



**RWO**

# Desalination and Other Water Treatment

**MARINE WATER TECHNOLOGIES**

# SRO-COM Seawater Reverse Osmosis Desalination

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## SRO Fresh Water Maker

The SRO-COM is a standardized seawater desalination plant for service onboard ships. Seawater reverse osmosis plants are an advantageous solution whenever desalinated water for drinking, utility and process applications is needed. The technology is simple, the operation easy and only limited maintenance is required.

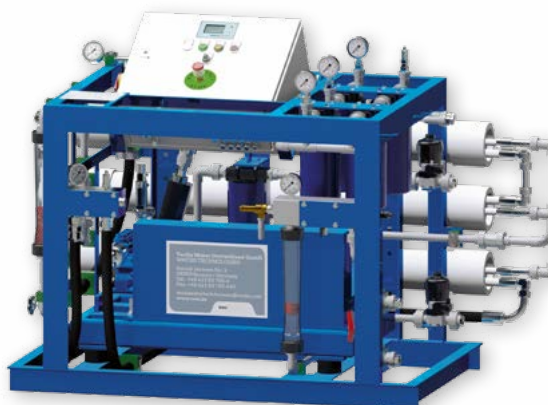
RWO offers standardized RO units for the common capacity requirements of commercial vessels. Permeate rates reach from 10 m<sup>3</sup> per day up to 60 m<sup>3</sup> per day.

This desalination plant has a stable permeate flow over the complete temperature range from 1°C to 35°C. The SRO units come with a built-in concentrate displacement device that will extend the membrane operation cycle.

The system is part of RWO's leading **Total Water Management** offer.

## Available Options

- > Media Filter as pre-filtration
- > RO-Cleaning Station (CIP)
- > Buffering tank
- > Antiscalant Dosing
- > Post Treatment (Mineralization, Chlorination, UV-Sterilizer)



High-quality fresh water with maximum salinity of 500 ppm

# Advanced Membrane Technology

The newly developed SRO-COM seawater reverse osmosis plants from RWO offers state-of-the art technology by using low energy membranes. Compared to conventional systems, they produce the same permeate rate at a considerably lower operating pressure, resulting in lower investment and lower energy costs.

## High Reliability Plant Control

The heart of the plant is the integrated electronic control device, with a user friendly digital display. The graphic on the display shows the temperature, conductivity, operating pressure and operating hours. All failure recordings including the alarm and warnings can be checked through the menu feature.

## How it Works

A two-stage filter system protects the membranes of the SRO-COM from suspended particles in the feed water. If the seawater has a high content of impurities, it is recommended to install an additional filter (such as sand filter). Generally a high pressure pump is used to provide working pressure up to a maximum of 68 bar.

Permeate, i.e. desalinated water, passes through the membranes, while the remaining seawater takes up the rejected salts and leaves the modules as concentrate back to the sea.

## Key Features & Benefits

- > Simple technology and modular design
- > Automated operation and low maintenance requirements
- > Designed for operation in unmanned engine rooms
- > Continuous operation: no downtime
- > Simple, compact installation
- > Proven technology
- > High-quality fresh water with a maximum salinity of 500 ppm
- > No chemicals needed

The reverse osmosis membranes remove salts and minerals. The post-treatment, which is available as an option, also removes all kinds of impurities hazardous to human health, such as viruses, bacteria and legionella. This way RWO offers a safe method to produce fresh water of quality in accordance with European, international WHO and US Health Standards.

Type	Permeat m <sup>3</sup> /day	Recovery %	Desalination Rate %	Motor capacity kW	Lenght mm	Width mm	Height mm
SRO-COM 10	10	21	ca. 96-99 %	5,5	1654	940	1080
SRO-COM 25	25	35	ca. 96-99 %	10	2667	940	1088
SRO-COM 40	40	28	ca. 96-99 %	20	2060	1208	1185
SRO-COM 60	60	32	ca. 96-99 %	25	2936	1208	1150



# SAF-COM Sand Filter

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## Simple and Efficient Pre-treatment for Reverse Osmosis

The RWO sand filter SAF-COM is generally used as a pre-filtration step for fresh and process water treatment. The SAF-COM removes suspended particles. The system ensures high process efficiency of further filtration steps for fresh and process water treatment e.g. the RWO seawater reverse osmosis plant SRO-COM.



