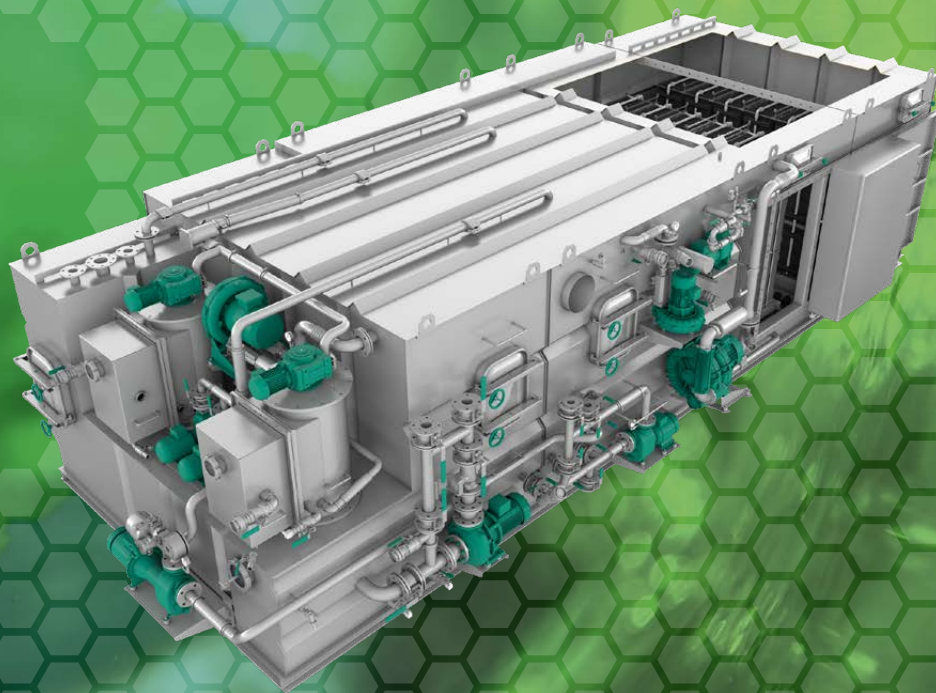


Life is good - with clean water



# Advanced Wastewater Treatment Technologies for Vessels & Offshore Installations

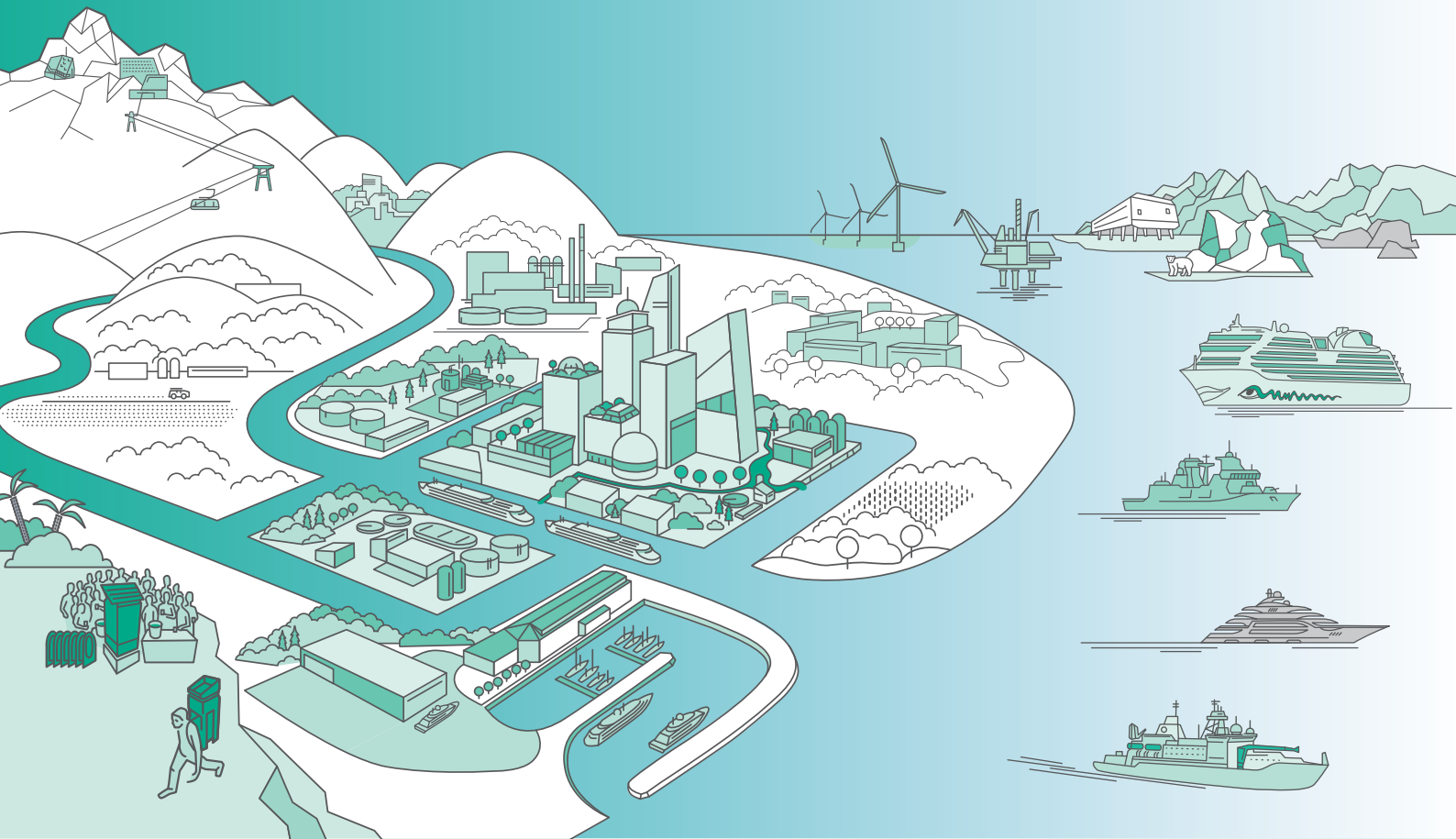


[www.martin-systems.com](http://www.martin-systems.com)



