Tratamiento
Digestato

ENERGRUP

¿QUE ES EL DIGESTATO?

El digestato es el producto orgánico resultante de la digestión anaerobica en plantas de biogás, donde los microorganismos transforman la materia orgánica en biogás y este biofertilizante natural. Rico en nutrientes, representa una solución sostenible que convierte residuos en recursos valiosos para la agricultura, sustituyendo fertilizantes químicos y promoviendo la economía circular.

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Problema del Digestato

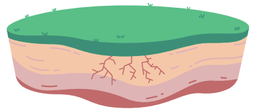
Si bien su apariencia no sugiere riesgos evidentes, una mala gestión puede desencadenar problemas ambientales significativos.

Contaminación de Aguas

La filtración de digestato puede contaminar aguas superficiales y subterráneas. Al contener un exceso de nutrientes puede provocar eutrofización y afectar al ecosistema acuático

Emisiones atmosféricas

Un almacenamiento o aplicación inadecuado genera emisiones de gases de efecto invernadero (CH4 y N2O) y NH3 contrubuyendo al cambio climático y a la contaminación del aire



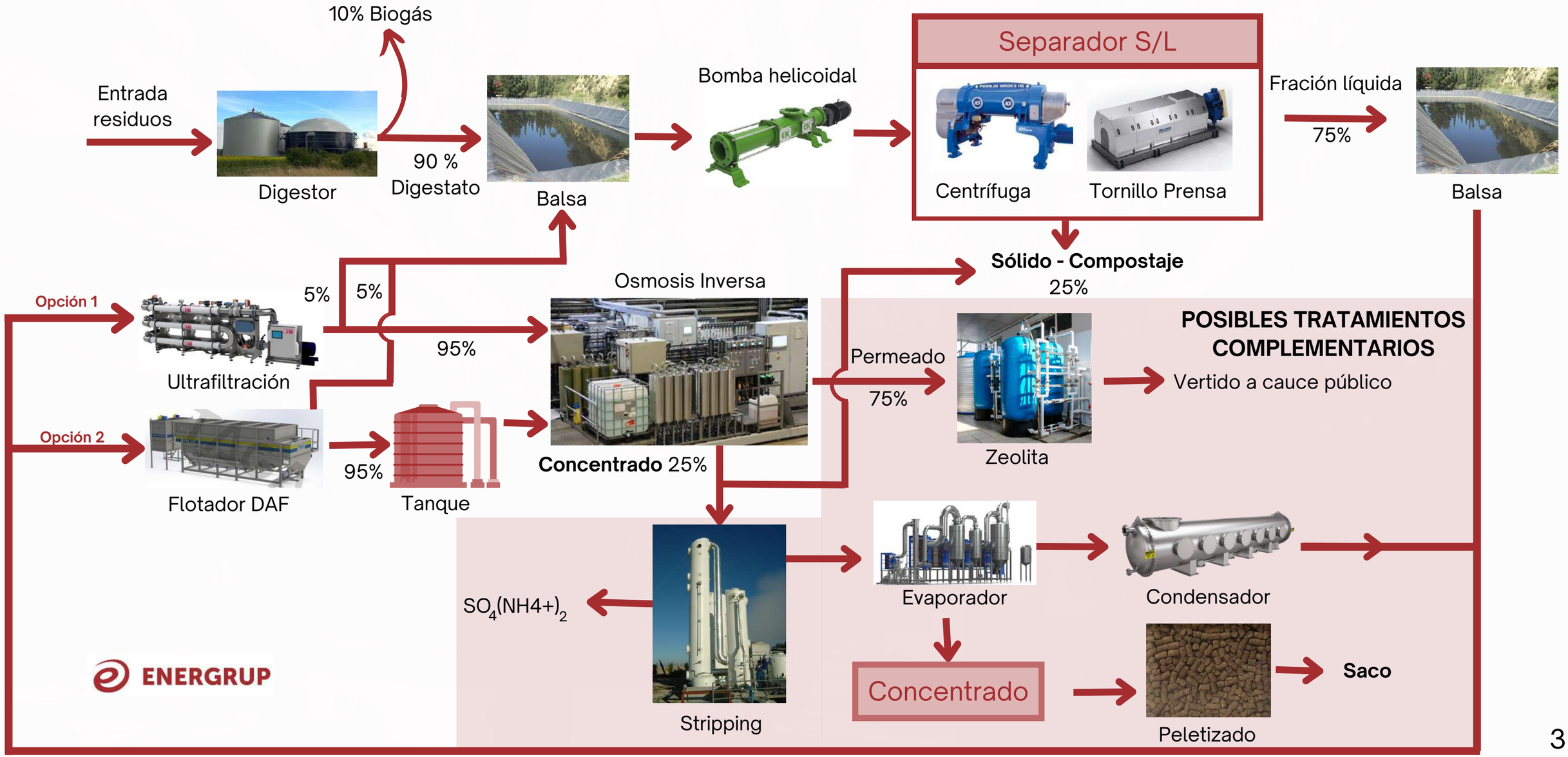
Desequilibrio del suelo

"El elevado contenido de nitrógeno y fósforo en el digestato puede provocar la eutrofización de los suelos, alterando su equilibrio natural y reduciendo su capacidad para sustentar cultivos