SAF-COM for pre-filtration for fresh and process water treatment

## How it Works

It is a closed filter system and the filter media are chosen according to the raw water quality. These materials retain the turbidity in the filter. When the capacity of the filter is exhausted, it will be backwashed.

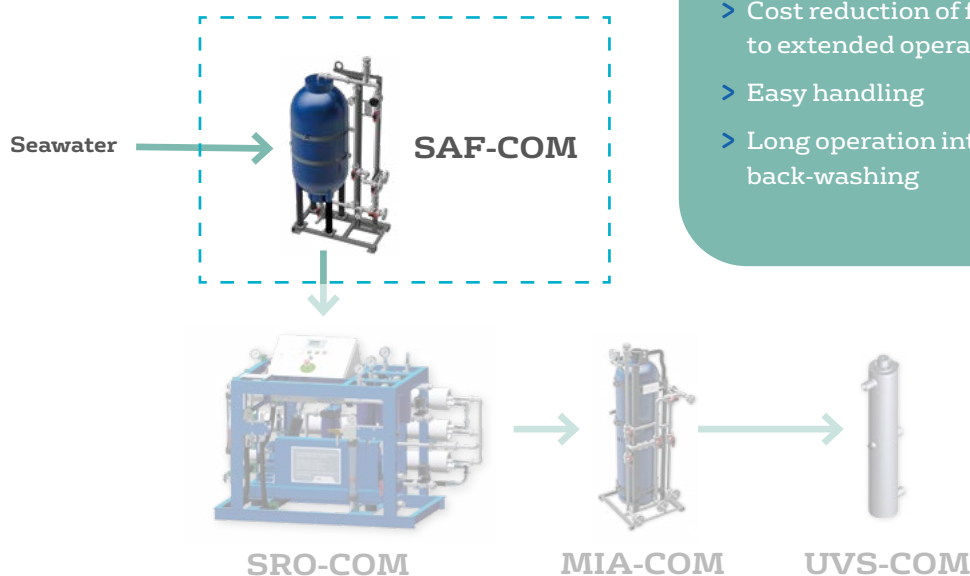
The dirt particles are rinsed out of the sand in the sand scrubber using filtered water. The rinsed sand trickles onto the sand filter bed and is available for further filtration. The dirt particles are removed from the system using the backwash water.

## Easy Handling

The sand filter has a long life-cycle and is easy to operate. This plug-and-play unit does not need any electrical and pneumatic connections. The filter housings are made of polycarbonate. They are available with manual backwashing. The range of flow rates in the standard program is from 0.42 m<sup>3</sup>/h to 7.86 m<sup>3</sup>/h.

### Key Features & Benefits

- > Skid-mounted units in a compact, marine-suitable design
- > Reliable equipment, safe to operate
- > Cost reduction of fine filtration due to extended operation times
- > Easy handling
- > Long operation interval before back-washing



Type	Capacity* m <sup>3</sup> /h	Length mm	Width mm	Height mm	DN/PN	Wet weight kg
SAF0420	0.42	725	470	1150	10/16	60
SAF01050	1.00	790	560	1360	15/16	100
SAF02040	2.00	920	555	1550	20/16	170
SAF03000	4.20	965	615	1875	25/16	310
SAF06000	8.50	1340	835	2125	40/16	680
SAF07860	7.86	1580	990	2120	50/16	1135

\*Volumetric flow depends on the water composition and the type of filter media.



# MIA-COM Mineralization and De-acidification

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## Simple and Reliable Post-treatment

Post-treatment of desalinated water from evaporators or reverse osmosis units is necessary to get safe, potable water. The mineralization and deacidification processes inside the MIA-COM unit help to prevent corrosion and improves quality of drinking water. The application of the mineralising unit brings advantages for both crew and passengers. It protects the material of downstream equipment, such as air-conditioners, ice makers and heating systems.

