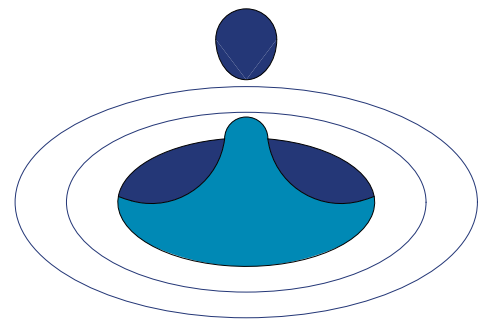


ROCHEM®

Technical Services



REVERSE OSMOSIS DESALINATORS
MEMBRANE BIO-REACTORS/ MBR

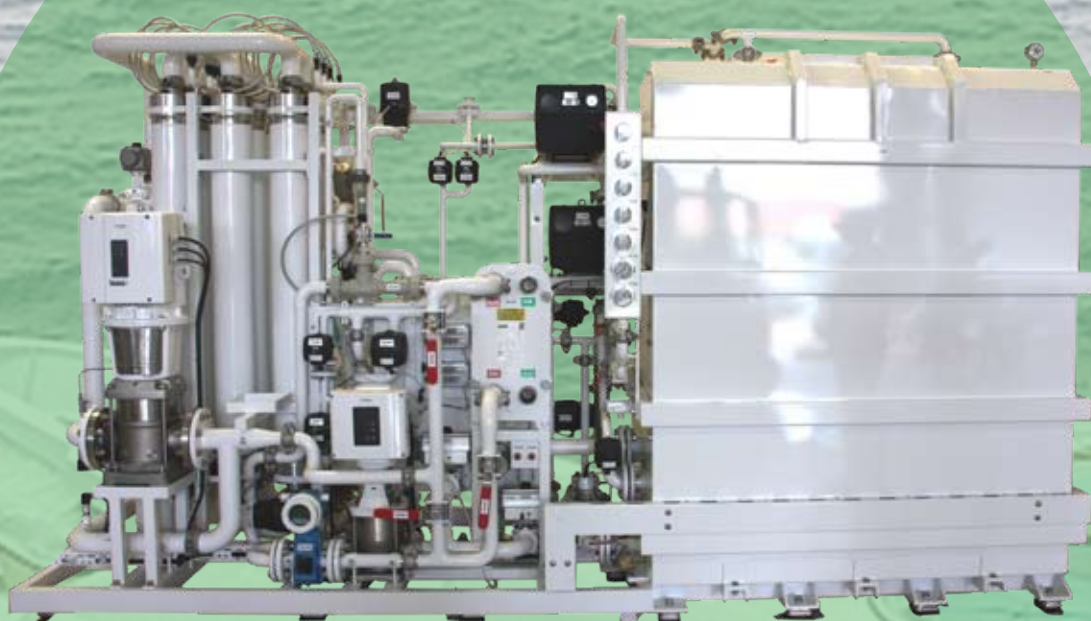
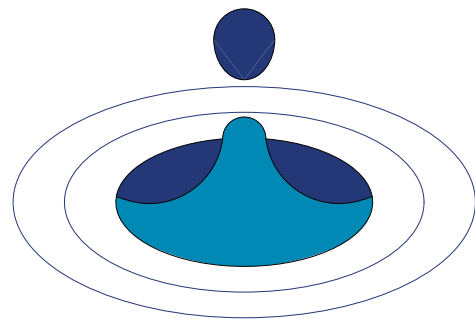
NAVY SHIPS
RESEARCH SHIPS
CRUISE SHIPS
MEGA YACHTS
OFFSHORE PLATFORMS
SUBMARINES

OPEN - CHANNEL / PATENTED MEMBRANE MODULE TECHNOLOGY SINCE 1982

WATER IS LIFE **ROCHEM®** ALL SHIPS AT SEA

ROCHEM®

Technical Services



IMO Type Approval

Ahead of the Regulations

ROCHEM® have developed systems that are ahead of the Marpol certificate standards.

The Rochem Membrane Bio- Reactor (MBR) combined Black & Grey waste water treatment systems not only meet IMO/ Marpol standards but also meet discharge regulations for Miami Dade County surface water, US Coast Guard, US Public Health, Lloyd's and all current and forecast future standards.

The system is designed to treat combined Black & Grey waste waters from sewage, galley (after grease trap unit), accommodation & laundry grey waste waters.

The process in principle is essentially the same for 20 persons or 4000 persons by (to simplify) changing the number of bio- reactors and membrane modules to suit the waste water volume.

The main components of the combined black- and grey- water- treatment plant are the pre- filtration stage, bioreactor segments and the ultra- filtration modules. The clean effluent (filtrate) is passed to a small tank for further use or discharge. The bio- waste/ excess sludge produced in the aerobic digestion of the black- and grey- water ingredients is collected in a bio- waste tank for disposal or further treatment such as drying, and or incinerating, etc.

