G&O BIOREACTORS

PART OF G&O MARITIME GROUP

BIOLOGICAL WASTE WATER CLEANING MADE SMART & SIMPLE

CONTENTS

OPERATE ANYWHERE WITHOUT HARMING MARINE ECOSYSTEMS

Gertsen & Olufsen's bioreactors clean your grey and black water on vessels and offshore installations without dilution, consumables or chemicals.

The process is 100% biological and exceeds the strictest IMO requirements. It's clean, flexible and cost-effective – the solution for your future.

Marine ecosystems are under scrutiny like never before. Pressure on companies to clean up their act is growing year on year, from regulations, from customers and investors. Forward thinking organisations are looking for tomorrow's solutions.

G&O's bioreactors are among the cleanest and most customisable waste water solutions in the marine industry.

They comply with – and exceed – the rules for discharging anywhere in the world. What's more, our bioreactors can be custom-fitted into the smallest spaces, offering valuable solutions for older vessels, cruise ships and yachts.

This gives you great operational flexibility, while taking care of the marine environment around you. Combine that with our bioreactors' ease of use, flexibility and cost effectiveness, and here is the answer to your waste water challenges.

RELIABLE, SIMPLE AND FLEXIBLE SOLUTIONS

Gertsen & Olufsen's bioreactors are low maintenance solutions, simple to use and highly efficient in operation. Their design is compact and low weight, and we readily customise them according to your requirements.

These design changes can range from simple 'customising to order' to more extensive engineering to order'. Either way, our skilled teams will ensure the solution precisely fits your needs.

- More than 10 00 units installed worldwide
- Customised designs can be retrofitted into the tightest spaces without the need for excessive time spent at shipyard
- Two key types of bioreactor – our conventional bioreactor and membrane bioreactor
- Conventional bioreactor available in 15 standard systems ranging in capacity from 1.85 m3/day up to 74 m3/day in a single system
- Membrane bioreactor available in all ranges up to 990.m3/day in a single system
- Advanced system approved by US Coastguard and Transport Canada
- Certified and Type approved by DNV according to IMO MEPC 227(64)
- Fitted with quality components from European suppliers

CHOSEN BY LEADING GLOBAL ORGANISATIONS

Our customers include many of the maritime industry's largest players from ship owners to national navies, offshore operators and more.

WHY GERTSEN & OLUFSEN?

Work with the global leader in the maritime and offshore industry

At Gertsen & Olufsen we apply brilliant design and quality engineering to solve the maritime industry's toughest and most pressing challenges.

We help you reduce costs, increase productivity and operate more sustainably, whether through innovative vibration compensators or bioreactors.

Since 1945, Gertsen & Olufsen has been one of the leading international partners for shipping operators, owners and builders worldwide.
Today we have expanded into the G&O Maritime Group by joining forces with other world-leading maritime suppliers.

Together we develop a range of unique advanced solutions for the maritime and offshore industries.

CHOOSE FROM TWO G&O BIOREACTORS: **CONVENTIONAL AND ADVANCED**

BIOREACTOR BR TYPE – CONVENTIONAL
The bioreactor is a 100% biological treatment system, which uses a fixed biofilm combined with UV treatment for a sustainable solution. The system can handle all grey and black water from any vessel or offshore facility with no need for filters, dilution or chemicals during normal treatment.

BIOREACTOR NX TYPE – ADVANCED
With the advanced bioreactor, it is possible to go beyond regulations to protect the environment. The process here is also based on a biological treatment in combination with a unique membrane treatment. In addition to this, phosphorous and nitrogen is removed, thereby living up to the rules for special areas in MEPC 227(64). The advanced solution is for those who face the toughest challenges, including cruise ships in protected waters and ship owners with an ambitious environmental agenda.

HOW GERTSEN & OLUFSEN BIOREACTORS WORK

The fundamental process used in our bioreactors – both conventional and advanced – is 100% biological. There's no dilution or consumables.

Waste water is led through several chambers and in the process is cleaned biologically with naturally occurring bacteria. The bacteria use oxygen to convert sewage into CO2 and water, leaving a small residue of sludge.

