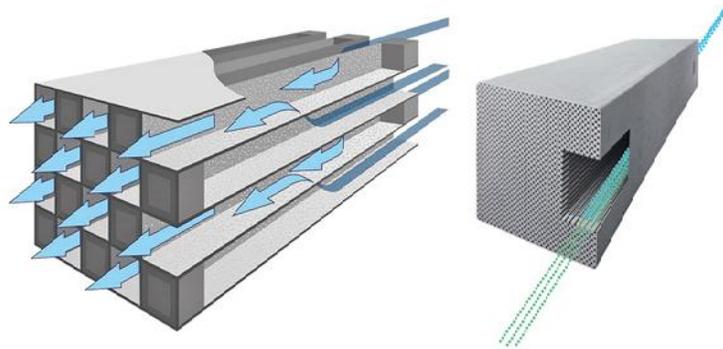
Case Study :

Membranes Crystar® HiPur and HiFlo: a revolution in recreational water filtration!

Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the wellbeing of each of us and the future of all. The development of Crystar® ceramic membranes perfectly reflects this strategy: a filtration technology that improves recreational water quality assures the safety of swimmers and ensures their wellbeing to the fullest.

Crystar® Filtration Technology is the product of years of R&D carried out in Germany and France. These filtration membranes are made of recrystallized silicon carbide, a special ceramic that exhibits unmatched permeability to water and excellent resistance to chemicals and abrasion. As a result, these membranes have long lifetimes and offer significant energy savings to the users.

Another key benefit of Crystar® FT is the filtrate water quality, which is close to drinking water (reduce turbidity by 40%, reduce chloramines by 40%, reduce trihalomethanes by 30% when compared to sand filters). This is all the more important in public pools, a very good medium for growth and proliferation of dangerous microbes. The reduction in chloramines makes the water less irritating for the skin and eyes, and reduces the risk of respiratory diseases for people frequently using indoor pools.

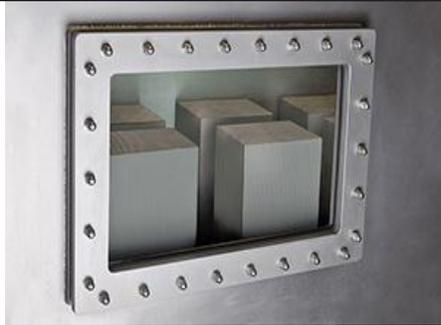


The honeycomb structure of the filtration membrane has channels alternatively plugged at inlet and outlet surfaces.

The filtration membranes have external dimensions of only 149 x 149 x 1000 mm, but provide 11 m² of filtration area thanks to their internal honeycomb geometry. These ceramic parts are installed in housings that connect them to the filtration system.

This specific geometry allows for fast backwash cycles with low water consumption. Indeed,

current users report reduction in backwash water consumption up to 70% when compared to sand filters. Only 30-60 liters are enough to clean a CRYSTAR® FT membrane.



With a housing (2000 x 1 800 x 650 mm) containing 12 Crystar® HiPur membranes, a filtration capacity Of 72 m3/h can be reached. With Crystar® HiFlo, the same housing will have a filtration capacity of 170 m3/h.

The use of a filtration medium with a well- engineered and controlled pore size ensures a superior and reliable removal of particles and microorganisms. As an example, Crystar® HiFlo membranes can remove Cryptosporidium, a dangerous and chlorine-resistant microbe, with 99.996% efficiency, according to a recent study performed at the University of North Carolina – Charlotte in the USA.

It is worth noting that the first filtration system equipped with Crystar® membranes was installed in Rödental, Germany, in 2012. During many months, the water quality of the pool was rigorously checked following the DIN norm 19643 and exceeded by far all its requirements.

Other swimming pools in Germany, Norway, Sweden and France have adopted this innovative filtration technology.

With Crystar® FT, Saint-Gobain provides pool owners with a filtration technology that lowers operational costs. Furthermore, it reduces the environmental impact (water, energy and chemicals consumption) and increases water safety for swimmers.

SOLVE YOUR LIQUID FILTRATION CHALLENGES WITH CRYSTAR® SiC CERAMIC MEMBRANES!