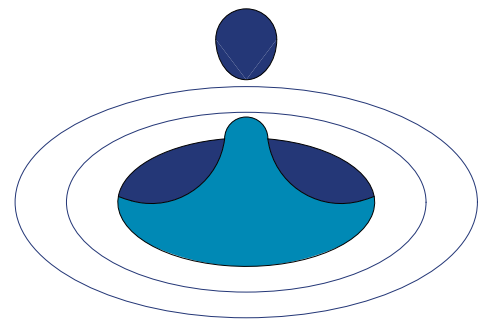
Yacht builders/ owners internationally including Royal De Vries/ Feadship have contracted the Rochem MBR Systems for their Luxury yachts.

ROCHEM® provide customised system designs, and an international spares and maintenance service.

ROCHEM® SINCE MANY YEARS CUSTOMER SATISFACTION ON BOARD

ROCHEM®

Technical Services



ROCHEM®
Technical Services

Rochem Technical Services GmbH
Knickberg 1a
21077 Hamburg
Tel.: +49 (0) 40 703 85 77-0
E-Mail: info@rts-rochem.de

Rochem-BioFilt **028** Serial-No. **B3056**

400 V **50** Hz **2016** Year


Equipment in accordance with IMO resolution MEPC.227(64)
and in accordance with Helsinki Convention

IMO Type Approval / EC-Type Examination **340.549**

Issued by Dienststelle Schiffssicherheit
BG Verkehr / Germany **01.07.2016**

Hydraulic loading: **28.0** m³/day

Organic loading: **18.4** kg BOD₅/day


0736/16

ROCHEM® MBR

Membrane Bioreactor
Turn sewage from toilets and greywaters
from sinks, basins, showers, kitchen and laundry
into clean environmental-friendly water that meets
the bath water quality according to EU-standards

IMPROVED TECHNOLOGY FOR WATER PURIFICATION WITH **ROCHEM®** MBR

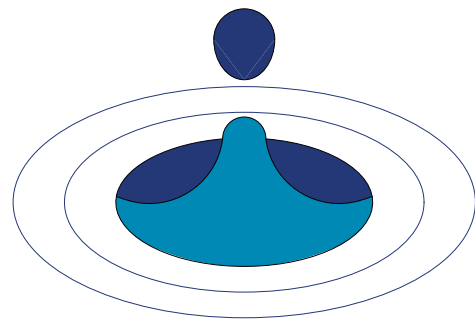
The combination of a high density biomass reactor with the FS module system for ultrafiltration forms the operating unit of the **ROCHEM®** membrane bioreactor which provides many advantages for marine waste water treatment

ROCHEM® SOLUTION

The high efficiency design of the membrane biological reactor purifies black water on ships to achieve a superior quality to the international limit values for contaminants imposed by MARPOL/IMO.
Therefore the environmentally sound purified waste water can be discharged overboard in any harbour or coastal area allowed by law.

ROCHEM®

Technical Services



ROCHEM® MEMBRANE- BIO- REACTOR/ MBR



From 10-1000 m³/day

Improved technology for
water purification with
ROCHEM® MBR Membrane Bio Reactor

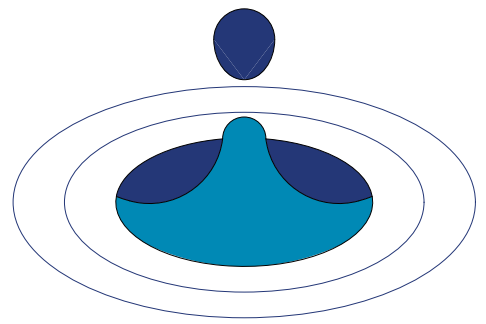
The combination of a high density biomass reactor with the UF module system for ultrafiltration forms the operating unit of the membrane bioreactor **ROCHEM®** MBR which gives many advantages for waste water treatment

ROCHEM® SOLUTION

The efficiency of the Membrane Biological Reactor allows for the purification of black water on ships to achieve a quality treaty superior to the international limit values for contaminants imposed by MARPOL/IMO. Therefore the environmentally sound purified waste water can be discharged overboard in any harbour or coastal area.

ROCHEM®

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ROCHEM® - MEMBRANE- **BIO- REACTOR/ MBR**
DESALINATION PLANTS



since 1998 on the research ship POLARSTERN
PORTABLE WATER AND MBR SEWAGE TREATMENT