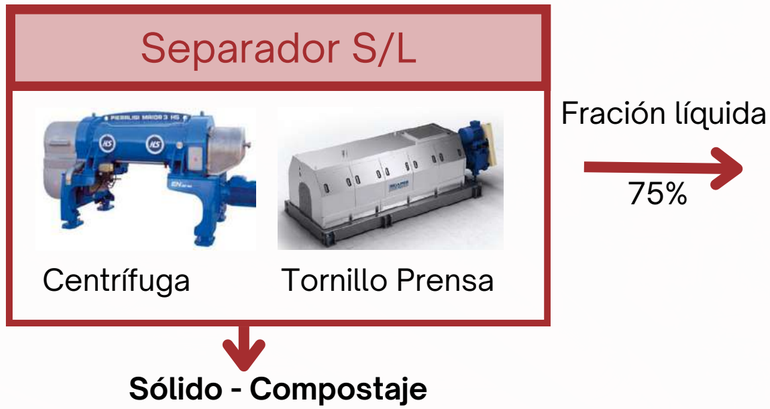
Soluciones

ENERGRUP

Etapas del proceso



Etapas del proceso



Función Separador S/L

- Separar eficientemente los sólidos y líquidos presentes en el digestato
- Obtención fracción semi-sólida con alta concentración de SST
- Obtención del clarificado con baja concentración de sólidos. Se tratará en fases posteriores

Tecnologías empleadas

1. Centrífuga : Alta eficiencia en la separación del digestato, ideal para sólidos finos y partículas pequeñas.
2. Tornillo prensa: Requiere menor mantenimiento y consumo energético, adecuada para digestato con mayor contenido de sólidos

Consideraciones técnicas

- Selección del equipo según la receta del digestato
- Posibilidad de optimizar la separación con el uso de floculantes y coagulantes
- Adaptación de la tecnología según necesidades cliente

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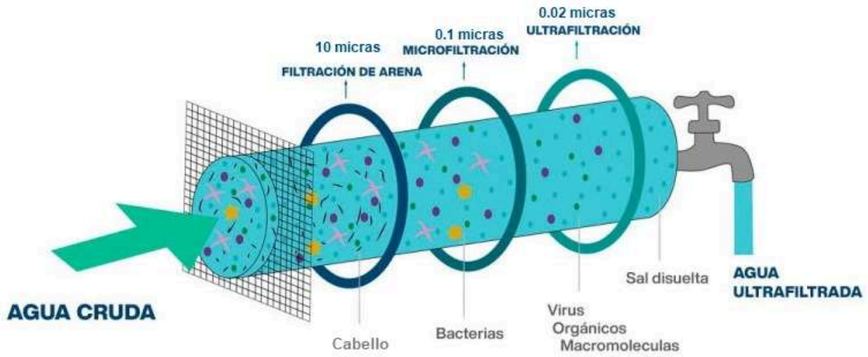
Etapas del proceso

Ultrafiltración



Función de la ultrafiltración

- Separación de sustancias contenidas en un líquido mediante membranas.
- Permite una operación más eficiente de las fases siguientes como Osmosis Inversa

Ventajas

- Plantas muy compactas, mínima área de implementación
- Operación sencilla y automatizada
- Alta capacidad de filtración
- Incrementa calidad del agua tratada

Consideraciones técnicas

- Mantenimiento preventivo para evitar obstrucciones y maximizar eficiencia
- Adaptación del diseño según los caudales y análisis del clarificado

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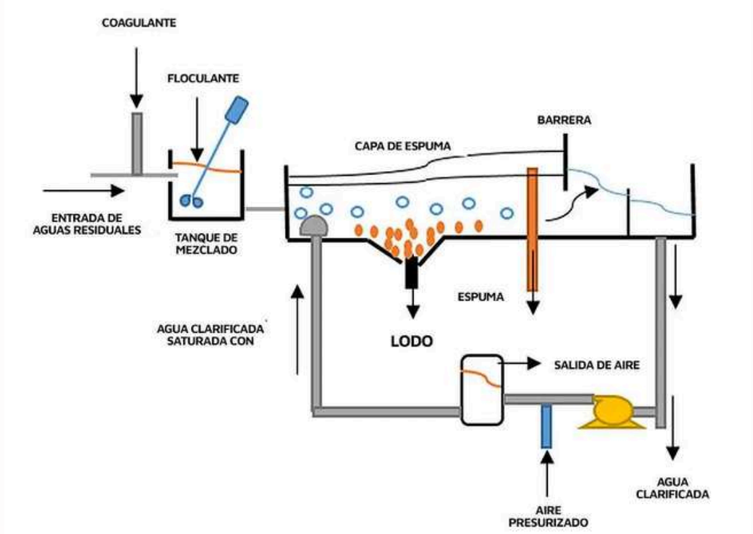
Etapas del proceso

DAF
(Flotación por aire disuelto)



Función del DAF

Separación de sólidos suspendidos, aceites y grasas del clarificado

Técnica DAF:

Inyección de aire en el agua que forma burbujas, las cuales adhieren partículas contaminantes y las hacen flotar para su separación y eliminación.

Ventajas

- Alta eficiencia en separación de sólidos ligeros y grasas
- Reducción de la carga de contaminantes orgánicos e inorgánicos
- Disminuye el consumo de productos químicos en procesos posteriores

Consideraciones técnicas

- Mantenimiento preventivo para evitar acomulación en difusores y garantizar eficiencia
- Adaptación del diseño según los caudales y análisis del clarificado

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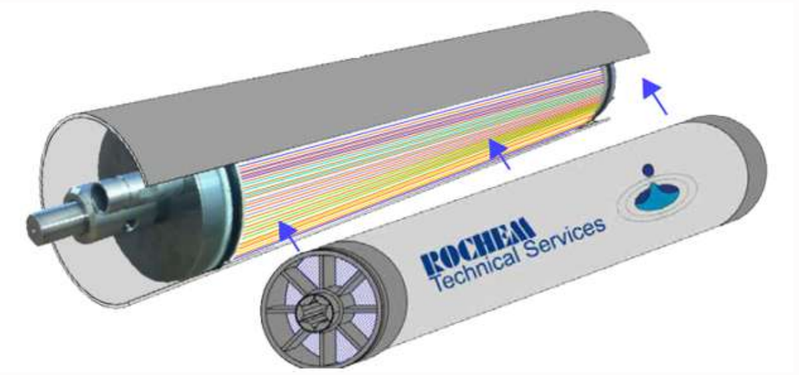
Etapas del proceso

Osmosis Inversa



Función de la Osmosis Inversa

- Eliminar sales disueltas, metales pesados, compuestos orgánicos y contaminantes químicos del agua
- Alta eficiencia en la retención de partículas a nivel molecular
- Producir agua de alta pureza

Tecnología empleada

- Sistema de membranas ROCHEM: Separa moléculas de agua de contaminantes aplicando alta presión, superando la presión osmótica natural.