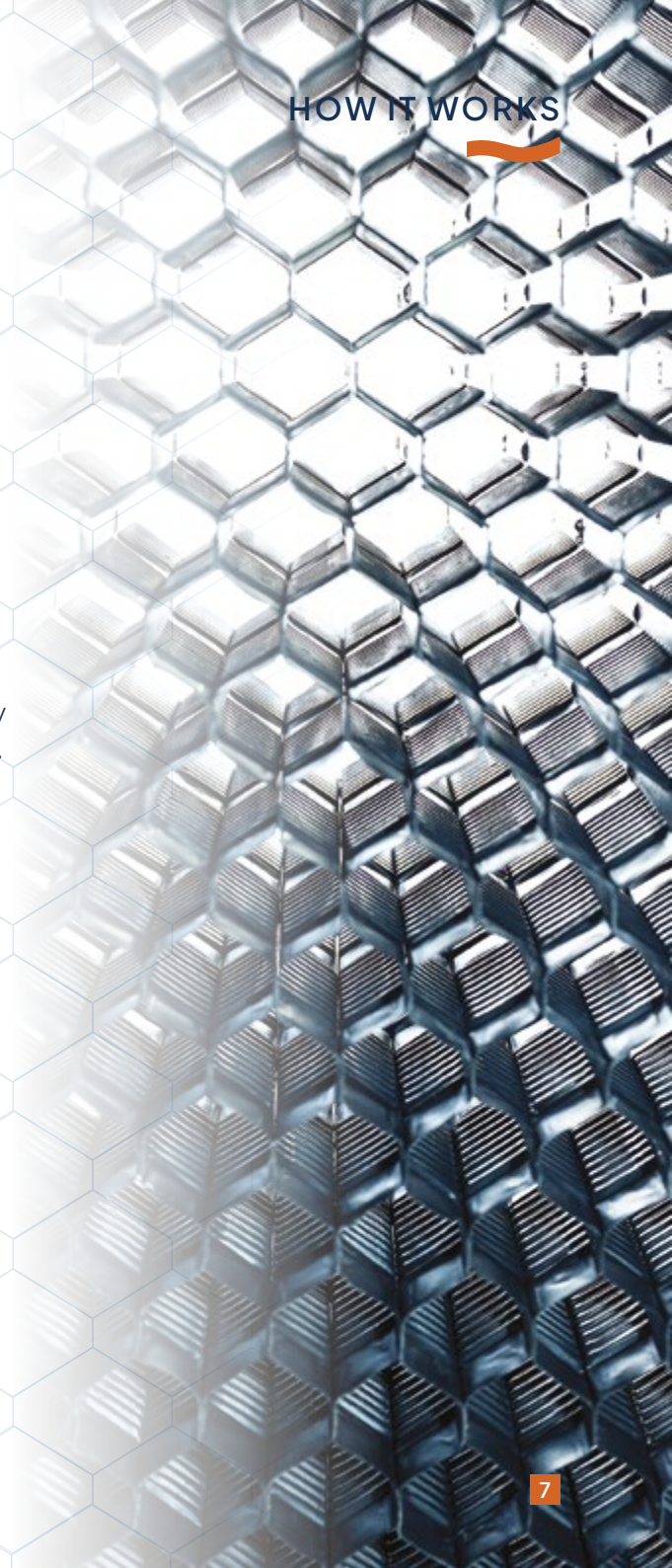
In conventional bioreactors
Before going into the cleaned water tank ready for discharge, the water passes through a UV filter to kill any remaining bacteria, including E.coli. The process is entirely free of man-made chemicals.

In advanced bioreactors
The water is treated biologically via an activated sludge process with natural occurring bacteria. This is combined with an anoxic nitrogen removal and simultaneous phosphorus precipitation. The water is then passed through a membrane unit where it undergoes an ultrafiltration process, which includes removing E.Coli and filtering any potential microplastic.

A track record of success
Gertsen & Olufsen bioreactors have proved successful in more than 1000 installations at all scales of operation, from offshore drilling rigs to passenger vessels, the smallest tugboats and even on land installations.

A better choice than chemical-based systems
Other waste water systems use harsh chemicals to tackle sewage. The resulting treated water typically contains traces of these chemicals.