About Crystar® Filtration

Crystar® filtration technology comprehends high purity recrystallized silicon carbide ceramic membranes, delivering advanced liquid microfiltration for applications encompassing beverage clarification...

[History and Expertise with Cutting Edge Ceramic Materials](#)

Saint-Gobain Ceramic Materials is an institution in the field of advanced engineered materials, providing unmatched expertise when it comes to ceramics technology. More specifically, Saint-Gobain Performance Ceramics & Refractories have been providing unique and high added value silicon carbide-based solutions for decades, including the first-to-market recrystallized silicon carbide (R-SiC) product. This outstanding ceramic forms the basis of our Crystar® filtration technology.

Crystar® FT is designed for liquid purity, security, and sustainability. The demands of filtration have changed dramatically over the years, as growing global population forces industries to adopt more demanding processing capabilities to satisfy the needs of global sustainability efforts. This technology is central to the sustainability vision of Saint-Gobain.

[Sustainability Vision of Saint-Gobain](#)

We classify sustainability as a megatrend. This is an over-arching belief that commands the directions of the business world for an extended period. It has changed the way we conduct ourselves from day-to-day, and how industries operate on a massive scale. Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the well being of each of us and the future of all. They provide comfort, performance and safety while addressing the challenges of sustainable construction, resource efficiency and climate change.

With Crystar® FT membranes, Saint-Gobain is committed to improving the sustainability of sectors as diverse as water/wastewater, industrial processes & life sciences, and recreational water, with new and innovative products.

We aim to make sustainability a driving force for every liquid filtration sector. Crystar® FT technology provides microfiltration of leading efficiency, with consistent retention, excellent filtrate quality at high fluxes, and operation with low consumption of energy, water and chemicals.