**MARTIN**  
MEMBRANE SYSTEMS

A WILO COMPANY



**MARTIN**  
MEMBRANE SYSTEMS

A WILO COMPANY

**MARTIN Systems** is an international wastewater treatment company. We offer complete on-board systems for maritime applications, including

- Vacuum systems and vacuum toilets,
- Flotation systems for the treatment of galley grey water,
- Grease separators,
- Transfer pump units,
- Tank equipment,
- Mechanical pretreatment units,
- High-efficiency biological treatment systems,
- Membrane filtration systems,
- Sludge handling equipment (dewatering, drying),
- Food waste systems,
- Exhaust air treatment,
- Waste handling equipment and
- Incineration systems.

All **MARTIN Systems** has a compact design, requiring small tank capacities and spaces and are customized solutions, tailored to the individual requirement of each ship.

Our range of German-engineered and manufactured wastewater treatment systems provide a superb effluent quality, reducing suspended solids to effectively zero and fulfilling the latest international and local requirements without chemicals consumption.

Our project teams support you throughout the entire process lifecycle: from pre-planning, during the construction and building phase through to commissioning. We offer individual customized solutions for refit and new buildings.

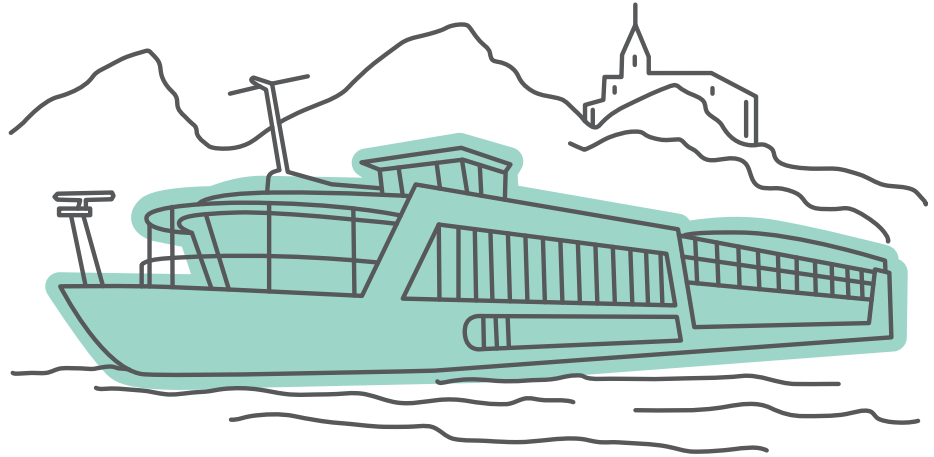
**MARTIN Systems** is also your partner for worldwide service and maintenance.



## RIVERSIDE

Leading in MBR maritime  
wastewater treatment for  
river cruise vessels

According to CDNI  
(certified to Rheinschiffs-  
untersuchungsordnung)



## MARTIN Systems solutions

Food waste systems

Flotation systems

Transfer pump units

Vacuum systems and  
toilets

Mechanical pretreatment  
units

Biological treatment  
systems

Waste Handling  
equipment

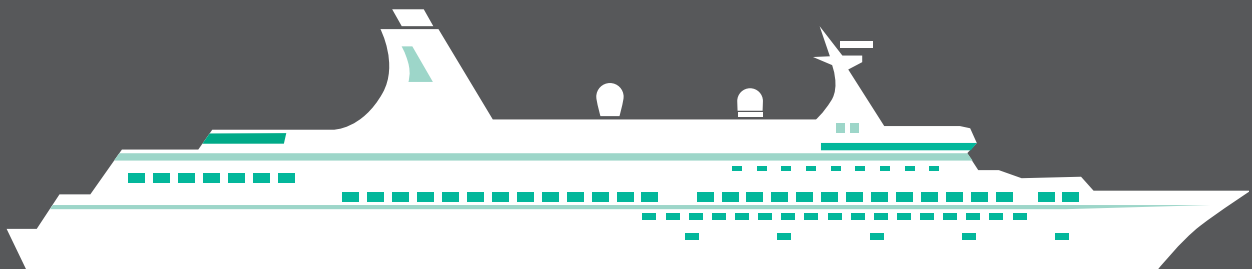
Membrane filtration  
systems

Sludge handling equip-  
ment (dewatering & drying)