Consideraciones técnicas

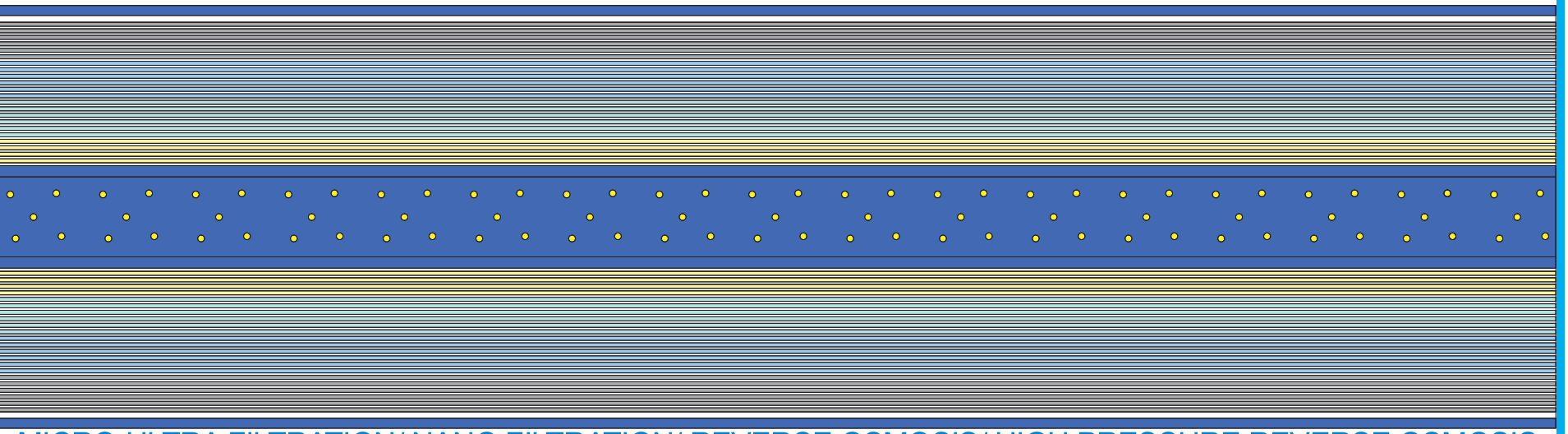
- Requiere presiones altas (20- 60 bar) dependiendo de la calidad del agua a la entrada
- Solo necesita un filtro de arena y de cartucho previo a la entrada en los módulos O.I ROCHEM
- No necesita pretratamientos para evitar el ensuciamiento