<p>Water, the World's Most Valuable Resource</p> <p>We all need water to survive. It is fundamental to our diet and a key component in industrial processes worldwide. Saint-Gobain is committed to reducing its own water usage and to improving technologies to provide better water usage for a more sustainable future.</p>	<p>Growth of the Global Population</p> <p>According to current estimates, half of the world's population will suffer from water shortages by 2050. Reducing the amount of water that we waste and improving recovery and recycling methods is critical for ensuring water security and quality for the next generation and beyond.</p>	<p>Food Scarcity and Security</p> <p>With an ever-growing and more demanding global population, it is essential that food and beverage products are safe to consume, have long shelf life stability and yields the expected nutritional benefits to humans. Our Crystar® membranes offer a consistent solution for F&B processing to meet these needs.</p>
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<p>Industrial Processes & Life Sciences</p> <p>Purity and reliability are paramount in industrial applications such as powders separation, and chemicals recovery, as well as food and beverage and biotechnology processes such as clarification and bacteria removal. Crystar® silicon carbide microfiltration can support the manufacturing of high value products with consistent retention cut-offs and long lifetime with very effective operating conditions for filtration and cleaning cycles.</p> <p>Ceramic microfiltration (MF) membranes have been used for some decades on specific applications like dairy processing or pharmaceutical broth filtration. Now the technology is also finding</p>	<p>Water & Waste Water</p> <p>Sustainability is increasingly important in every major industrial sector, with a large focus on the recovery of waste water and production of high quality process water. Additionally, increasing needs for drinking water availability, safety, and quality also calls for the development of better water treatment technologies. Crystar® ceramic microfiltration is ideal for recycling difficult industrial waste waters, for instance as a polishing step to prepare water with consistent and reliable quality prior to reverse osmosis or nanofiltration processes. Crystar membranes also provides an excellent alternative in drinking water production plants, thanks to excellent permeate qualities, high water recovery rates, low pressure operation and unmatched compactness.</p>	<p>Recreational Water</p> <p>Ceramic membranes for recreational water filtration can drastically improve the cleaning and disinfection processes of swimming pools, spas, and splash pads. They reduce the risk of swimmers encountering harmful microorganisms such as legionella, cryptosporidium, and giardia, while enhancing the water quality through a reduction of aggressive compounds such as chloramines and trihalomethanes. They are also instrumental in the manufacture of cutting-edge pool designs using compact filtration systems with low water and energy consumption.</p> <p>Pool filtration has changed. Crystar® ceramic membranes provide a new industry benchmark for water quality and cost efficiency. Conventional pool filtration systems such as sand filters fail to provide an effective barrier against various pathogenic organisms and bacteria owing to their large pore size structures. As a consequence, the efficiency of disinfection must rely only on chlorine or other chemical treatments, which can lead to the generation harmful by-products. Crystar membranes work in conjunction with chlorination and other water treatment technologies to provide safe and pleasant pool water with significant operational cost savings.</p>
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<p>additional pervasive uses in various industrial processes and life science spaces.</p> <p>Crystar® ceramic membranes have been engineered to enhance the performance of a range of microfiltration applications, with enhanced corrosion and thermal shock resistances, improved flux, and outstanding retention of extremely small particles.</p> <p>The benefits of ceramic microfiltration membranes vary depending on the application, but they all translate to enhanced productivity by enabling longer periods of filter operation and reduced downtime for mandatory maintenance and cleaning operations. Saint-Gobain's Crystar products take end users to a step further in terms of productivity, thanks to more efficient and faster cleaning processes made possible by the outstanding chemical and thermal shock resistance of recrystallized silicon carbide. Crystar® FT membranes are available in both cross flow and dead-end configurations, enabling installation in a range of process and life science facilities.</p>	<p>Improve Water Savings, Water Security, and Water Safety</p> <p>Every day, 2 million tons of sewage, industrial, and agricultural waste are discharged into the world's water. Sustainability is increasingly important for global infrastructures attempting to meet growing demands without commensurately increasing their environmental footprint. In the water and waste water sector, this translates as a desire to improve water savings, water security, and water safety. The scarcity of water has become a significant issue for the developed and the developing world. Indeed, a water gap of 40% is predicted by 2030 if no actions are taken to recover and reuse water.</p> <p>Crystar® ceramic membranes were engineered for cutting-edge water microfiltration that provides a cost-effective method for the production of drinking water and the recycling of waste water. This innovative water microfiltration technology is comprised of multiple layers of recrystallized silicon carbide, with high filtration areas and improved filtration fluxes. Crystar ceramic membranes have been engineered for both cross flow and dead-end water microfiltration, with an extensive range of potential applications in the water and waste water sector.</p>	<p><u>A Compact and Environmentally Friendly Filtration Technology</u></p> <p>Crystar® ceramic membranes filter pool water through a unique honeycomb dead-end architecture of parallel channels with stable and well-engineered porous microstructure. This specific geometry features a very high filtration area in compact filtration membrane elements (11 m² in a filtration membrane element of 149 x 149 x 1000 mm). Combined with the modular design of filtration systems, Crystar filtration technology is the perfect solution for filtration systems installation or upgrading in limited spaces or with difficult access. The honeycomb geometry also allows for fast backwash cycles with low water consumption. Only 30-80 liters are needed during a backflush of 3 to 5 seconds to clean a Crystar® membrane. Frequent backwashing of the filtration membranes contributes to the reduction of chloramines and trihalomethanes, reducing skin and eye irritation as well as the risk of diseases such as asthma and allergy due to the long-term exposure to these chlorinated compounds.</p> <p>Finally, the high permeability of recrystallized silicon carbide allows for low pressure operation, typically in the range of 0.1 to 0.5 bars (1 to 5 meters of water column). The filtration membrane elements can be built into vacuum or pressure housings depending upon the application requirements.</p> <p><u>A Physical Barrier Against Micro-Organisms</u></p> <p>Crystar® ceramic membranes feature 40% of open porosity with membranes as small as 0.25 micrometers (µm) in pore size. As a consequence, it offers a unique combination of water permeability with micro-organism retention efficiency that is vastly improved over standard pool filtration systems. The stability of the ceramic silicon carbide microstructure provides a reliable filtration barrier, contrary to granular media filters, which can be subject to gradual degradation and loss of efficiency.</p> <p><u>Crystar® HiFlo</u></p> <p>The Crystar® HiFlo membrane (4 µm pore size), for example, can retain chlorine-resistant Cryptosporidium and Giardia protozoa with an efficiency of 99.996%. Outbreaks of these dangerous micro-organisms have caused multiple pool closures all over the world. Crystar® HiFlo shows an outstanding trade-off between water filtration capacity and filtration efficiency.</p>
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<p style="text-align: center;"><u>Application :</u></p>	<p style="text-align: center;"><u>Application :</u></p>	<p><u>Crystar® HiPur</u> The Crystar® HiPur membrane (0.25 µm) can filter Legionella and Pseudomonas Aeruginosa with a measured efficiency above 99.999% and viruses with efficiencies above 98%.</p> <p>This product is suitable for therapy pools and spa filtration, providing sanitary and excellent water, with a low need for chemicals, for the comfort and enjoyment of swimmers. CONTACT :</p> <ul style="list-style-type: none"> • Document Center • Recreational Water Calculator Estimates Ceramic Membrane Requirements & Performance • Recreational Water Calculator <p style="text-align: center;"><u>Application</u></p>
<p>1. Food & Beverage</p> <p>Crystar® membranes are an ideal alternative to titanium dioxide (TiO2) and other oxide ceramic membranes, to polymeric hollow fiber membranes, as well as Kieselguhr filters in the food and beverage sector. They offer enhanced retention of suspended compounds of organic and inorganic compositions combined with higher permeate flux, significantly reducing the turbidity of processed liquids for superior food and beverage filtration. Our Crystar® products have been used to make the clarification and stabilization of beer products more cost-effective and to enhance coconut water clarification.</p>	<p>1. Industrial Waste Water</p> <p>Industrial waste water is responsible for as much as 16% of the world’s annual freshwater withdrawals. This effluent is typically comprised of particulate media, microorganisms, and chemicals which can harm ecosystems and infiltrate the human drinking water supply. Crystar® FT is poised to interrupt this cycle of consumption and pollution by providing a cost-effective solution for the filtration of aggressive industrial wastewater as part of the water recycling process.</p> <p>2. Oil & Gas Produced Water</p> <p>There has been no simple and cost-effective solution for recycling oil and gas produced water, given the difficulties in</p>	<p>1. Swimming Pool Owners</p> <p>Crystar® ceramic membranes provide a myriad of benefits to the recreational water space. Pool filtration systems equipped with permeable and durable silicon carbide membranes are operable at <u>low pressures and can be integrated into individual or pressure housings to optimize the cleaning and disinfection processes of leisure pools, spas, and more</u></p> <p>2. System Integrators</p> <p>Numerous recreational water facilities still rely on technologies that repeatedly fail to meet modern standards of pool water safety. These systems rely on rudimentary designs to filter particulate matter from recreational water with limited degrees of success, and higher water and energy demands compared to emerging ceramic filtration technologies.</p> <p>3. Swimmers</p> <p>Swimming and leisure are synonymous. Enjoying recreational water in a facility near home or abroad <u>can be equally enjoyable and healthy – but it often comes with unpleasant drawbacks. New</u></p>