Grease separators

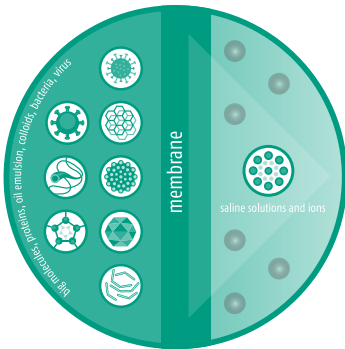
Exhaust air treatment

Incinerators



# MEMBRANE FILTERS

for all MBR applications

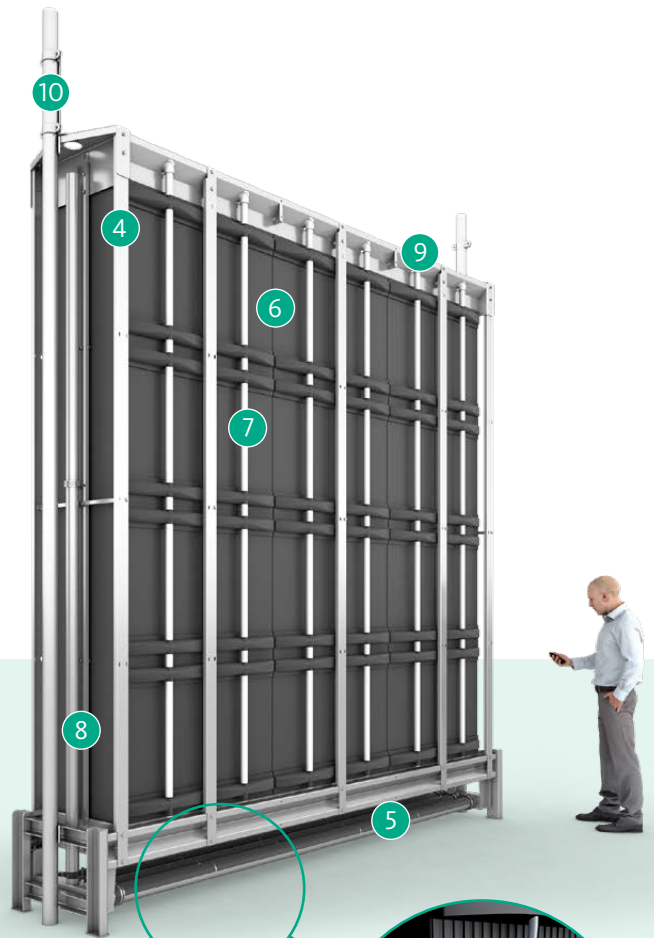


The mean pore diameter of the membranes is only thirty-five millionths of a millimetre (0.000035 mm).

In comparison, the diameter of an enteric bacteria (*E-Coli*) is approx. one thousandth of a millimetre (0.001 mm), so that the membrane represents an impassable barrier for these bacteria.

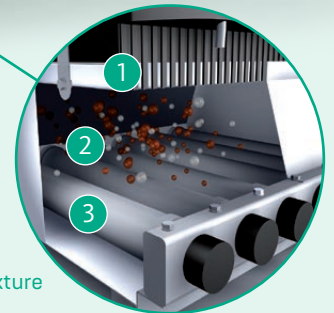
The ultrafiltration membranes used for wastewater treatment physically separate smallest particles down to colloids from liquids on the basis of its defined pore size (<0.1 µm). The membrane holds these substances back without changing them either physically or chemically. This means that dangerous substances cannot even be produced. We utilise user-friendly flat sheet membranes made of organic polymers which, in combination with the sophisticated filter design, effectively prevent clogging of the filter due to hairs, fibres or other unhygienic coarse matter.

This technology is a combination of the proven activated sludge technology and the innovative membrane process and offers a number of advantages over conventional aeration plants. The membrane filters are installed directly in the aeration tank or in downstream filtration chambers and ensure that activated sludge, bacteria and viruses are safely retained there. A conventional secondary settling tank is thus no longer needed to achieve the highest effluent quality.



## CUBE LFM 20124 with 960 m<sup>2</sup> filter surface

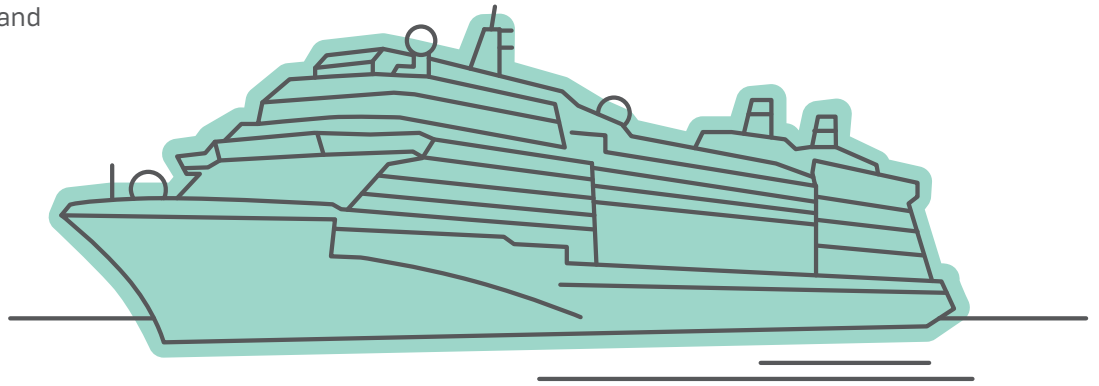
- 1 filter module
- 2 activated sludge - air mixture
- 3 aerator for air scouring
- 4 frame
- 5 up-streaming foot
- 6 filter modules
- 7 filtrate extraction
- 8 scouring air connection
- 9 filtrate connection
- 10 guide rail