ENERGRUP

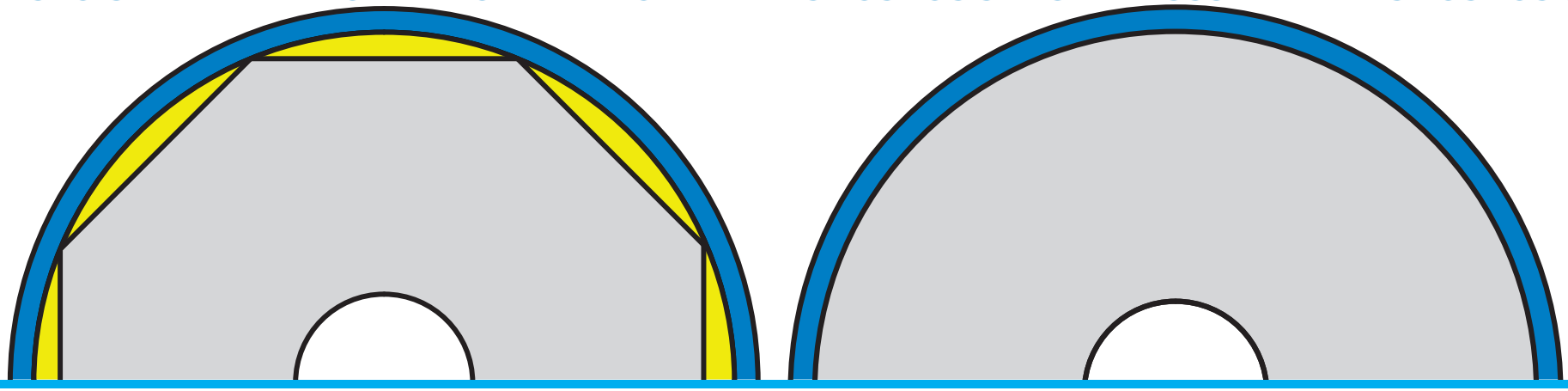
ROCHEM

OPEN - CHANNEL / PATENTED MEMBRANE MODULE TECHNOLOGY SINCE 1982

G4-Module/1982,DT-Module/1984,DTG-Module/1998,ST-Module/2006,TS-Module/2012



MICRO-ULTRA FILTRATION/ NANO FILTRATION/ REVERSE OSMOSIS/ HIGH PRESSURE REVERSE OSMOSIS



ROCHEM®

Technical Services

ROCHEM® Technical Services

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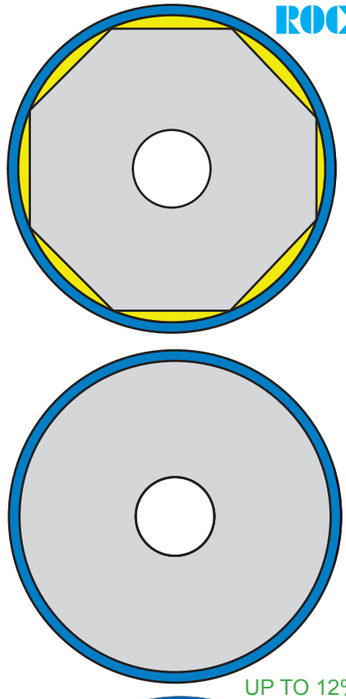
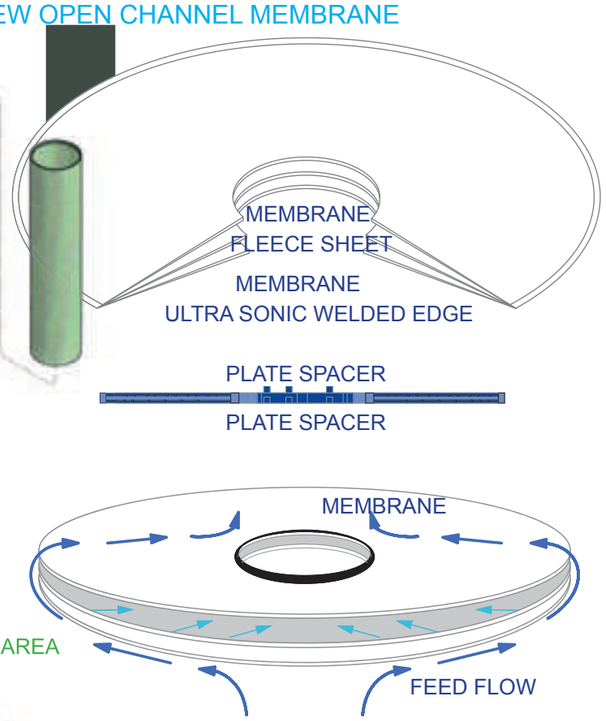
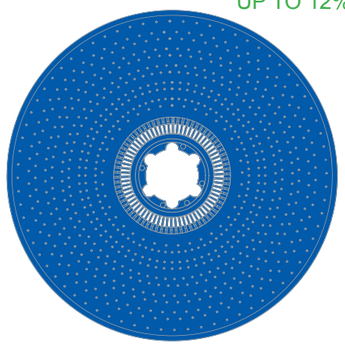
ROCHEM® PF- PFG/ PLATE AND FRAME MODULE

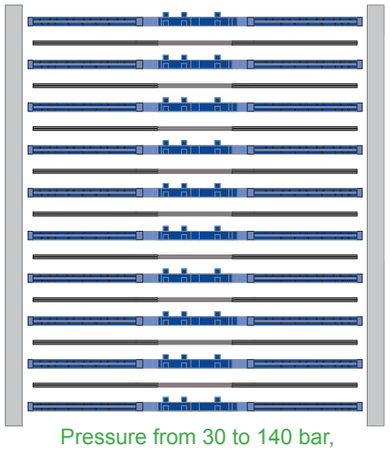
THE NEW OPEN CHANNEL MEMBRANE



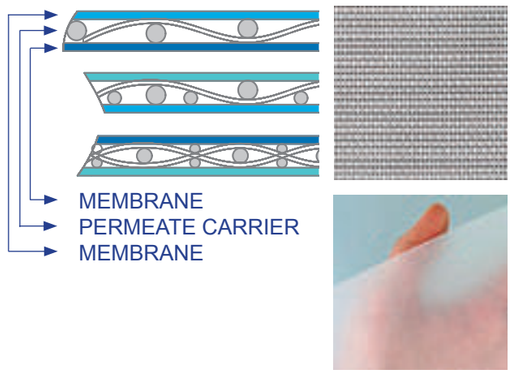


UP TO 12% MORE MEMBRANE AREA





Pressure from 30 to 140 bar,
Different Pressure Housings



Permeate Carrier
Different Types

DIFFERENT MEMBRANE
DIFFERENT SPACER

PF/ PLATE AND FRAME MODULE

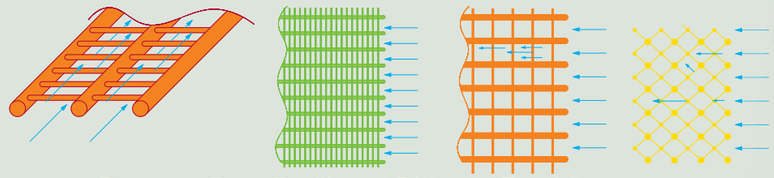
MODULE AND SYSTEM MANUFACTURING SINCE 1982