ROCHEM® USE OUR EXPERIENCE

ROCHEM®

Technical Services

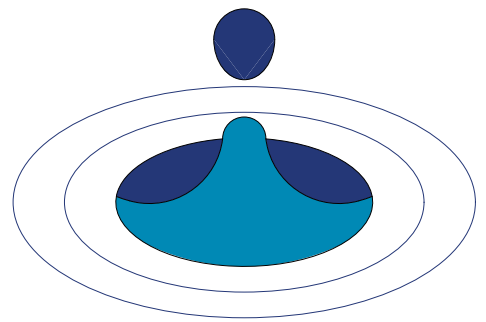
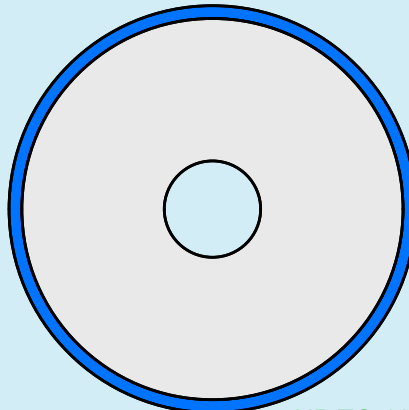
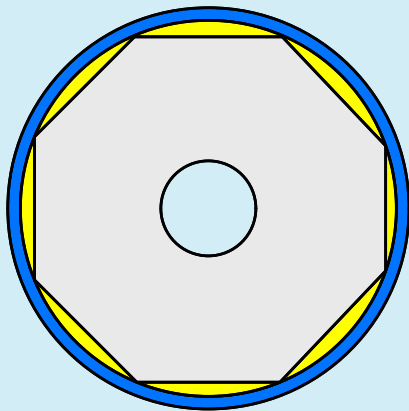
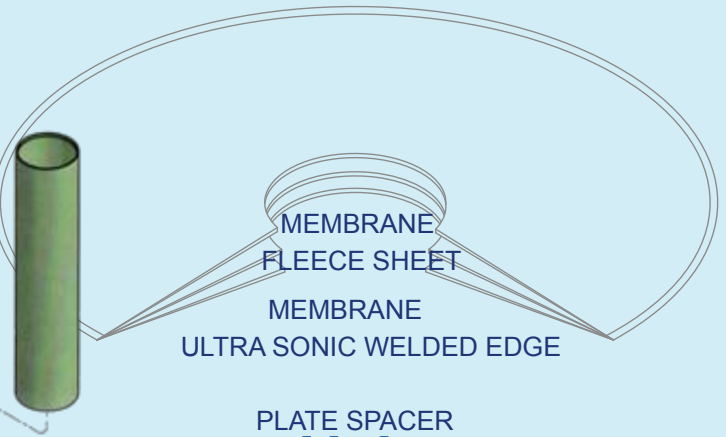
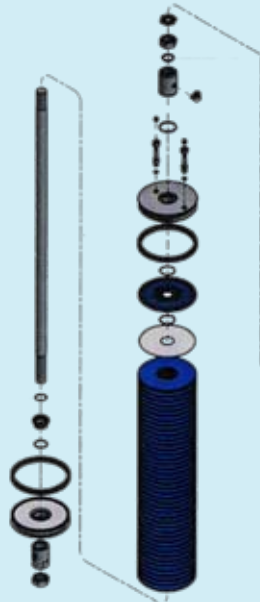
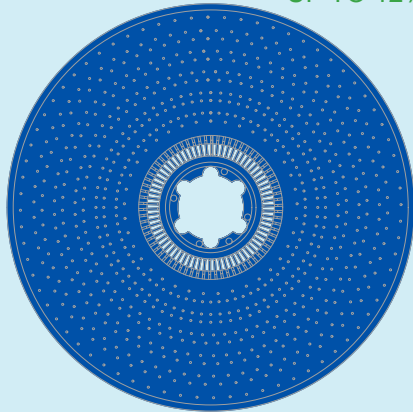


PLATE AND FRAME/ PF MODULE



UP TO 12% MORE MEMBRANE AREA



MEMBRANE
FLEECE SHEET
MEMBRANE
ULTRA SONIC WELDED EDGE

PLATE SPACER
PLATE SPACER

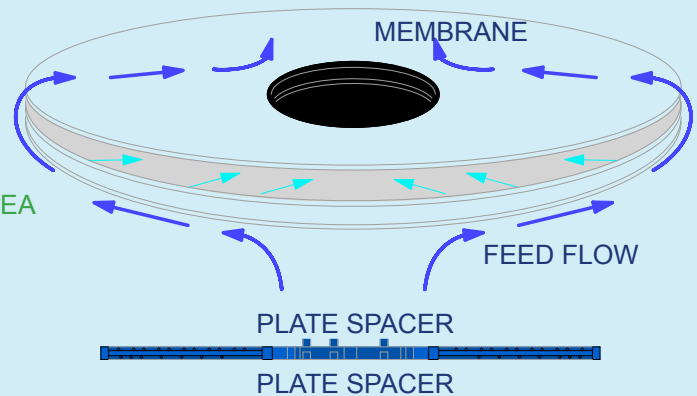
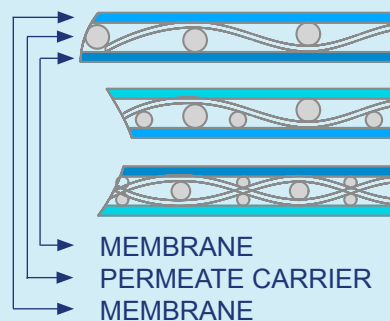
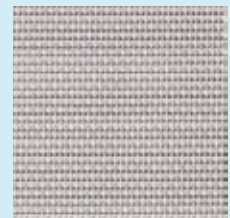