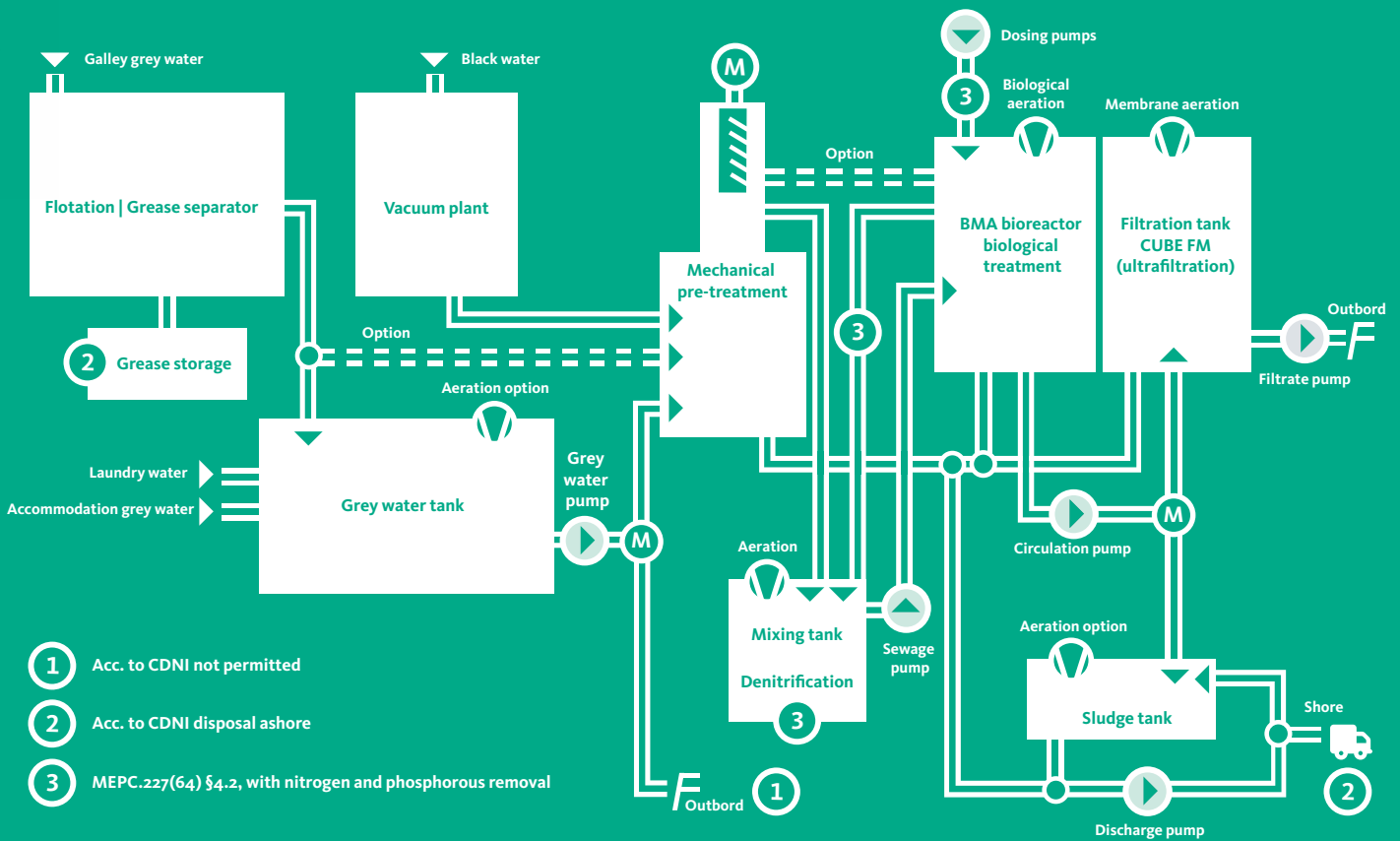
# ACROSS THE OCEAN

## MBR supply for maritime applications

Certified according to IMO Marpol MEPC.227(64) including 4.2 with nutrient removal (nitrogen and phosphorus).

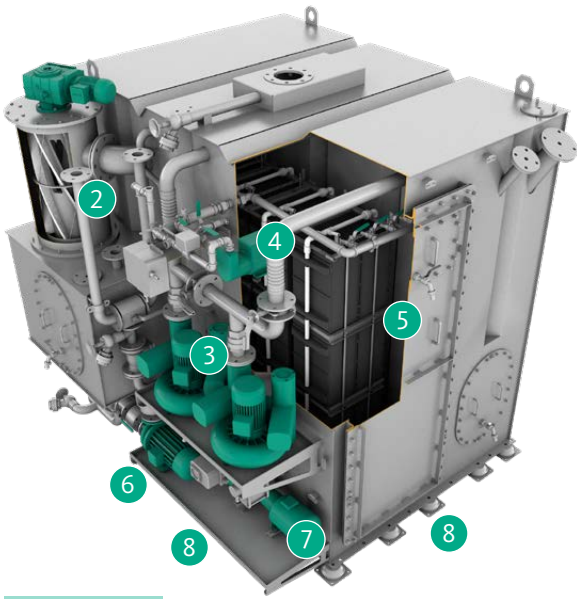


### Typical arrangement of a MBR system acc. to MEPC.227(64) / CDNI



## BMA® N-Line

### Solutions for Super Yachts and Passenger Ships



BMA® 150

## → Our solutions for your advantage

### Low investment costs:

Compact design requiring small tank capacities and spaces.

### Low operation costs:

Minimal energy demand | Long membrane lifecycle | Simple maintenance | No risk of blocking or clogging | Fully automated filtration operation.

### Guaranteed compliance to hygienic standards.

Certified according to IMO standard MEPC.227(64) with nutrient removal and CDNI.

The BMA® system was developed to allow ships to be operated globally and ensure reliable compliance with the stringent worldwide sewage standards. Our BMA® Lines treat all wastewater streams onboard, such as black water, accommodation grey, galley grey and laundry water.

Effluents from BMA® systems comply with the requirements of IMO MEPC.227(64) and USCG. Our BMA® S-Line meets also the advanced nutrient requirements for nitrogen and phosphorus according to MEPC.227(64) for

Cruise vessels operating in Special areas according to MEPC.290(62), thanks to the integration of anoxic treatment stages and selected phosphate elimination.