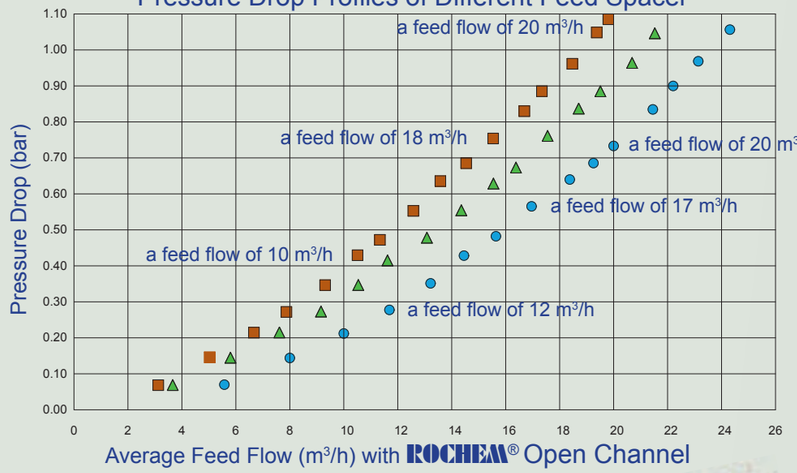
ROCHEM® TRIPLE S/ TS MODULE, TS plus+ MODULE

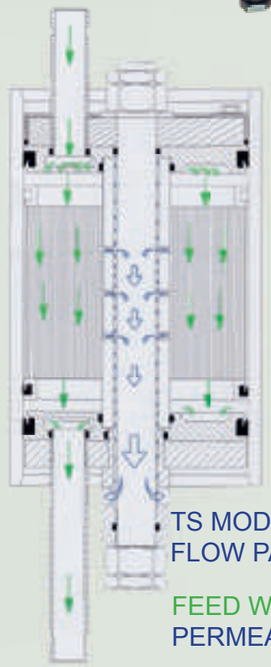
SELECTIVE SUBSTANCE SEPARATION

Feed Flow

Different types and configurations/ open channel





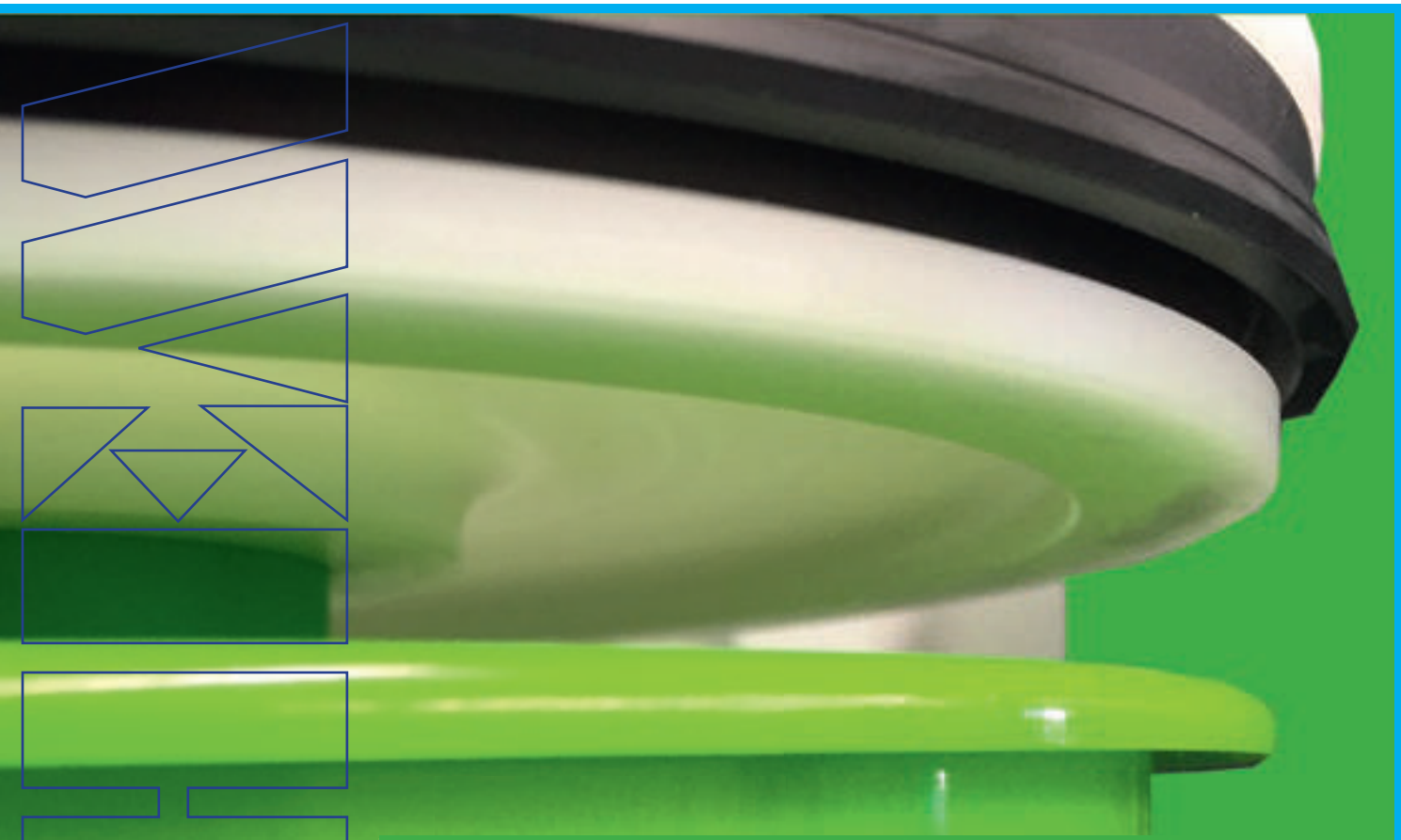


TS MODULE
FLOW PATH

FEED WATER
PERMEATE

MODULE AND SYSTEM MANUFACTURING SINCE 1982

ROCHEM®
Technical Services



MODULE

USE OUR EXPERIENCE

TS MODULE, TS plus+ MODULE

STANDARD

FOR SPECIAL APPLICATION

ROCHEM®Technical Services GmbH
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D-21077 Hamburg, Germany
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Fax: +49 (0) 40 703 85 77-29
info@rts-rochem.de