PLATE SPACER
PLATE SPACER

FEED FLOW



MEMBRANE
PERMEATE CARRIER
MEMBRANE

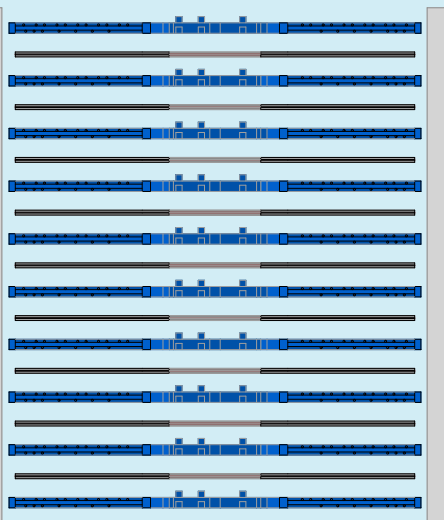


Permeate Carrier
Different Types

DIFFERENT MEMBRANE
DIFFERENT SPACER

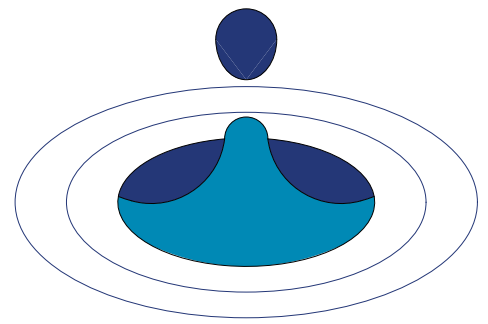
PF/ PLATE AND FRAME MODULE

Pressure from 30 to 140 bar,
Different Pressure Housings



ROCHEM®

Technical Services

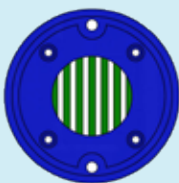
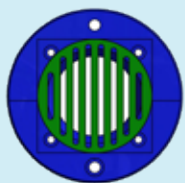
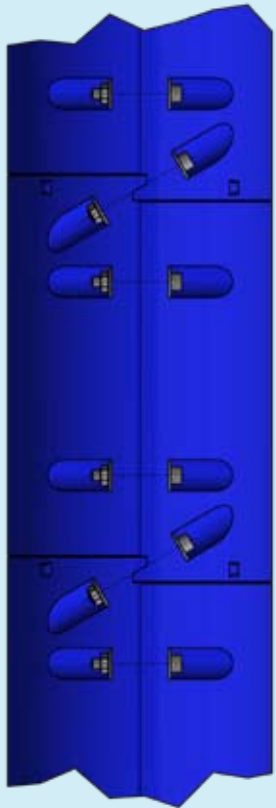