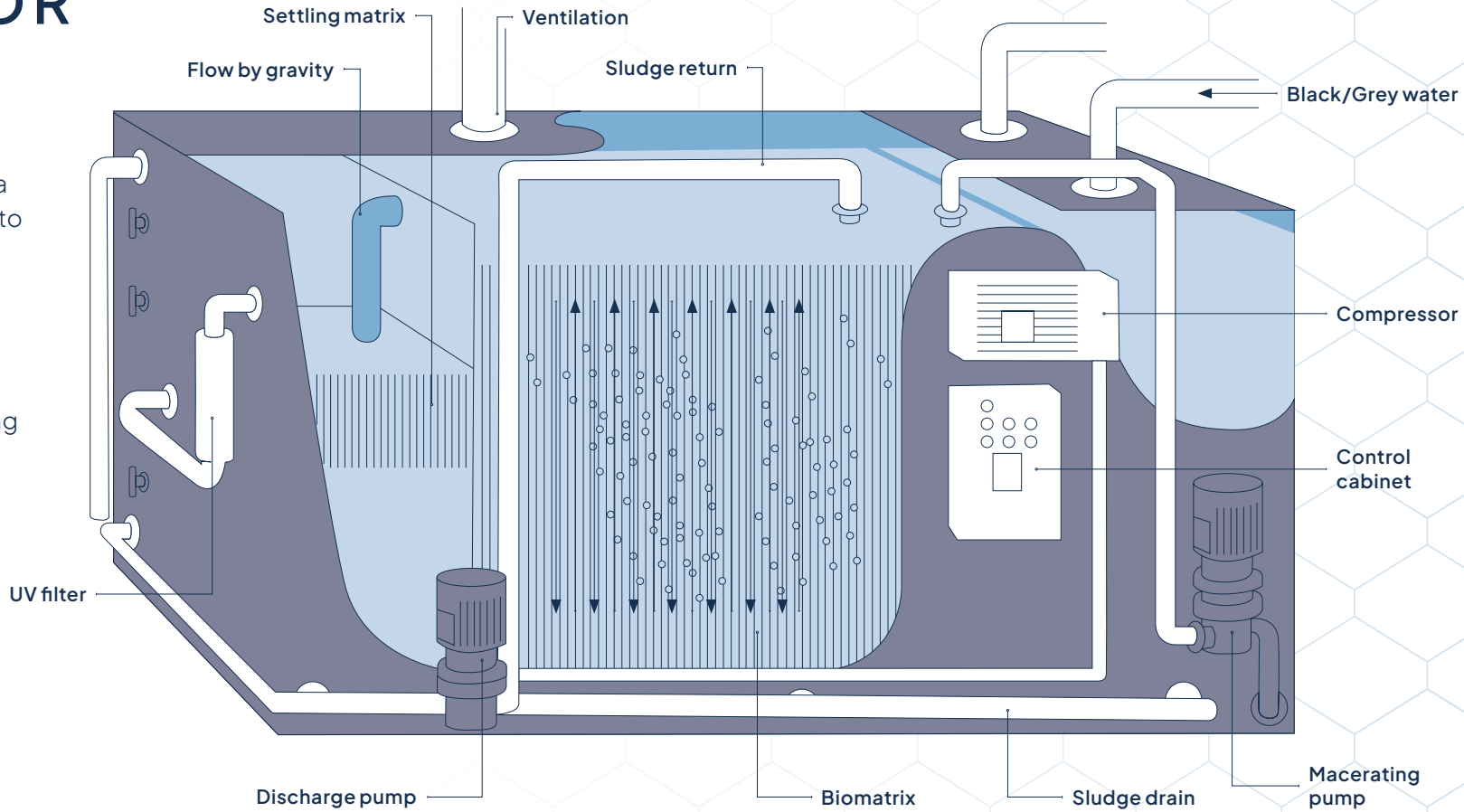
Other systems can also be inefficient and maintenance-intense, with the need for ongoing supplies of chemicals – a logistical hassle and more expensive than ever in today's global market.



CONVENTIONAL BIOREACTOR

Black & grey waste water is led into the inlet tank of the biore-actor via a macerating pump or a vacuum pump and is pumped into the main chamber matrix by the air from the aerators.

The waste water passes through the settling matrix and UV light for final disinfection before going into the cleaned water tank for discharge.



SIMPLE, EASILY MAINTAINED SYSTEM

- Designed for easy operation and maintenance
- Easy operation with minimal manual operation
- Built-in cleaned water tank and inlet tank
- Danish design
- Fitted with quality components from European suppliers
- Low power consumption