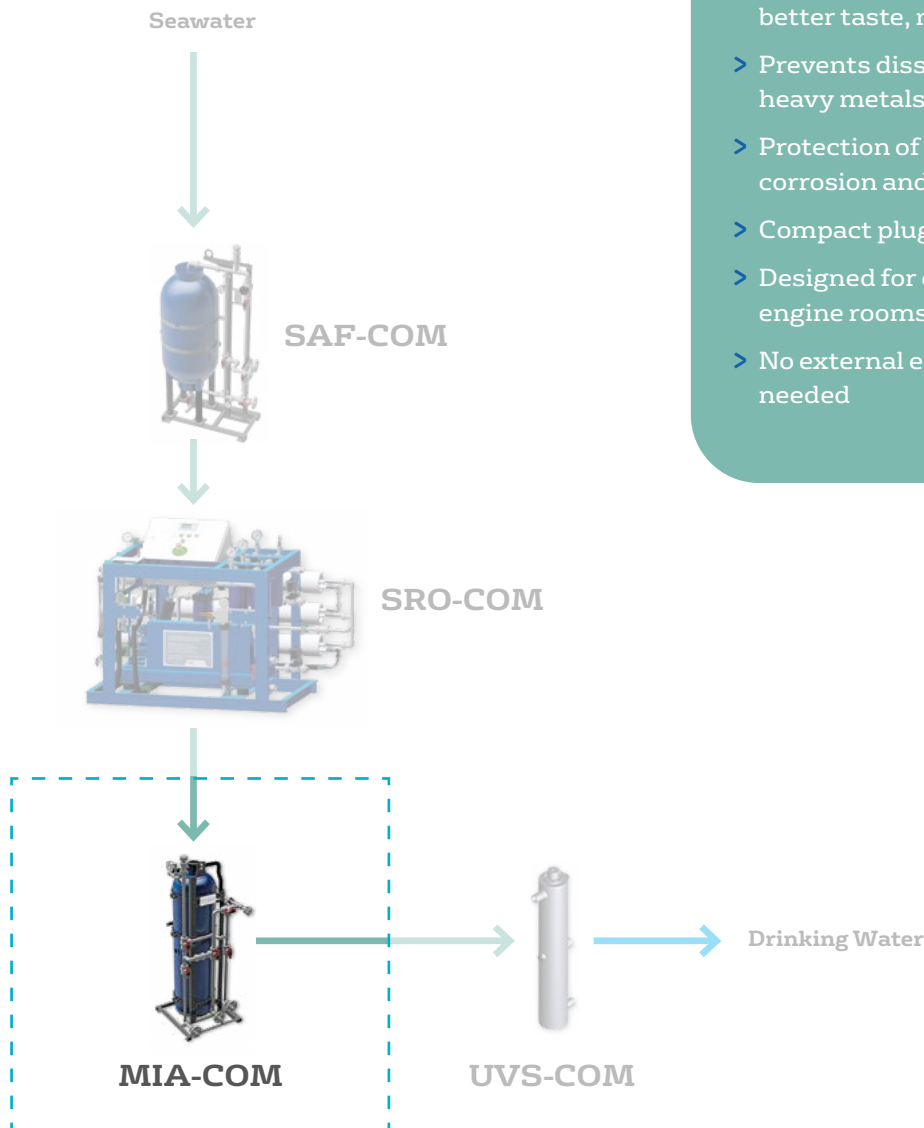


MIA-COM helps to prevent corrosion and improves health protection

The standard capacities of the RWO mineralizing single filter units range from 0.65 m<sup>3</sup>/h to 8.50 m<sup>3</sup>/h. Mineralizing units in duplex configuration, with two single filters operating in parallel mode, are also available.

## Key Features & Benefits

- > Higher quality of potable water, better taste, no odour
- > Prevents dissolving hazardous heavy metals from the pipe surface
- > Protection of ship equipment against corrosion and subsequent damages
- > Compact plug-and-play design
- > Designed for operation in unmanned engine rooms
- > No external electrical power supply needed



Type	Capacity m <sup>3</sup> /h	Length mm	Width mm	Height mm	DN/PN	Wet weight kg
MIA-COM 650	0.65	725	470	1150	10/16	60
MIA-COM 1000	1.00	790	560	1360	15/16	100
MIA-COM 2000	2.00	920	555	1550	20/16	170
MIA-COM 4200	4.20	965	615	1875	25/16	310
MIA-COM 8500	8.50	1340	835	2125	40/16	680

max. allowed working overpressure: 6 bar; max. allowed operating temperature: 40 °C

# UVS-COM Ultraviolet Disinfection

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## Reliable Disinfection of Potable Water

RWO's UV units consist of a reaction chamber with the UV lamp and a separate control cabinet. The UV lamps, which emit over 90% of the total UV emission at the optimum wave length of 254 nm, are fitted into the reaction chamber and protected by a UV transparent quartz glass.

Disinfection of potable water by UV radiation is a safe and reliable alternative to other methods such as chlorination and is also used as final polishing before distribution/prior to consumption.