2. Biotechnology

Biotechnology is a growing sector that is intrinsically concerned with sustainability and complex scientific processes. Microfiltration membranes with well-controlled pore sizes for consistent and reliable selectivity are critical, for instance, in the process of recovering or pre-filtration of fermentation broth. Crystar® membranes provide a myriad of benefits such as clarifying and protecting from undesired microorganisms in advanced solutions of heterogeneous consistencies.

3. Chemical Recovery

Solvent, acid or alkaline solutions recovery in industrial processes is increasingly important to global sustainability efforts. Chemical recovery stands to benefit from ceramic microfiltration due to the unmatched corrosion resistance of Crystar® products. They can provide unparalleled microfiltration of chemicals in harsh pH and temperature conditions with high stability for improved component longevity.

polishing oily wastewater in extremely high volumes. Latest estimates suggest that the US alone generates 60 million barrels of high salinity water with high biological oxygen demand (BOD) every day. Crystar® FT introduces an innovative method for ethical oil and gas wastewater disposal, or for its efficient reuse, for instance as water re-injection.

3. Drinking Water

Drinking water microfiltration must be carried out to uncompromising degrees of security and consistency. Crystar® liquid filtration technology offers excellent levels of efficiency in terms of microorganism retention and particulate removal, combined with unmatched filtration fluxes and water productivity. With fast and efficient cleaning procedures, Crystar ceramic membrane technology provides a very compact and cost-effective filtration process.

technologies are emerging to combat the risks of swimming pools and offset outdated filtration systems.