DESIGN OPTIONS

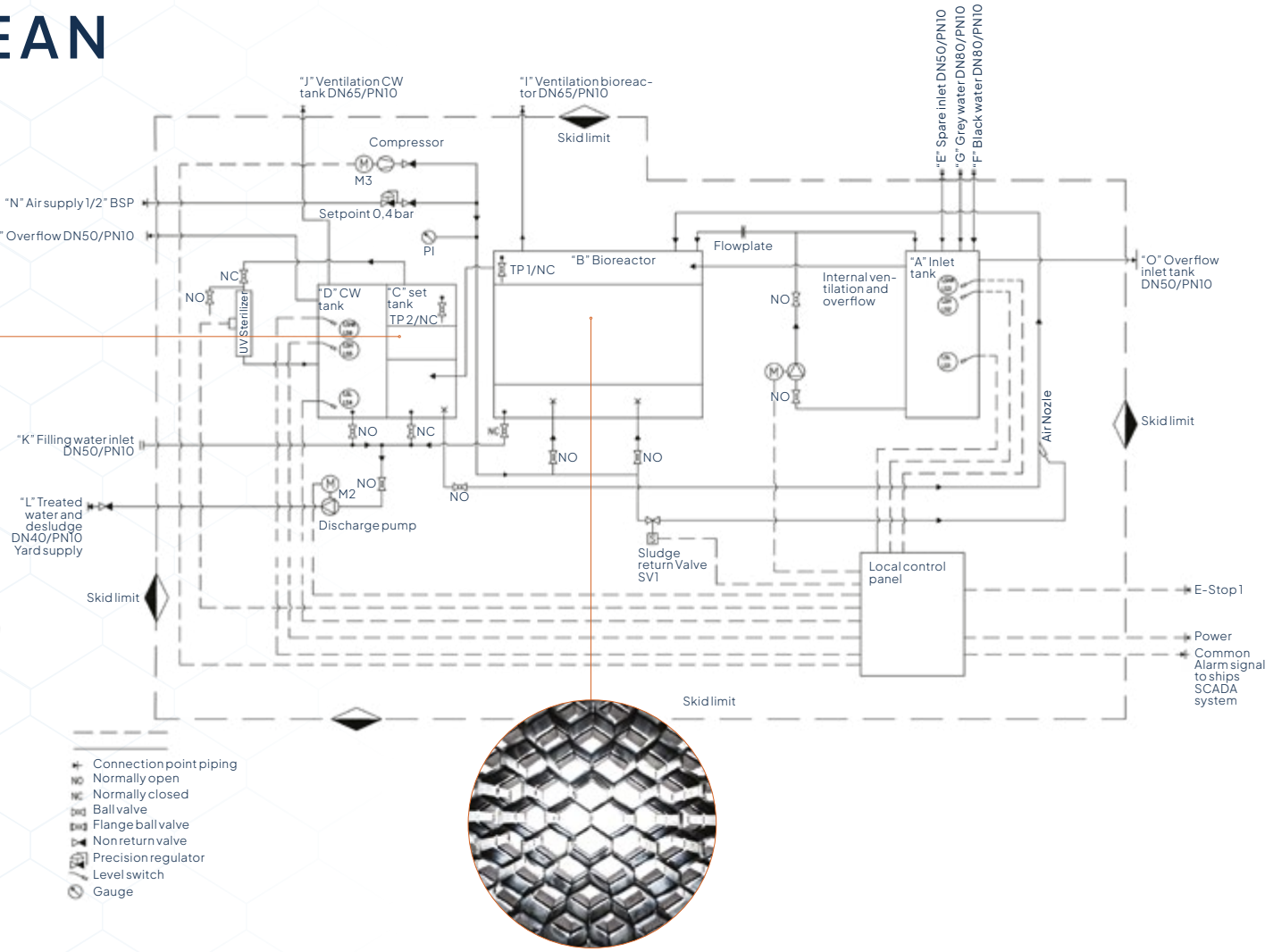
- Available in coated black steel and coated or uncoated stainless steel
- Work with both gravity and vacuum systems
- Vacuum equipment, grease separation and sludge handling systems available
- CE and ATEX systems available.
- Custom designed systems – e.g. where space limitations disqualify the use of standard systems
- Tailor-made split units, e.g. for retrofit projects

TECHNICAL SPECIFICATIONS FOR STANDARD PLANTS

BIOREACTOR TYPE	HYDRAULIC LOAD (m3/d)	ORGANIC LOAD (kg BOD5/day)
BR01850BG	1.85	0.75
BR03700BG	3.70	1.50
BR05550BG	5.55	2.25
BR07400BG	7.40	3.00
BR09250BG	9.25	3.75
BR11100BG	11.10	4.50
BR14800BG	14.80	6.00
BR18500BG	18.50	7.50
BR23125BG	23.13	9.38
BR27750BG	27.75	11.25
BR37000BG	37.00	15.00
BR46250BG	46.25	18.75
BR55500BG	55.50	22.50
BR64750BG	64.75	26.25
BR74000BG	74.00	30.00