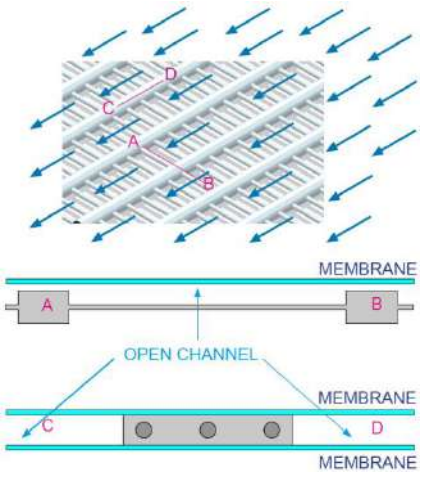
DATA SHEET
REVERSE OSMOSIS MODULES

ROCHEM® Technical Services

THE REVERSE OSMOSIS MEMBRANES

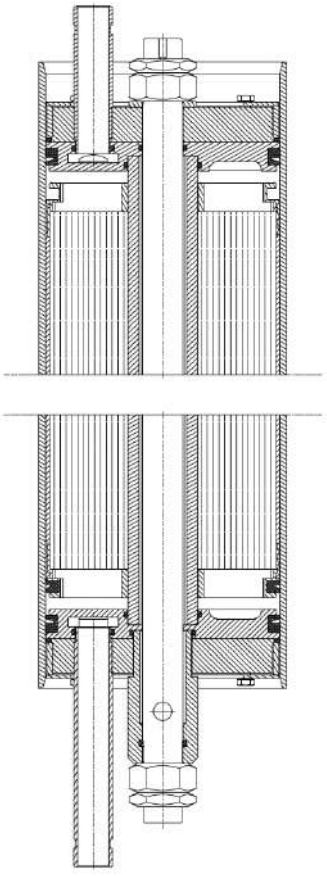
Reverse Osmosis membranes, produced by ROCHEM® according to the thin-film composite design, offer a high chemical stability over a wide pH and temperature range. Therefore they are perfectly suitable for applications under rough process conditions.

Having their origin in seawater desalination, the ROCHEM's membranes combine an excellent rejection of NaCl together with highest flow rates, which leads to lowest operation costs. The high degree of energy efficiency is what the different RO membranes have in common. The "tightness" of the membrane, i.e. the achievable permeate quality, is represented by the index number of the membrane; for example, for the most stringent permeate requirements, an RO-6 would be the membrane of choice.



OPERATING & CLEANING LIMITS FOR ROCHEM® REVERSE OSMOSIS MODULES

- Maximum Operating Temperature [a] 45°C (113°F)
- Maximum Element Pressure Drop 1 bar (15 psig)
- Feed Flow Rate Range 5 – 12 m³/h
- pH Range, Continuous Operation [a] 2 - 11
- pH Range, Short-term Cleaning [b] 1 - 12
- Max. Feed Silt Density Index SDI 20
- Free Chlorine Tolerance [c] < 0.1 ppm



NOTE:

[a] Maximum temperature for continuous operation above pH 10 is 35°C (95°F)
[b] Refer to the Cleaning Guidelines in the specification sheet
[c] Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, ROCHEM recommends removing the free chlorine by pretreatment prior to membrane exposure

CHARACTERISTICS OF THE TS / TS+ MODULES

Spiral-wound element with polyamide thin-film composite membrane, available in two standard sizes:

	TS MODULE	TS+ MODULE
Active area	26 m² (269 ft²)	30 m² (324 ft²)

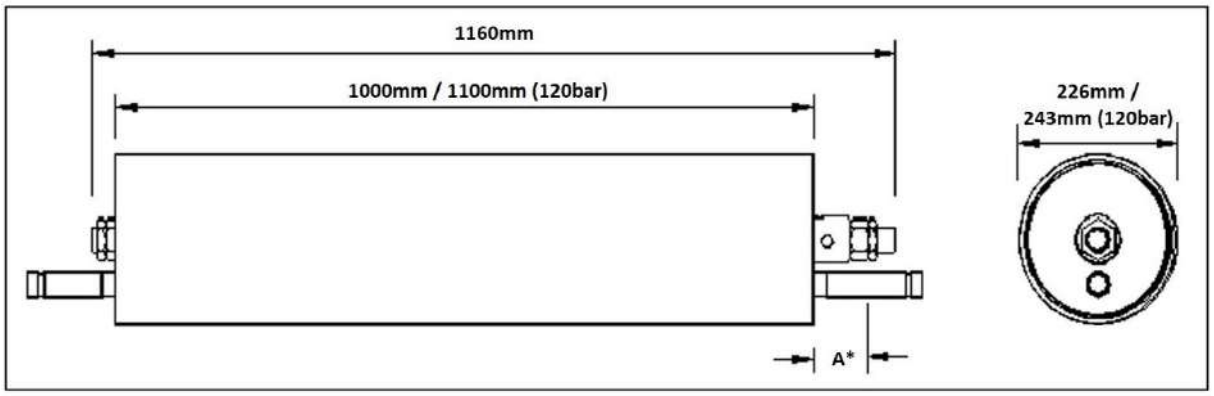
ROCHEM® REVERSE OSMOSIS	RO-4	RO-6
Rejection of NaCl	> 99.7 %	> 99.75 %
Rejection of Boron	> 93 %	> 93 %
Max. Operating pressure*	75/90/120 bar	75/90/120 bar