## How it Works

The radiation causes photochemical reactions in the cells of micro-organisms, thus inhibiting essential cell functions. UV radiation is most suitable for sterilisation as an exposure to UV-C radiation kills more than 99,9% of the bacteria and viruses.

## Key Features & Benefits

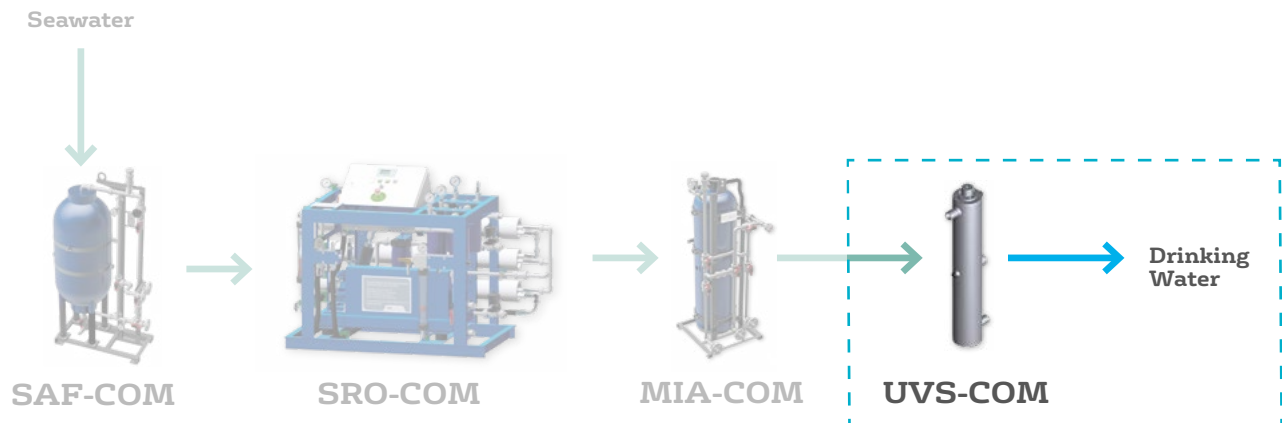
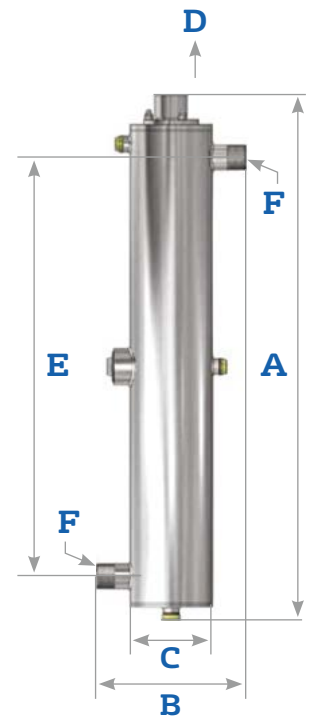
- > No chemicals required
- > No effects on taste and odour
- > No disinfection by-products
- > No corrosion problems
- > Safe disinfection of drinking water
- > Easy to operate and maintain





## Dimensions

Type	UVS-COM 3	UVS-COM 5	UVS-COM 15
A	1000	1000	1350
B	165	210	210
C	89	114	114
D	900	900	1200
E	870	860	1105
F	1"	1 ½"	2"



## Design-Parameters

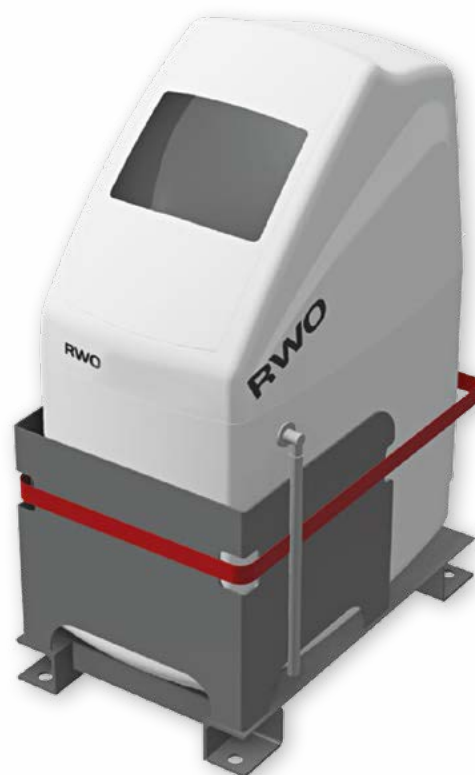
Type	UVS-COM 3	UVS-COM 5	UVS-COM 15
Flow-Rate (m <sup>3</sup> /h)	3	5	10-15
UV-C-Transmission -SSK m (T <sub>1cm</sub> )	96 %	96 %	96 %
Dose (J/m <sup>2</sup> )	400	400	400
Water temperature (°C)	max. 35	max. 35	max. 55
Ambient temperature (°C)	max. 40	max. 40	max. 40
Working pressure (bar)	max. 10	max. 10	max. 10
Power supply (V/Hz)	230/50-60	230/50-60	230/50-60
Reactor (kg)	6	8.5	12
Control unit (kg)	11.5	11.5	11.5