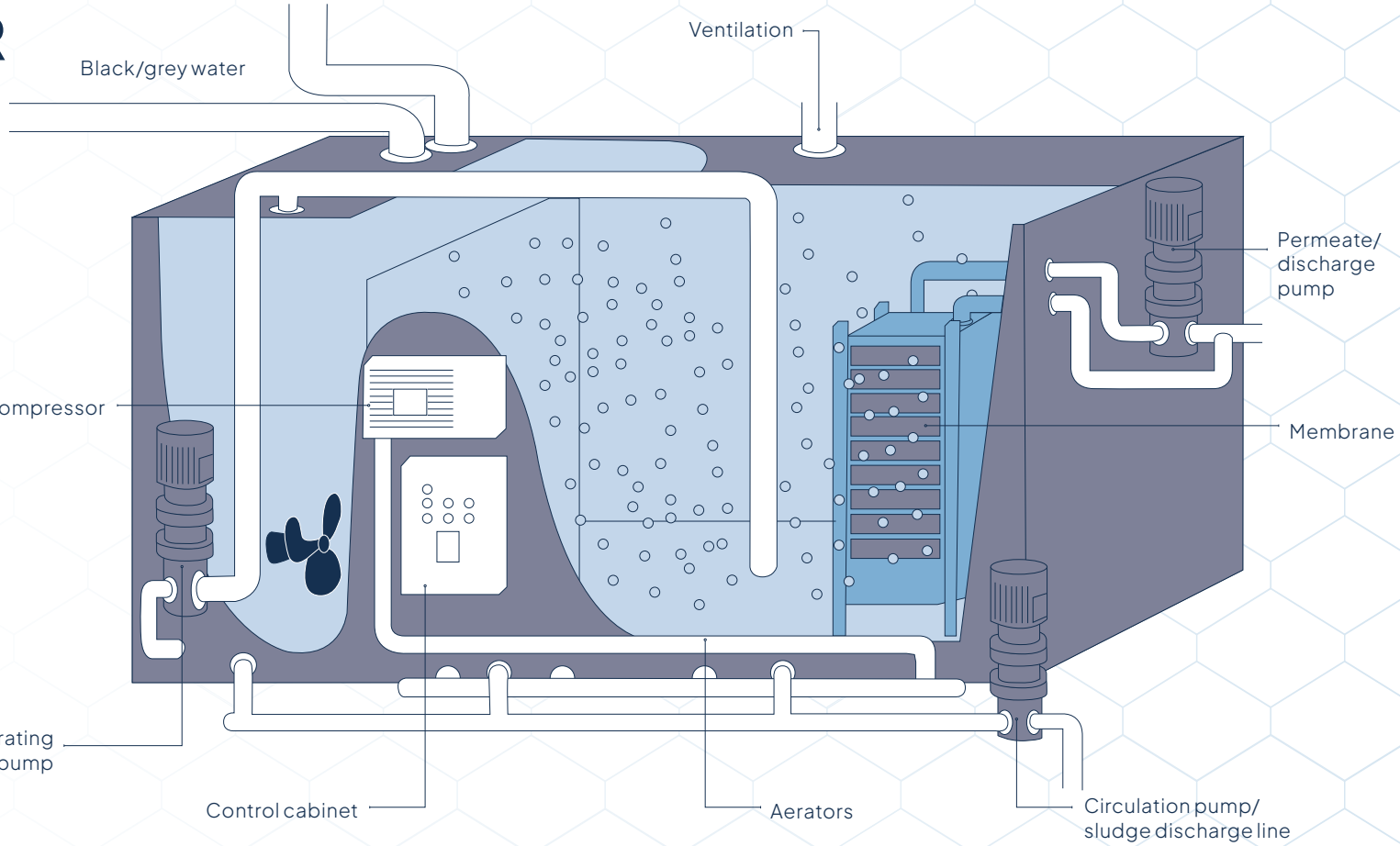
The capacity of the bioreactor ranges from 1–1000 Persons. Subject to change depending on actual organics and hydraulic load conditions. Please consult us for detailed information on the calculations for your specific project.

CONVENTIONAL BIOREACTOR
HOW DO WE CLEAN THE WATER?



ADVANCED BIOREACTOR

Black & grey waste water is let into the bioreactor pre-treatment tank through a macerator with a four knife cutting system, reducing the particle size optimised for the membrane filter. The water is then pumped into the filtration tank where nitrogen is removed via nitrification and phosphorous, particles and E.Coli is removed via filtration. The cleaned water is extracted with the permeate pump through the membrane filter system and then let overboard.



ADVANCED BIOREACTOR

This bioreactor is compliant with the stringent Directive 2006/7/EC of the European Parliament and of the Council concerning the management of bathing water quality and therefore the treated water can be reused e.g. as process water or technical water.

SIMPLE, EASILY MAINTAINED SYSTEM

- Minimum maintenance requirements – easy access for inspections
- Easy operation with minimal manual operation
- Built-in cleaned water tank and inlet tank
- Danish design
- Fitted with quality components from European suppliers
- Low power consumption

DESIGN OPTIONS

- Available in painted black steel and stainless steel
- Work with both gravity and vacuum systems
- Vacuum equipment, grease separation and sludge handling systems available
- CE and ATEX systems available.
- Tailor-made split units –e.g. for retrofit projects
- Flexible control and operational features to switch in and out of specific areas
- Custom designed systems – e.g. where space limitations disqualify the use of standard systems
- Full SCADA interface available
- Unique 30 degree inclination approval