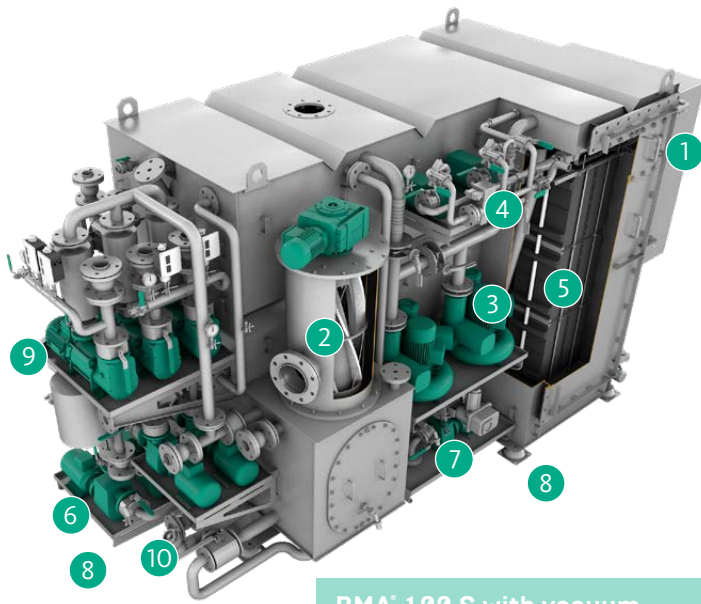
### Split arrangement

We also provide pre-assembled filtration units for all capacities. The biological treatment stages are integrated in the structural tanks. Please ask for a detailed offer.

BMA® N-Line <sup>(1)</sup>							
Type	Average daily flow		BOD5 Load kg/d	Maximum dimensions L1 × W1 × H1/H2 <sup>(3)</sup> mm	Service area S1 mm	Weight empty kg	Weight filled kg
	nom. m³/d	max. m³/d <sup>(2)</sup>					
BMA® 10 N	1,85	2,6	0,98	1.650 × 1.140 × 1.900/1.900		700	1.800
BMA® 30 N	5,5	7,6	2,93	1.850 × 1.310 × 1.900/1.900	600	1.200	3.000
BMA® 50 N	9,2	12,7	4,92	2.370 × 1.570 × 1.900/1.950		1.400	4.300
BMA® 75 N	13,9	19,2	7,38	2.450 × 2.000 × 2.100/2.050		2.000	6.800
BMA® 100 N	18,5	25,5	9,84	2.800 × 2.270 × 2.000/2.050		2.200	8.500
BMA® 150 N	27,7	38,2	14,76	3.500 × 2.620 × 2.000/2.050	800	2.400	11.400
BMA® 200 N	37	51	19,68	4.100 × 2.600 × 2.200/2.280		3.800	16.400
BMA® 300 N	55,5	76,6	29,5	4.500 × 3.200 × 2.200/2.280		5.500	26.600
BMA® 500 N	92,5	127,6	49,2	6.950 × 3.200 × 2.100/2.100		7.000	28.000
BMA® 740 N	136,9	189	72,8	8.100 × 3.500 × 2.200/2.200		9.000	40.000

# BMA® S-Line

## Advanced Solutions



**BMA® 100 S with vacuum and grey water pumps**

- 1 Control cabinet
- 2 Mechanical pre-treatment
- 3 Biological and scouring blower
- 4 Filtrate pump
- 5 Biologic treatment with ultrafiltration
- 6 Drain pump
- 7 Circulation pump
- 8 Service area
- 9 Vacuum pump
- 10 Sewage pump

Higher organic loading and hydraulic flows on board Passenger Ships, Super and Mega Yachts require adapted solutions for wastewater treatment systems. The BMA® S-Line is certified according to MEPC.227(64) with nitrogen and phosphorus removal for an organic load of 150 g BOD5 per person per day and a hydraulic flow of 185 l per person per day. The plants are manufactured and painted to the highest quality standards.

**Remarks:** External mixing tank and sludge tank required.

<sup>(1)</sup> **BMA-N®:** Type certified plants according IMO MEPC.227(64), with 98,4g/(p\*d) organic BOD5 load according to type test and 185l/(p\*d) hydraulic capacity.

<sup>(2)</sup> **38% Hydraulic overload according to IMO certification, max.24h.**

<sup>(3)</sup> **Tank is also available in H3=2.600mm. Dimensions upon request.**

<sup>(4)</sup> **Mixing tank / separate Denitrification**

<sup>(5)</sup> **BMA-S®:** Type certified plants according IMO MEPC.227(64), with 150g/(p\*d) organic BOD5 load according to type test and 185l/(p\*d) hydraulic capacity.

**BMA® 10, 30:** Fine screen, 3 l/s  
**BMA® 50, 75:** Fine screen, 5 l/s  
**BMA® 100–300:** Fine Screen, 7 l/s  
**BMA® 500, 740:** 2 Fine Screen, 7 l/s

**Vacuum plant:**

**BMA® 10, 30:** 15 l/h, L x W x H = 720 x 360 x 850 mm, 90 kg  
**BMA® 50:** 30 l/h, L x W x H = 720 x 500 x 850 mm, 180 kg  
**BMA® 75–100:** 52 l/h, L x W x H = 880 x 620 x 950 mm, 220 kg

All other systems with vacuum collecting tank; available upon request. Subject to technical alterations.