*depending on pressure vessel

ROCHEM® TS / TS+ REVERSE OSMOSIS MODULES RO-4 RO-6

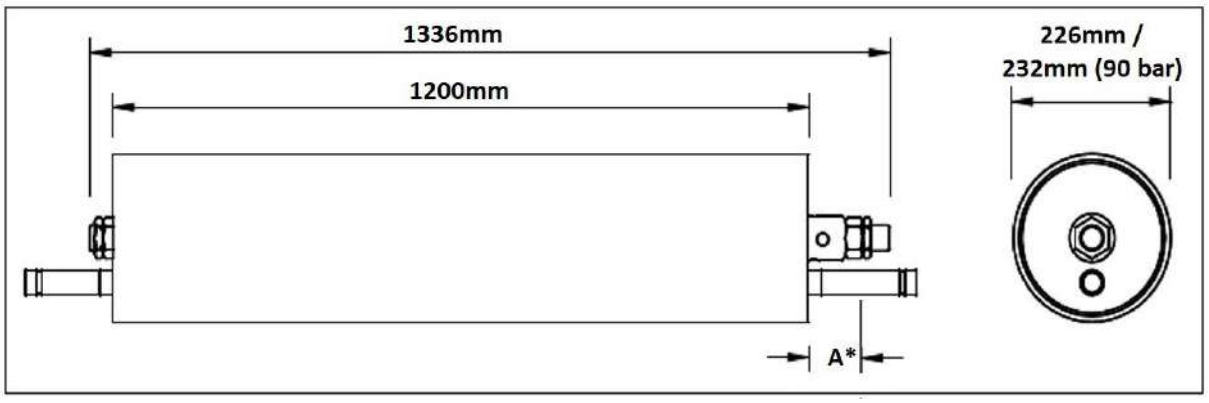
DIMENSION AND WEIGHT

TS MODULE



Operating pressure:	up to 75 / 90 / 120 bar
Weight dry:	48,5 kg
Weight working:	60,5 kg
Inlet and outlet connections:	1" Victaulic/ DN25
Permeate connections:	G3/8" – 90° elbow for 9mm hose

TS+ MODULE



Operating pressure:	up to 75 / 90 / 120 bar
Weight dry:	52 kg
Weight working:	62 kg
Inlet and outlet connections:	1" Victaulic/ DN25
Permeate connections:	G3/8" – 90° elbow for 9mm hose

*A = Height from bottom of pressure vessel to top of module frame

DATA SHEET
NANOFILTRATION MODULES

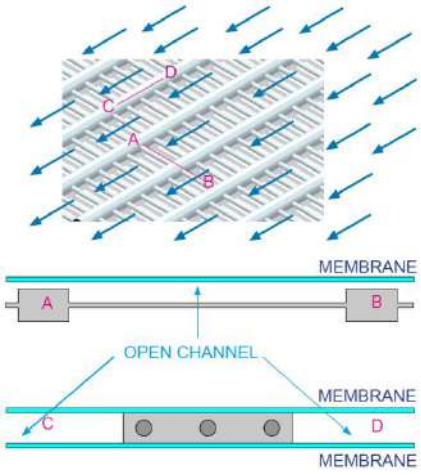
ROCHEM® Technical Services

THE NANOFILTRATION MEMBRANES

Nanofiltration membranes, produced by ROCHEM® according to the thin-film composite design, offer a high chemical stability over a wide pH and temperature range. Therefore they are perfectly suitable for applications under rough process conditions.

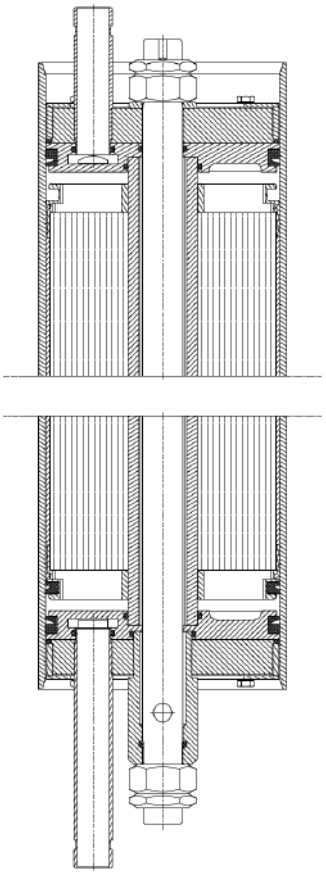
Due to the low rejection of monovalent anions like Chlorides and Sodium, the influence of the osmotic pressure on the operation is significantly reduced compared to reverse osmosis membranes. Thus nanofiltration membranes are operated in a trans-membrane pressure range between 20 to 40 bar, in special cases even higher pressure.

The significantly lower operating pressure of nanofiltration is the basis for a lower energy demand and an important contribution to the reduction of operational costs.



OPERATING & CLEANING LIMITS FOR ROCHEM® NANOFILTRATION MODULES

- Maximum Operating Temperature [a] 113°F / 45°C
- Maximum Element Pressure Drop 15 psig / 1.0 bar
- pH Range, Continuous Operation [a] 3 - 10
- pH Range, Short-term Cleaning [b] 1 - 12
- Max. Feed Silt Density Index SDI 5
- Free Chlorine Tolerance [c] < 0.1 ppm



NOTE:

[a] *Maximum temperature for continuous operation above pH 10 is 95°F / 35°C*

[b] *Refer to the Cleaning Guidelines in the specification sheet*

[c] *Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, ROCHEM recommends removing the free chlorine by pretreatment prior to membrane exposure*

CHARACTERISTICS OF THE TS / TS+ MODULES

Spiral-wound element with polyamide thin-film composite membrane, available in two standard sizes:

	TS MODULE	TS+ MODULE
Active area	281 ft² / 26 m²	324 ft² / 30 m²

ROCHEM® NANOFILTRATION	NF-1	NF-3	NF-K	NF-X
Rejection of NaCl	85 - 90 %	40 - 60 %	50 - 60 %	10 - 20 %
Rejection of MgSO4	97 %	97 %	99 %	97 - 99 %
Max. Operating pressure	40 bar	40 bar	40 bar	40 bar

ROCHEM® TS / TS+ NANOFILTRATION MODULES NF-1 NF-3 NF-K NF-X

DATA SHEET
REVERSE OSMOSIS MODULES

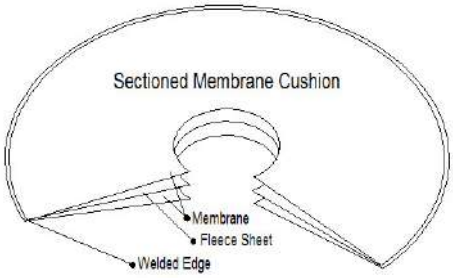
ROCHEM® Technical Services

THE REVERSE OSMOSIS MEMBRANES

Reverse Osmosis Membranes, produced by ROCHEM® according to the thin-film composite design, offer a high chemical stability over a wide pH and temperature range. Therefore they are perfectly suitable for applications under rough process conditions.

COMPOSITION OF THE MEMBRANE CUSHION

The Membrane Cushion is made up with a porous sheet known as the fleece sheet.



This fleece sheet is sandwiched between two membrane sheets. The outer diameter is sealed by ultrasonic welding of the three sheets together.

MEMBRANE SPECIFICATIONS

Product:	**Disc Membrane RTS-RO3** **Article No.: 30153c**
Membrane material:	Thin-film composite, Polyamide
Water flux:	0.91 – 1.23 $m^3/m^2/d$ (22 – 30 Gallons/ft^2/day)
Max. salt passage:	1 %

NOTE: *Specifications based on testing under the following test conditions:*

- *NaCl feed :* *2,000 ppm*
- *Feed pressure:* *15.5 bar (225psi)*
- *Temperature:* *25°C*
- *Recovery:* *15 %*

OPERATING & CLEANING LIMITS

- Maximum Operating Temperature [a)] 45°C (113°F)
- pH Range, Continuous Operation [a)] 2 – 11
- pH Range, Short-term Cleaning [b)] 1 – 13
- Max. Feed Silt Density Index SDI 5
- Free Chlorine Tolerance [c)] < 0.1 ppm

NOTE: *a) Maximum temperature for continuous operation above pH 10 is 35°C (95°F)*
b) Refer to the Cleaning Guidelines in the specification sheet
c) Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, ROCHEM recommends removing the free chlorine by pretreatment prior to membrane exposure

ROCHEM® PF / PFG REVERSE OSMOSIS MODULE RTS – RO3

DATA SHEET
NANOFILTRATION MODULES

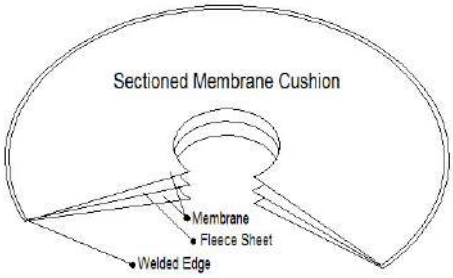
ROCHEM® Technical Services

THE NANOFILTRATION MEMBRANES

Nanofiltration Membranes, produced by ROCHEM® according to the thin-film composite design, offer a high chemical stability over a wide pH and temperature range. Therefore they are perfectly suitable for applications under rough process conditions.

COMPOSITION OF THE MEMBRANE CUSHION

The Membrane Cushion is made up with a porous sheet known as the fleece sheet.



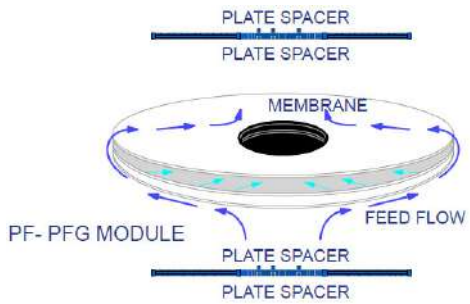
This fleece sheet is sandwiched between two membrane sheets. The outer diameter is sealed by ultrasonic welding of the three sheets together.

MEMBRANE SPECIFICATIONS

Product:	**Disc Membrane RTS-NF1** **Article No.: 30179b**
Membrane material:	Thin-film composite, Polyamide
Water flux:	0.76 m³/m²/d (19 Gallons/ft²/day) (NaCl) 0.97 m³/m²/d (24 Gallons/ft²/day) ($MgSO_4$)
Max. salt passage:	NaCl: 5 - 15% $MgSO_4$: 3%

NOTE: *Specifications based on testing under the following test conditions:*

- *NaCl feed : 2,000 ppm or*
- *$MgSO_4$ feed : 2,000 ppm, respectively*
- *Feed pressure: 4.8 bar (70psi)*
- *Temperature: 25°C*
- *Recovery: 15 %*
- *Flow rates for individual elements may vary +/-15%*



OPERATING & CLEANING LIMITS

• Maximum Operating Temperature [a)]	45°C (113°F)
• pH Range, Continuous Operation [a)]	3 – 10
• pH Range, Short-term Cleaning [b)]	1 – 12
• Max. Feed Silt Density Index	SDI 5
• Free Chlorine Tolerance [c)]	< 0.1 ppm

NOTE: *a) Maximum temperature for continuous operation above pH 10 is 35°C (95°F)*
b) Refer to the Cleaning Guidelines in the specification sheet
c) Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, ROCHEM recommends removing the free chlorine by pretreatment prior to membrane exposure

ROCHEM® PF / PFG NANOFILTRATION MODULE RTS – NF1