FS MODULE

CARTRIDGE CASE



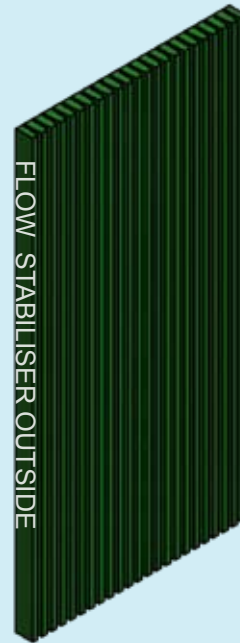
Axial Section FS Module



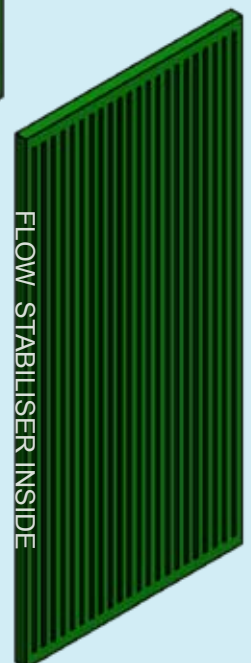
FURTHER DEVELOPMENT OF THE MEMBRANE MODULE



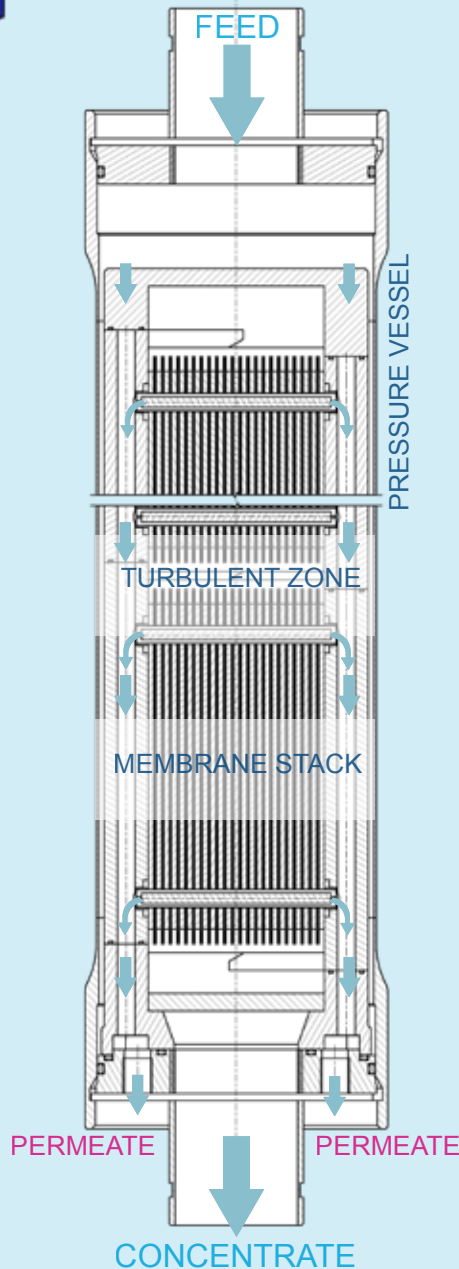
MEMBRANE STACK



FLOW STABILISER OUTSIDE



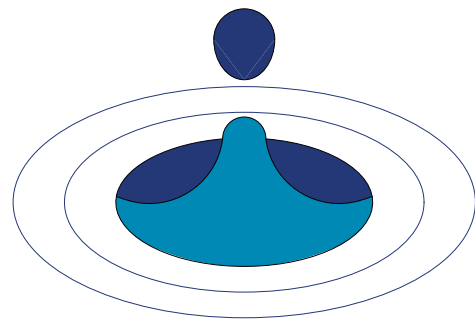
FLOW STABILISER INSIDE



IMPROVED TECHNOLOGY

ROCHEM®

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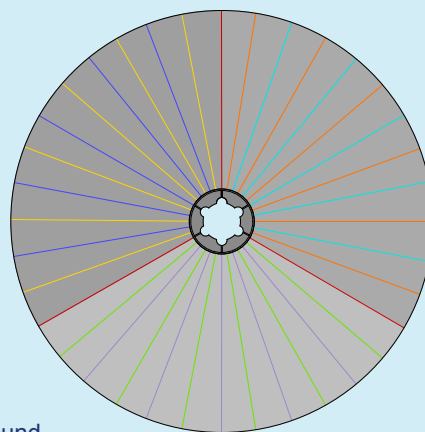
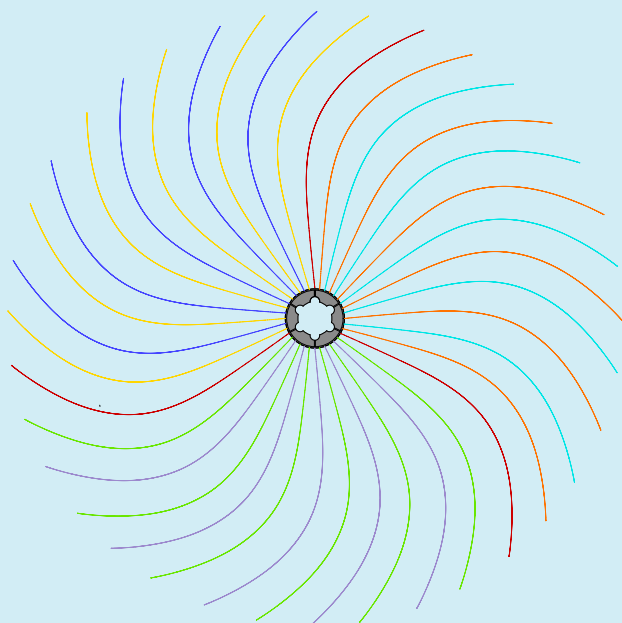
TRIPLE S/ TS MODULE SELECTIVE SUBSTANCE SEPARATION

The significant difference to conventional spiral wound modules is that **ROCHEM®** Technical Services combines different feed channels, permeate carriers and membranes in one module element.

THIS IS NEW, developed by **ROCHEM®** Technical Services

ROCHEM® Technical Services is able to create a module especially for your requirements.

The module element can be split in parts.
Each part includes different feed spacers and membranes;
also the membrane cushion carriers can be different.
R.T.S. **ROCHEM®** Technical Services has a lot of possibilities to find
the ideal composition for your particular objectives.