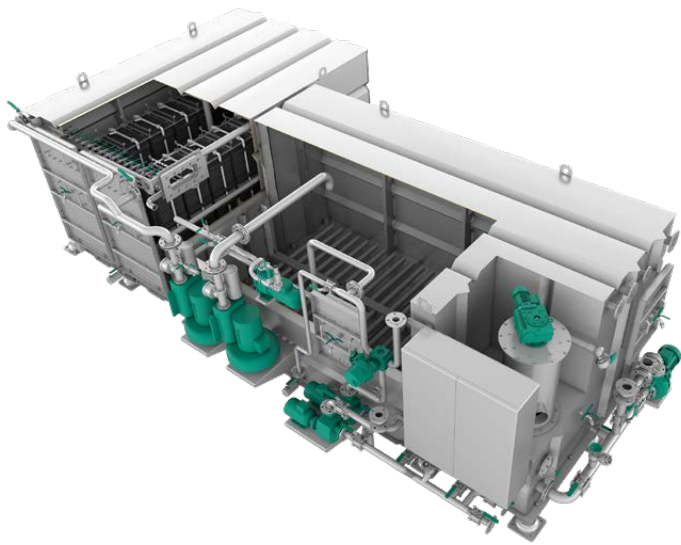
BMA® S-Line <sup>(4,5)</sup>		
Type	Average daily flow	BOD5 Load
	m <sup>3</sup> /d	kg/d
BMA® 40 S	7,4	6,0
BMA® 65 S	12	9,75
BMA® 100 S	18,5	15
BMA® 200 S	37	30
BMA® 325 S	60	48,7
BMA® 485 S	90	72,8

### Note:

Advanced wastewater treatment systems in the BMA® Line comply with the high requirements of IMO MARPOL in terms of disinfection without additional UV irradiation.

## BMA® R-Line

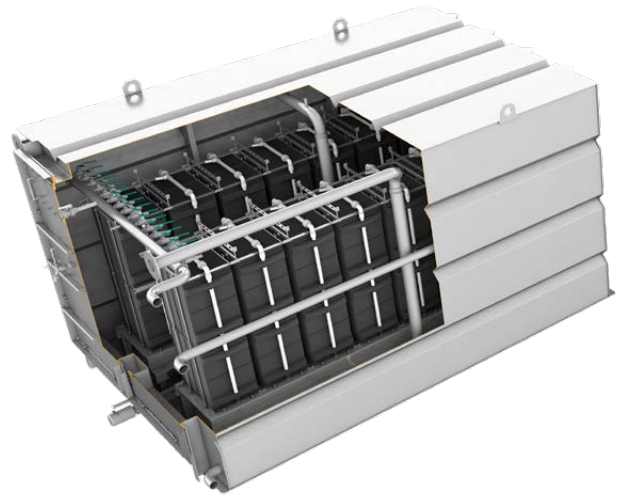
### Solutions for River Cruisers



BMA® 50 R

## BMA® C-Line

### Equipment for Cruise Ships



BMA® 10 C

### BMA® R-Line

The BMA® R-Line is customized for River Cruise/ Long Ships used on the Rhine, Main, Danube and other European inland waterways. These plants are preferably integrated in the ship's structural tanks or installed as pre-assembled containerized systems.

These plants comply with the requirements of CDNI Appendix V and the Danube Commission's recommendation on the organisation of the collection of shipborne waste. The plants are certified according to the 3rd BinSchUO Abweichung VI (technical requirements for inland waterway vessels). The following standard sizes are available:

BMA® R-Line <sup>[5] [6]</sup>		
Type	Average daily flow	BOD5 Load
	m <sup>3</sup> /d	kg/d
BMA® 5 R	5	4,8
BMA® 13 R	13	12,6
BMA® 20 R	20	19,4
BMA® 35 R	35	34
BMA® 50 R	50	48,6
BMA® 75 R	75	72,9

### BMA® C-Line

The scope of supply mainly consists of the delivery of pre-fabricated, factory tested filtration systems, as well as equipment sets for the mechanical pre-treatment, mixing, aeration and sludge tank that are installed in ship integrated structural tanks. The BMA® C-Line is certified according to the current requirements. Plants are available upon request.

BMA® C-Line				
FM624 <sup>[7]</sup>	Membrane area	Dimensions L × W × H	Wet Weight	Power 50/60Hz
	m <sup>2</sup>	mm	to	kW
BMA® 10 C	500	3.600 × 2.240 × 3.000	15,5	7,3 / 7,1
BMA® 14 C	700	4.400 × 2.240 × 3.000	20,5	9,5/8,7
BMA® 20 C	1.000	5.600 × 2.240 × 3.000	28	14,6/12,1
BMA® 30 C	1.500	7.500 × 2.240 × 3.000	40	19/16,5

<sup>[5]</sup> Separate mixing and sludge tank

<sup>[6]</sup> Type certified plants according to Rheinschiffsuntersuchungsordnung, with 180 g per person per day organic BOD 5 load, and 185 l per person per day hydraulic capacity, grey- and blackwater

<sup>[7]</sup> FM624 for example. Other filter types are available too.