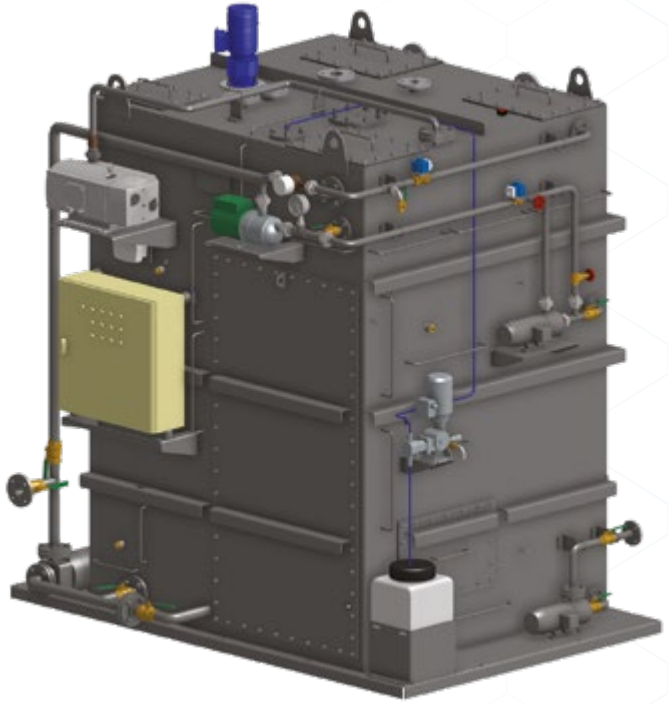
TECHNICAL SPECIFICATIONS FOR STANDARD PLANTS

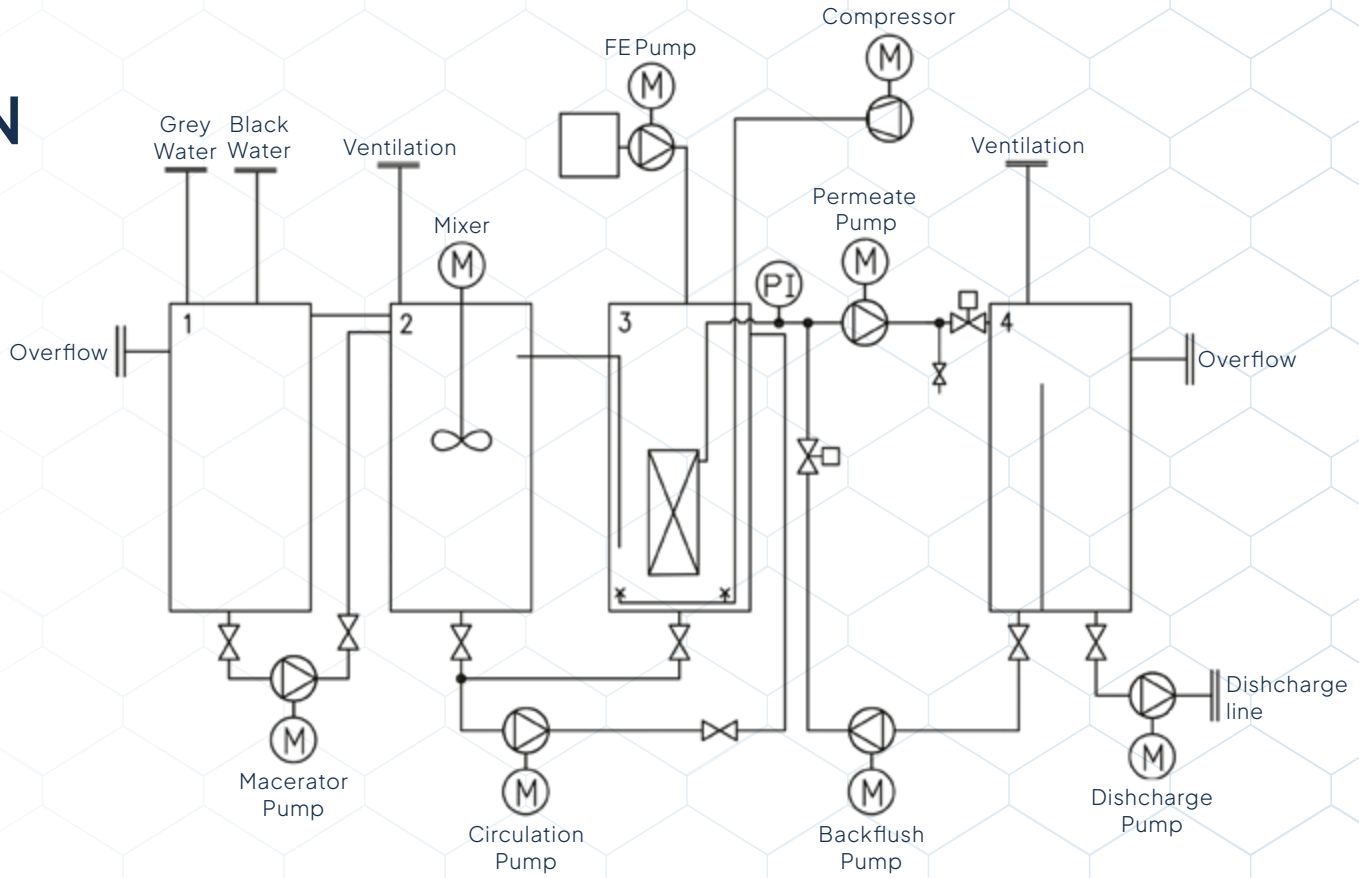
NX-C MEMBRANE TREATMENT OF WASTE WATER		
MODEL	**DESIGN HYDRAULIC LOAD**	**ORGANIC LOAD (kg BOD5/day)**
NX 10–C	1,7	0,6
NX 20–C	3,3	1,2
NX 25–C	6,6	2,3
NX 30–C	9,9	3,5
NX 35–C	13,2	4,7
NX 40–C	16,5	5,9
NX 45–C	19,8	7,0
NX 50–C	26,4	9,4
NX 55–C	39,6	14,1
NX 60–C	52,8	18,7
NX 65–C	79,2	28,1
NX 70–C	118,8	42,2
NX 75–C	264,0	93,7
NX 80–C	495,0	175,7
NX 90–C	990,0	351,5