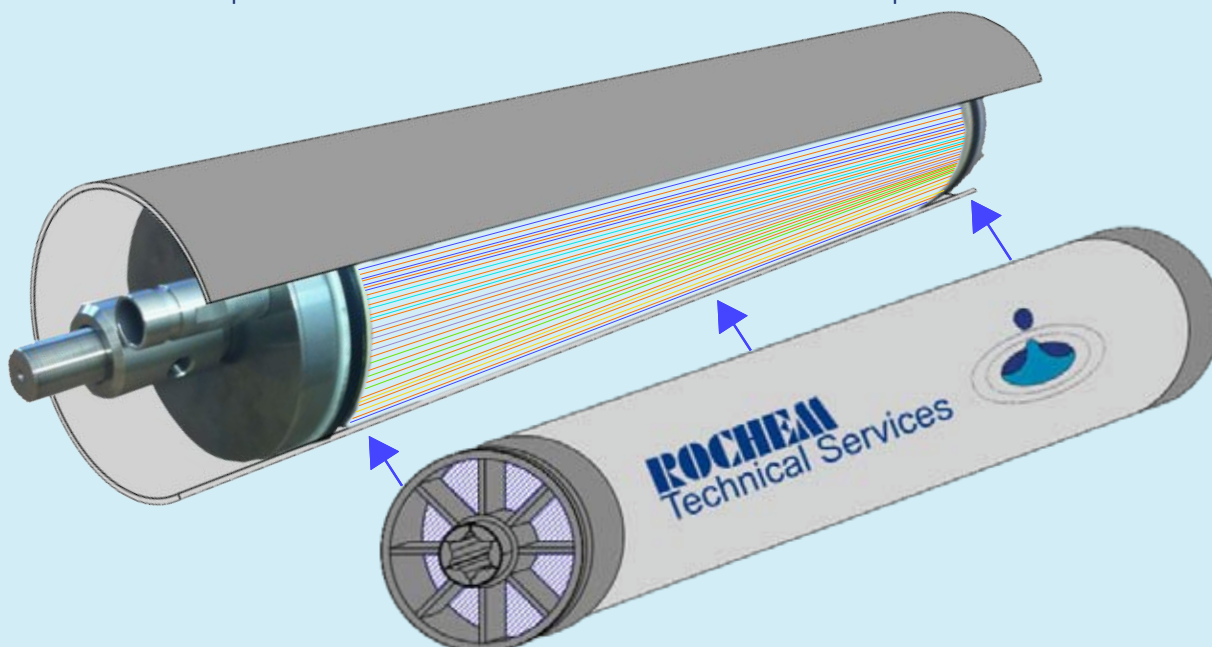
Spiral Wound

MEMBRANE- PERMEATE CARRIER- MEMBRANE / FEED SPACER

The heart of the TS module is the membrane element. This consists of membrane cushions and spacers wrapped in a tube element. The completed membrane element is then pushed on the rod-shaped permeate outlet and collecting device.

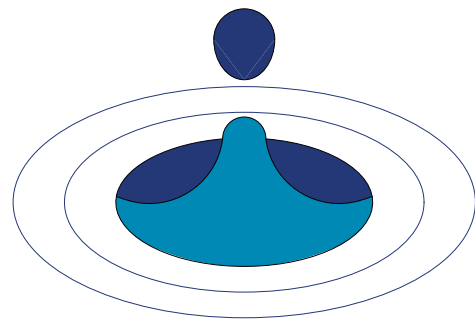
The membrane element is provided with end flanges on both sides. The end flanges consist of at least one input for the feed medium to be separated and one output for the retentate.

The border elements are kept sealed to the tube element. The TS element is covered in a pressure vessel.



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Technical Services



ROCHEM® MBR

skid mounted with bio reactor FS-Modules, control cabinet, pumps and blower measuring and control equipment, ready for operation



ROCHEM® MBR

These five units are installed on ships in the Caribbean, for treating the gray and black water

The reliable function of this process and the operating safety of the membrane filtration and bioreactor technology have been proved in a multitude of operating systems over many years.

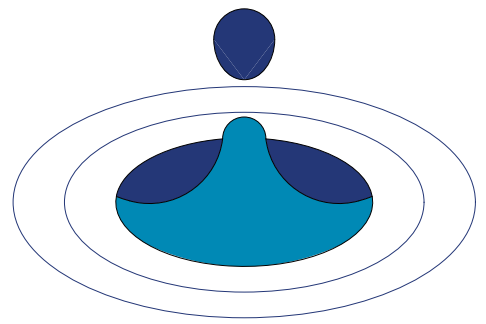
The bioreactor is manufactured as modular multi- tank construction from stainless steel. The adaptation to the purification demand is achieved by the respective design of the compact operating units.

The ultrafiltration unit consists of **ROCHEM®** FS- Modules, where the combination of open channel construction and narrow gap technology allows for a highly efficient cleanability and high availability- and thus for safe and economic operation.

The purification plant itself ensures an automatic, reliable and fail safe operation with a minimum of maintenance and high availability. This is due to a construction that is adapted to the client's needs by a well established manufacturing quality assurance system and PLC based process control.

ROCHEM®

Technical Services



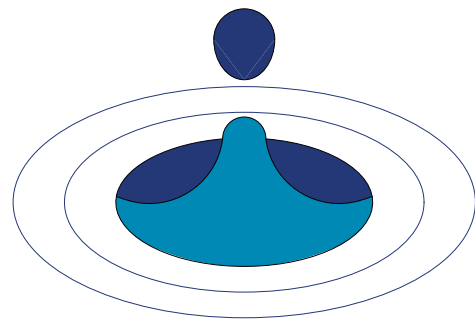
ROCHEM® RO 1530-TS-35S
Freshwater capacity: 35 m³/day
fully automatic version with seawater preheating system.