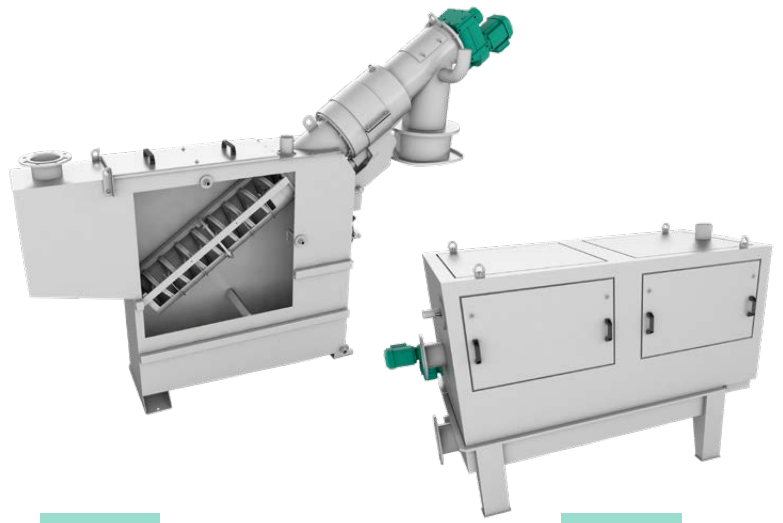


## Vacuum Systems MSV



MSV 800

## Fine Screen RA Mechanical Pretreatment Units



RA-SS

RA-DS

## Vacuum Systems MSV

MARTIN offers vacuum systems and equipment for the collection of black and partly grey water. Our vacuum stations mainly have dual vacuum and discharge pumps, as well as a vacuum collecting tank providing an excellent vacuum performance, especially at simultaneous use.

## Fine Screen RA

Hairs, fibrous materials, etc. can form unwanted agglomerations and block / clog equipment and the membrane bioreactor and therefore have to be separated from the receiving wastewater to ensure the plant's safe and low-maintenance operation. The RA-350 series fine screen combines a vertical strainer with screenings washer that returns the organic contents of the screenings to the biologic treatment as carbon source. The separated solid matter can be sucked off directly from the tank with a suction vehicle. As option the solids can be dewatered in a screw press and packed. Sieve screw RA-SS and Drum screens RA-DS are for larger ship applications, separating the solids straight into bags or dewatered silo tanks.

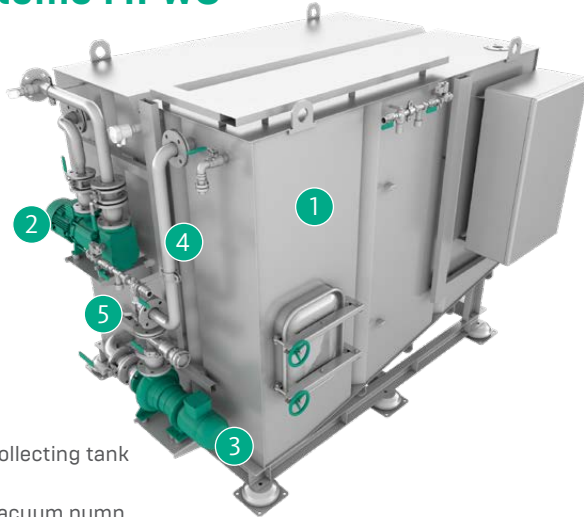
Vacuum Systems MSV

Type	Vacuum capacity	Discharge capacity		Tank volume	Operation volume
	m <sup>3</sup> /h	m <sup>3</sup> /h	m	liter	liter
MSV 800*	280	30	10	800	600
MSV 1200/2	280	30	10	1.200	1.000
MSV 1200/3	420	30	10	1.200	1.000

\* preferably for blackwater

Medium	Wastewater containing solid matter		
Designation	Fine screen		
	RA 350-600	RA 350-1000	RA-SS/DS
Material	1.4301/ 1.4571/ PP		
Max. flow rate [l/s]	5	7	15-30
Screen length [mm]	813	1000	<a href="#">Datasheet</a>
Screen pipe diameter [mm]	350		300/600
Screen openings [mm]	1 mm Hole / 0,5 mm Slot		
Outlet	Flange DN 150		
Output [kW]	0,37		1,1

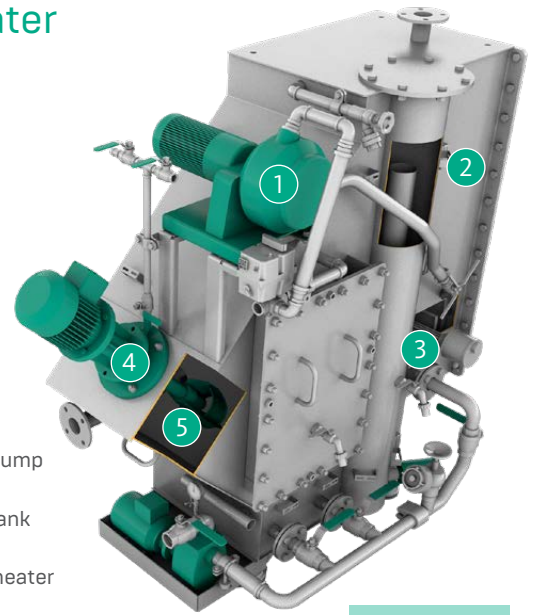
## Food Waste Vacuum Systems MFWS



- 1 Collecting tank
- 2 Vacuum pump
- 3 Discharge and circulation pump
- 4 Circulation pipe
- 5 Outlet

Food waste tank 5 m<sup>3</sup> with vacuum pumps and discharge or circulation pumps

## Flotation Systems MSF for the Treatment of Galley Grey Water



- 1 Grease pump
- 2 Grease tank
- 3 Electric heater
- 4 Jetstream mixer
- 5 Flotation reactor

MSF600G

### Food Waste Vacuum Systems MFWS

Food waste treatment is a very important task on-board of cruise vessels. A daily input of 0,8–2 kg per person and day have to be processed, but high food waste quantities affect the performance of the wastewater system. Our food waste systems are easy to use and require minimal maintenance. The food waste systems consist of one or more feeding stations (disposer) in the galley and a holding tank (capacity 3 or 5 m<sup>3</sup>). The food waste is macerated and transferred to the holding tank via vacuum, requiring only small pipe

diameter and less flushing water. Optional a skimmer for dewatering can be offered if sewage system has sufficient capacity.