NX-N MEMBRANE TREATMENT OF WASTE WATER INCLUDING REMOVAL OF PHOSPHOROUS AND NITROGEN		
MODEL	**DESIGN HYDRAULIC LOAD**	**ORGANIC LOAD (kg BOD5/day)**
NX 10–N		
NX 20–N	1,2	0,6
NX 25–N	2,5	1,2
NX 30–N	3,9	1,9
NX 35–N	5,1	2,4
NX 40–N	6,5	3,1
NX 45–N	7,6	3,6
NX 50–N	10,1	4,9
NX 55–N	15,2	7,3
NX 60–N	20,1	9,6
NX 65–N	30,2	14,5
NX 70–N	45,2	21,7
NX 75–N	100,3	48,1
NX 80–N	187,9	90,1
NX 90–N	375,8	180,2

The capacity of the bioreactor ranges from 1–5000 Persons. Subject to change depending on actual organics and hydraulic load conditions. Please consult us for detailed information on the calculations for your specific project.

ADVANCED MEMBRANE TREATMENT
HOW DO WE CLEAN THE WATER?





1. Inlet tank
2. Pre Treatment Tank
3. Filter tank
4. Clean water tank

SUPPORTED BY SUPERB GLOBAL SERVICE

We provide complete technical support throughout installation, maintenance, commissioning, and repair. We can help you either directly or through local partners located around the world offering 24/7 service to our customers.

The best way to protect your equipment is to ensure that the maintenance and service is done by G&O authorised service partners, where original spare parts are used. Genuine G&O spare parts come with a 12 month warranty.

WHEN YOU NEED OUR SUPPORT, WE ARE HERE TO HELP. WHEREVER YOU ARE.

G&O MARITIME GROUP
MARKET-LEADING BRANDS IN ONE PIONEERING GROUP

In 2022 HJ Lubricators was acquired by G&O Maritime Group. This drives for opportunities even further on a global scale and benefit shipping companies, striving to make vessels a greener and safer place to work. The companies have a long and proud history of inventing market leading products.

ABOUT G&O MARITIME GROUP
We are a group of sub system providers to the maritime industry, all developing high quality products and enabling our customers through a green transition in the maritime industry. Our brands are divided into 4 divisions:

Propulsion management
Offers vibration compensators, cylinder lubrication systems and piston rod stuffing boxes. We cooperate with engine manufacturers and shipping companies to optimise main engine operations, supporting the important task of utilising new environmentally friendly fuel types.

Tank management
Provides PV valves and protects tank vessels against unintended overpressure or vacuum, whilst simultaneously protecting against fire risk and ensuring that emissions from the cargo is kept to a minimum, as in accordance with IMO standards.

Water & Waste management
Includes incineration plants and biological water purifying plants, securing that waste water is purified before discharge while solid waste and oil sludge is incinerated at high temperatures to reduce SOx and NOx emissions.

Service management
Provides specialised solutions for the maintenance, repair and optimisation of critical marine equipment, ensuring the reliability and longevity of vessel operations. With expertise in boiler systems, automation and spare parts, services are designed to minimise downtime and enhance efficiency.

FUELTECH

Fuel supply and safety systems for dual-fuel vessels, enabling cleaner operations with future fuels like methanol, ammonia, LNG, and LPG.

G&O COMPENSATORS

Compensators that eliminate vibrations at the source, reducing cost, improving comfort and cutting fuel spend.

HECO®

Piston rod stuffing boxes for two-stroke engines continuously improved to live up to new fuel types entering the market.

HJ Lubricators®

Leading global provider of cylinder lubrication systems for two-stroke marine engines.

PRES·VAC®

Valves and venting equipment reducing emissions from cargo whilst keeping vessels, equipment and crews safe daily.

G&O BIOREACTORS

Biological cleaning of grey and black waste water before it is discharged.

ATLAS INCINERATORS®

Incineration of waste and oil sludge, eliminating the need for discharging to shore while reducing emissions from incineration.

Global Boiler Services

Specialised 24/7 solutions for the maintenance, repair and optimisation of marine boilers and critical equipment.