# SOE-COM Drinking Water Softening

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## Protecting Equipment from Scaling and Water Hardness

Hardness in water is caused by the ions of calcium and magnesium. The hardness of the water is of prime concern for many technical applications because of its scale-forming tendencies. Therefore, some water users on-board ships need softened water, e. g. hot water circuits, laundry water, galley pantry, boiler feed water, cooling water. We recommend the RWO drinking water softener SOE-COM.



Water softening for drinking water and technical systems

## How it Works

RWO water softeners operate using the ion-exchange process. The hardness minerals, calcium and magnesium, contained in the water are exchanged with sodium when flowing through the softener. To set an optimal water hardness between 6 and 8° dH the blending can be optionally integrated into the system. After exhaustion of the ion-exchange capacity the softener will be regenerated with brine.

## Minimal Resource Consumption

The special control of the plant calculates the required salt and water flow before each regeneration. The resource consumption is significantly reduced because only the actual required quantity of salt and water is used. This protects the environment and reduces operating costs.

## Easy Handling

Operating status and service requirements are indicated on a multicolor display. The control concept supports an optimal plant operation over the entire life cycle.

	SOE-COM 1200
Typical capacity $\Delta p$ 1 bar and blending 20°dH on 8°dH*	1.2 m³/h
Capacity min. /max.	0.3/1.2 m³/h
Adsorbtion capacity	13 ° dH x m³
Operating pressure	2.5 - 6 bar
Dimension A/B/C	345/620/790 mm
Connection	1 ¼"
Electrical connection	230 V, 50 Hz
Wet weight (kg)	80

\*Other capacities available on request.

## Key Features & Benefits

- > No scale inhibitors required
- > Compact plug-and-play design
- > Chemical saving system
- > Increased lifetime of water-contacting equipment
- > Low maintenance requirements
- > Designed for operation in unmanned engine rooms



# Dosing Unit

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## Chemical Dosing on Board

Fresh water and service water onboard of ships is necessarily taken from various sources. To compensate the varying water quality the water has to be treated with chemicals. RWO dosing units assist you to condition the water easily and reliably in order to serve the intended use and to meet the technical requirements.



High dosing accuracy and easy installation

The field of applications includes the dosing of:

- > Acids for alkalinity reduction and scale prevention.
- > Polyelectrolytes for coagulation of suspended solids and an improved subsequent filtration.
- > Scale inhibitors to avoid scale deposits on reverse osmosis membranes.
- > Disinfectants for shock treatment in order to avoid bacterial growth.
- > Chlorine to avoid biological growth in pipes and storage tanks.
- > Hydrated lime or caustic soda for pH adjustment to neutralize dissolved free carbon dioxide.

RWO dosing units feature solenoid driven diaphragm metering pumps. The combination of solenoid drive and diaphragm guarantees durability and dosing accuracy. All parts in contact with media are chosen for their resistance against the standard chemicals used for water treatment.

The control of the pump allows a continuous adjustment of injection volume and frequency. This guarantees an adaptation to the dosing characteristics of the dosing agents.

## Key Features & Benefits

- > High dosing accuracy local control for adjustment of dosing rate
- > Integral dosing head deaeration for degassing of chemicals
- > Easy installation and maintenance high operational reliability
- > High quality materials
- > Accessories in great variety

## Dosing Units AM

The AM line of products is designed for dosing proportionally to the flow. Contact signals from a water meter guarantee the appropriate dosing rate. This is important where regulations must be observed or the chemicals are expensive.

## Dosing Units HM

Dosing units of the HM type are designed for applications where proportional dosing rates are not necessary or not applicable.