STANDARD ROCHEM®
FRESHWATER GENERATORS
from 2000 ltr/day up to 100.000 ltr/day
potable water

ROCHEM®

Technical Services



ROCHEM® REVERSE OSMOSIS FRESHWATER

for naval surface ships and submarines:

Are designed to fulfill all Naval requirements, such as shock resistance, EMC, airborne- and structure borne noise emission, a-magnetic design, etc. according to NATO STANAG regulations.



ROCHEM® RO 510-10

Freshwater capacity: 20.000 ltr/day

Demi Water 1.000 ltr/day

ROCHEM® REVERSE OSMOSIS FRESHWATER GENERATORS

ARE OF A HIGH RELIABILITY
PROVEN BY 25 NAVIES
WORLDWIDE

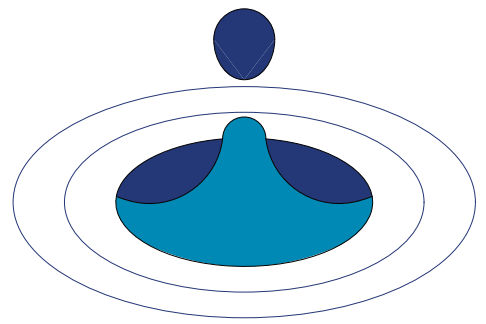
ROCHEM® RO 9400

Freshwater capacity: 2000ltr/day



ROCHEM®

Technical Services



**ROCHEM® GAS TURBINE
COMPRESSOR CLEANING SYSTEMS
& CHEMICALS
FOR ALL TYPES OF GAS TURBINES**

Every dual side spray nozzle is fully tested for correct flow and spray pattern before leaving the factory. **ROCHEM®** is a certified ISO9001:2008 manufacturer.



ON-LINE CLEANING
OFF-LINE, CRANK WASHING

PRODUCT DESCRIPTION

ROCHEM® designs and manufactures nozzle and manifold systems for cleaning the compressor on industrial and aero derivative Gas Turbines.

The nozzles are ready to install in place of existing nozzles as a retrofit or can be fitted on site by our qualified engineers.

Using proven and patented technology the **ROCHEM®** nozzles are the ultimate in on-line and off-line compressor cleaning delivering a highly atomised cleaning solution into the air stream.

ROCHEM®'s unrivalled expertise in the design and manufacture of compressor cleaning systems means that the engine is cleaned in the most efficient and cost effective way ensuring excellent recovery of lost power output.

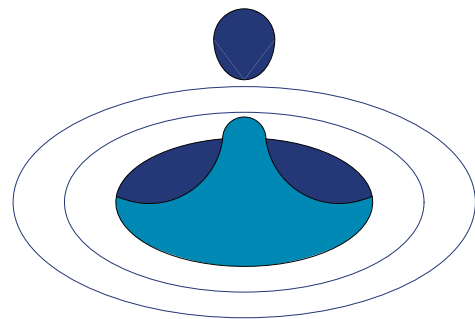
Why does this fouling affect my engines performance?

Axial flow compressor blading comprises smooth airfoil shapes similar to an airplane wing and consequently blade performance may deteriorate due to increases in surface roughness or due to shape changes brought about by blade deposits. Blade deposits or fouling, of the type shown reduces both compressor airflow and efficiency that combine to reduce gas turbine output and overall thermal efficiency. In addition the compressor discharge pressure drops due to the reduced air mass flow rate through the turbine nozzle. Fouling will therefore be recognised by a drop in turbine output for a given exhaust gas temperature, accompanied by a lower compressor discharge pressure. These effects will be accompanied by an increase in heat rate, resulting in increased fuel consumption.



ROCHEM®

Technical Services



**ROCHEM® MEMBRANE CLEANER
FOR REVERSE OSMOSIS AND MBR
ROCHEM® DW-GENERATOR**

PROCESS COMPRESSOR CLEANING SYSTEM



**ROCHEM® OFFERS A FULL RANGE OF
ON-LINE AND OFF-LINE COMPRESSOR CLEANING CHEMICALS**

FYREWASH® F1

A high purity solvent & surfactant formulation for heavy duty on and off-line compressor cleaning.