GET YOUR SHIPS AND INSTALLATIONS FUTURE-FIT

Gertsen & Olufsen Bioreactors are the solution you need to equip your vessels and offshore installations for the future.

Across industries, there's an increased focus on the environment and more rules are being adopted to secure the future of our marine ecosystems. Also in the maritime industry more regulations are continuously being developed. Authorities and class societies are focusing more on ships' own monitoring of water treatment systems onboard, and non-compliant shipowners risk losing certificates and class approvals.

Choose a waste water system that's biological, intelligently engineered for reliability and ease of operation, and delivers greater operational flexibility.

Our bioreactors can be retrofitted as ultra compact, modular systems that can work in difficult spaces, minimising delays and periods in dock.

It's a cleaner, simpler and smarter solution.

Contact us to find out more.

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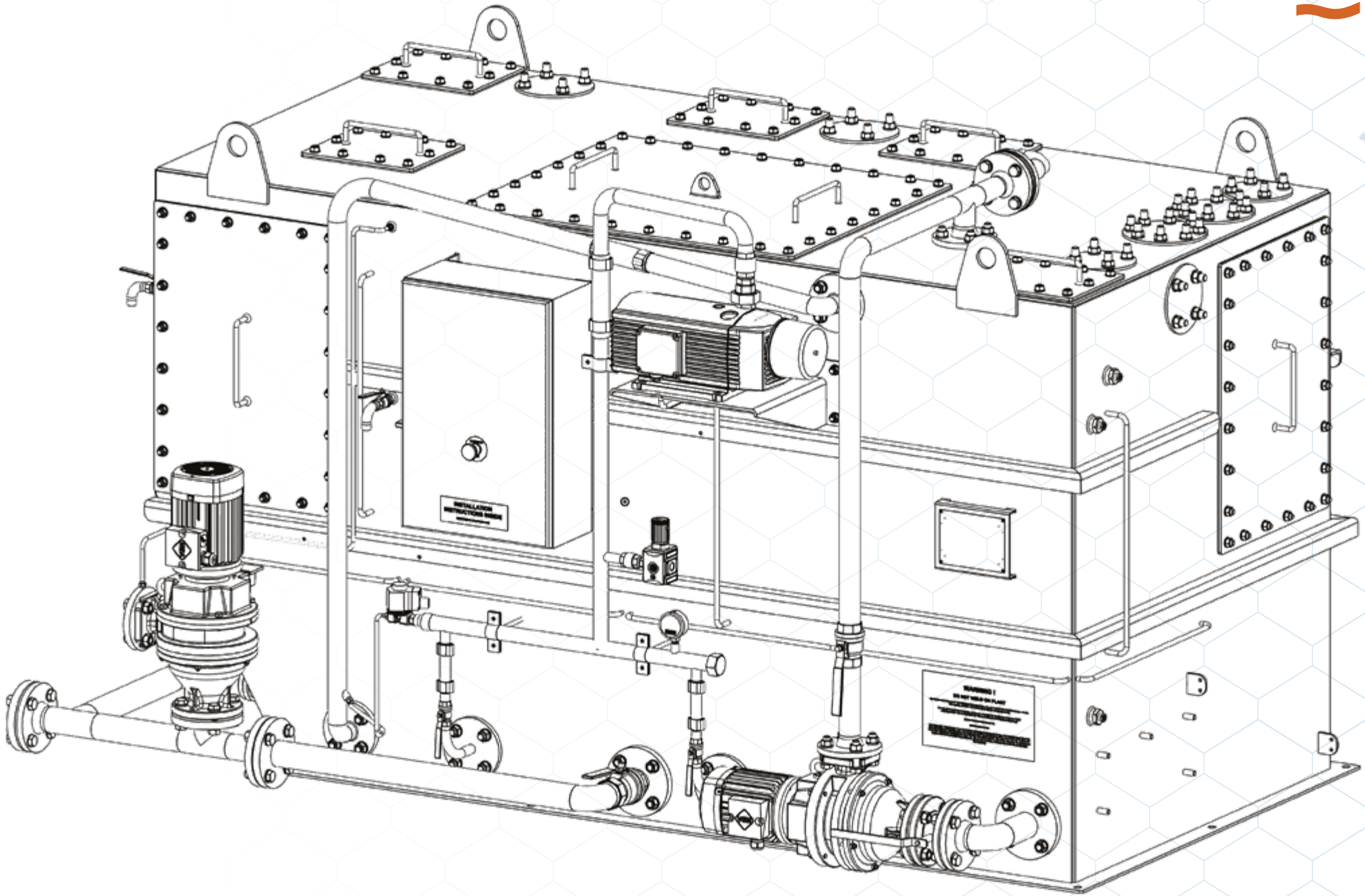

G&O MARITIME GROUP®

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At G&O Maritime Group we enable our customers during the green transition in the maritime industry