### Flotation Systems MSF

The flotation system is designed for the removal of fats, oil and grease from the galley water and ensures a failure-free plant operation. In comparison to a grease trap, the flotation system works fully automated and has a much higher removal rate for FOGs, resulting in a better MBR performance.

Flotation Systems MSF									
Type	Persons	Principle	ADF	PHF	Dimensions L × W × H	Dry weight	Net weight	Grease tank	Galley collecting tank (*)
	Approx.		m <sup>3</sup> /d	L/h	mm	kg	kg	liter	m <sup>3</sup>
MSF600FG	250	Jetstream mixer / batch process	12,5	600	1.970 × 980 × 1.830	800	1.200	260	2,5
MSF600G	250	Jetstream mixer / batch process	12,5	650	1.690 × 1.2230 × 1.830	800	1.450	separate grease tank (*)	2,5
MSF550FG	200	Jetstream mixer / batch process	10	500	150 × 1210 × 1700	650	1.250	240	2,0

\* Collecting tank to be provided by others. \*\* ADF= Average daily flow 50/l(p\*d)

# REFERENCES

## Shipboard-wastewater treatment plants and offshore applications

### → Related solution

- Pump Units
- Vacuum System
- Vacuum Toilet
- Grease Separator
- Waste handling Systems
- Exhaust Air Treatment



Maritime wastewater treatment for cruise vessels



Maritime wastewater treatment for special vessels



Maritime wastewater treatment for navy vessels



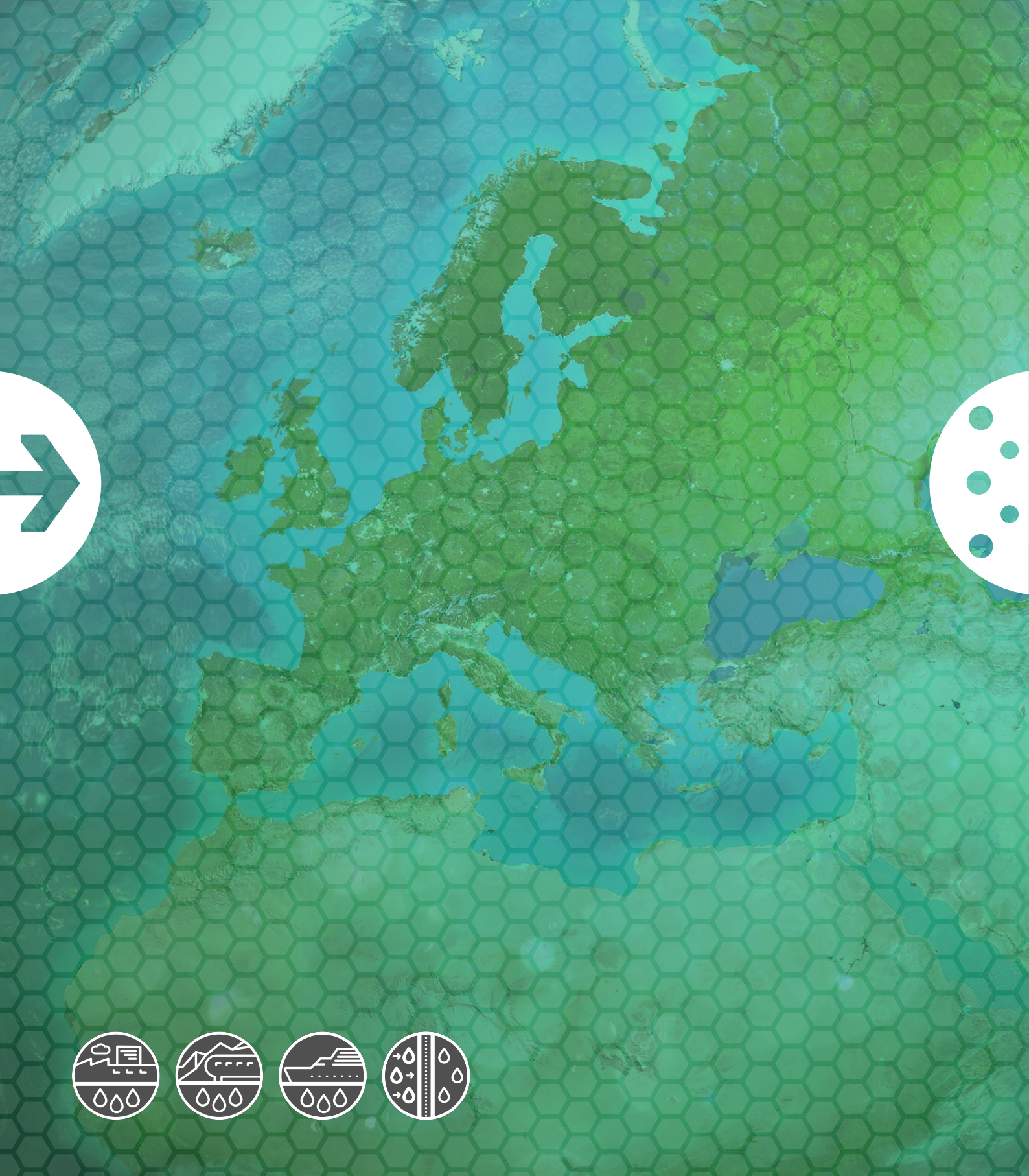
Maritime wastewater treatment for super yachts



Maritime wastewater treatment for river cruise vessels



Maritime wastewater treatment for merchant & offshore vessels



**MARTIN Systems GmbH**  
Friedrichstr. 95  
10117 Berlin, Germany  
T +49 30 2005 970 0  
[www.martin-systems.com](http://www.martin-systems.com)  
[info@martin-systems.com](mailto:info@martin-systems.com)

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