FYREWASH® F2

Highly biodegradable natural solvent for on-line and off-line compressor cleaning

FYREWASH® F3

Environmentally friendly water-based detergent for on-line and off-line cleaning of Compressors

FYREWASH® F3 O&G CEFAS

Gold version of F3 to be used in offshore applications

FYREWASH® F4

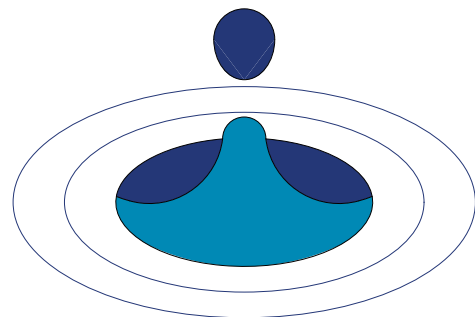
Biodegradable water-based chemical for on-line and off-line cleaning of Compressors, capable of removing the widest spectrum of fouling



ROCHEM® CLEANING CHEMICALS BIODEGRADABLE

ROCHEM®

Technical Services



REVERSE OSMOSIS DESALINATION SINCE 1982

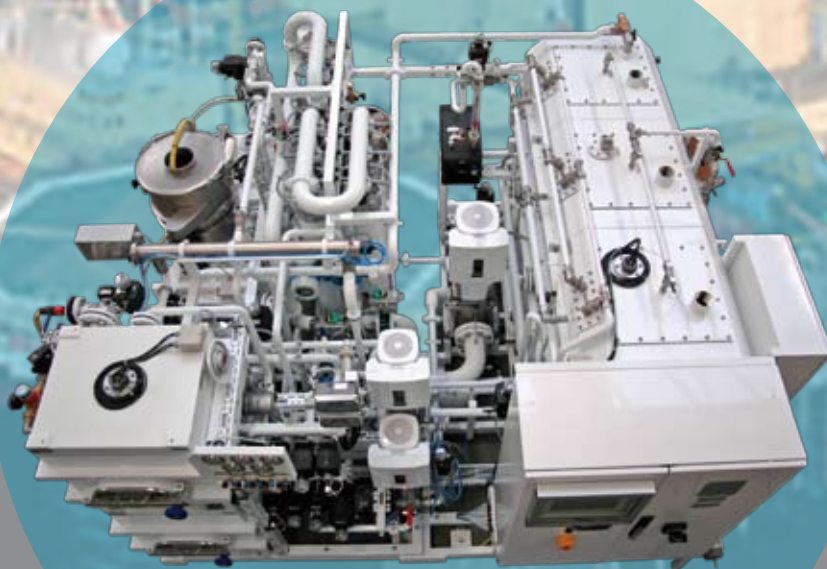
ON OFFSHORE-PLATFORMS

Saipem belongs to the ENI Group, which is a large international turnkey contractor in the oil and gas industry. It is a leader in providing engineering, procurement, project management, and construction services with specialization for large scale offshore projects in deep water and remote areas.



ROCHEM® REVERSE OSMOSIS

FRESHWATER GENERATORS are in operation at Saipem Offshore-Platforms



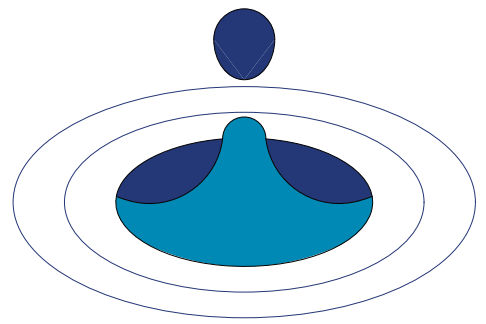
TREATMENT OF BLACK WATER WITH

ROCHEM® MBR /MEMBRANE BIO- REACTOR

for treating all the black and grey water generated on board by the crew.

ROCHEM®

Technical Services



ROCHEM® MEMBRANE MODULES SINCE 1982

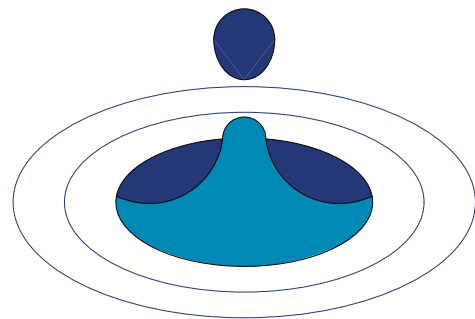


- | | |
|-------------------------------------|----|
| - PLATE AND FRAME/ PF | RO |
| - TRIPLE S/TS | RO |
| - FLATSHEET/ FS | UF |
| - PLATE AND FRAME/ PF & TRIPLE S/TS | NF |



ROCHEM®

Technical Services



The **ROCHEM®** RO units are designed and constructed to fulfil the requirements of the following classification societies:

- GERMANISCHER LLOYD / DET NORSKE VERITAS
- LLOYD'S REGISTER OF SHIPPING
- AMERICAN BUREAU OF SHIPPING
- BUREAU VERITAS
- REGISTRO ITALIANO NAVALE
- RUSSIAN MARITIME REGISTER OF SHIPPING

WE PROVIDE

- SERVICE
- MAINTENANCE
- SPARE PARTS
- STANDARD PLANTS
- NEW BUILD
- CUSTOMER FOCUSED
- SPECIAL DESIGN
- OWN MANUFACTURER

R.T.S.
ROCHEM® Technical Services GmbH

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Fax: +49 (0) 40 703 85 77-29
info@rts-rochem.de