## Accessories

- > Water meters for in-line installation, generating the timing pulse which is necessary for flow controlled dosing rates
- > Automatic control units for dosing units
- > A range of containers of different sizes for dosing chemicals
- > Handoperated mixers or motor driven mixers with timer and protection against dry running
- > Level switches for low level alarms and dry-running alarm
- > External failure signal

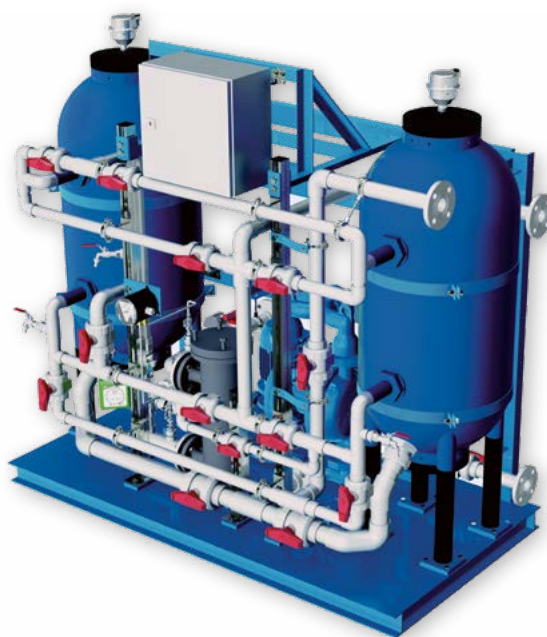
# ACCuRem Copper Removal & Condensate Reuse

**RWO**



## Economical Reuse of AC Condensate on Cruise Ships

Cruise ships that sail the warmer regions of the earth continuously produce a lot of condensate water. The air is cooled down inside the heat exchangers of the air-conditioning units to a temperature below the dew point of the outside atmosphere. This causes a large fraction of the air humidity to fall out as condensate, which accumulates at the bottom of the air conditioning (AC) units. Commonly, the AC condensate of heat exchangers is collected inside a central condensate tank from where it is used for secondary purposes or pumped overboard.



ACCuRem for water recycling offers a smart way to reduce expenses for fresh water generation



## Economical Focus

What makes the AC condensate interesting is the fact that it is water almost free from salts and minerals. Desalination of water on board a passenger vessel is a costly process and the by-product AC condensate is available practically for free. The flow of condensate may vary between none at all to up to 20 m<sup>3</sup>/hr on board very large cruise ships. The condensate can be used for ship's laundry and other applications.

## The Challenge

When the condensate is formed on the surfaces of the air coolers it takes up impurities from the air such as dust and bacteria, but also carbon dioxide, NO<sub>2</sub> and SO<sub>2</sub>, and copper ions from the AC heat exchangers. The suspended solids and the copper, may cause problems when reusing the AC condensate, as the copper tends to precipitate, e. g. in the washing machines where it may cause greenish colour on the laundry. Therefore, even on ships, where reclaim systems are installed, there is no reuse of AC-condensate in most cases and the ships are using expensive potable water instead.

## Your Solution: ACCuRem

The ACCuRem copper removal system is based on a combination of filtration and ion exchange. Numerous ACCuRem systems are in successful operation on cruise ships since its development and exceeding the expectations of both shipowners and operators. The system is part of RWO's Total Water Management offer.

## Key Features & Benefits

- > Treats several thousands of cubic metres of condensate via a special process
- > Very small footprint for easy integration also into existing piping onboard ships
- > No requirement to operate or maintain regeneration equipment
- > Easy removal and refill of filter material
- > No other chemicals involved
- > Quick return of investment costs

## How it Works

The handling of the ACCuRem system is simple and requires only a little monitoring for on-time detection of the exhaustion of the filter material. Checking the water quality after the treatment can be done by simple copper test kits or using the spectrophotometer. Reuse of AC drain condensate on board cruise ships for technical purposes, e. g. as laundry supply water, is an environmentally friendly and economic way of saving potable water, which otherwise needs to be produced conventionally from seawater by evaporation or reverse osmosis.

## Further RWO Technologies for Cruise and Yacht Applications

- > Oil-water separators
- > Advanced wastewater treatment plants
- > Ballast water treatment
- > Reverse osmosis desalination
- > UV disinfection
- > Pre and fine filtration
- > Softeners and demineralisers
- > Mineralisation and deacidification
- > Chemical dosing systems