

Liquids to Value



Westfalia Separator® **seaprotect**solutions

Systems to protect the sensitive marine ecosystem and the value of your investment



GEA Mechanical Equipment / **GEA Westfalia Separator**

Contents

4	Overview Westfalia Separator® seaprotectsolutions
4	High Performance Equipment for the Engine Room
6	Westfalia Separator® BilgeMaster® Systems
6	Self-Cleaning Centrifugal System
7	So That Our Water Stays as Nature Made It – Clean
8	Technologies to Protect the Sensitive Marine Ecosystem
9	The Flexible Compact Unit Design is Suitable Both for both Newbuildings or Retrofits
10	Westfalia Separator® minimaXx® – Manual Cleaning Centrifugal System
12	Westfalia Separator® minimaXx® – Clean and Compact
14	Westfalia Separator® SludgeMaster® System
14	Process Overview
15	System Concepts for the Future
16	Economical Advantages – Ecological Merits
18	Drain Water
19	Drain Water with High Solids Content
20	The Effective Combination
21	Process Overview
22	Westfalia Separator® seaprotectsolutions for your payback
22	Systems to Protect the Sensitive Marine Ecosystem and the Value of Your Investment

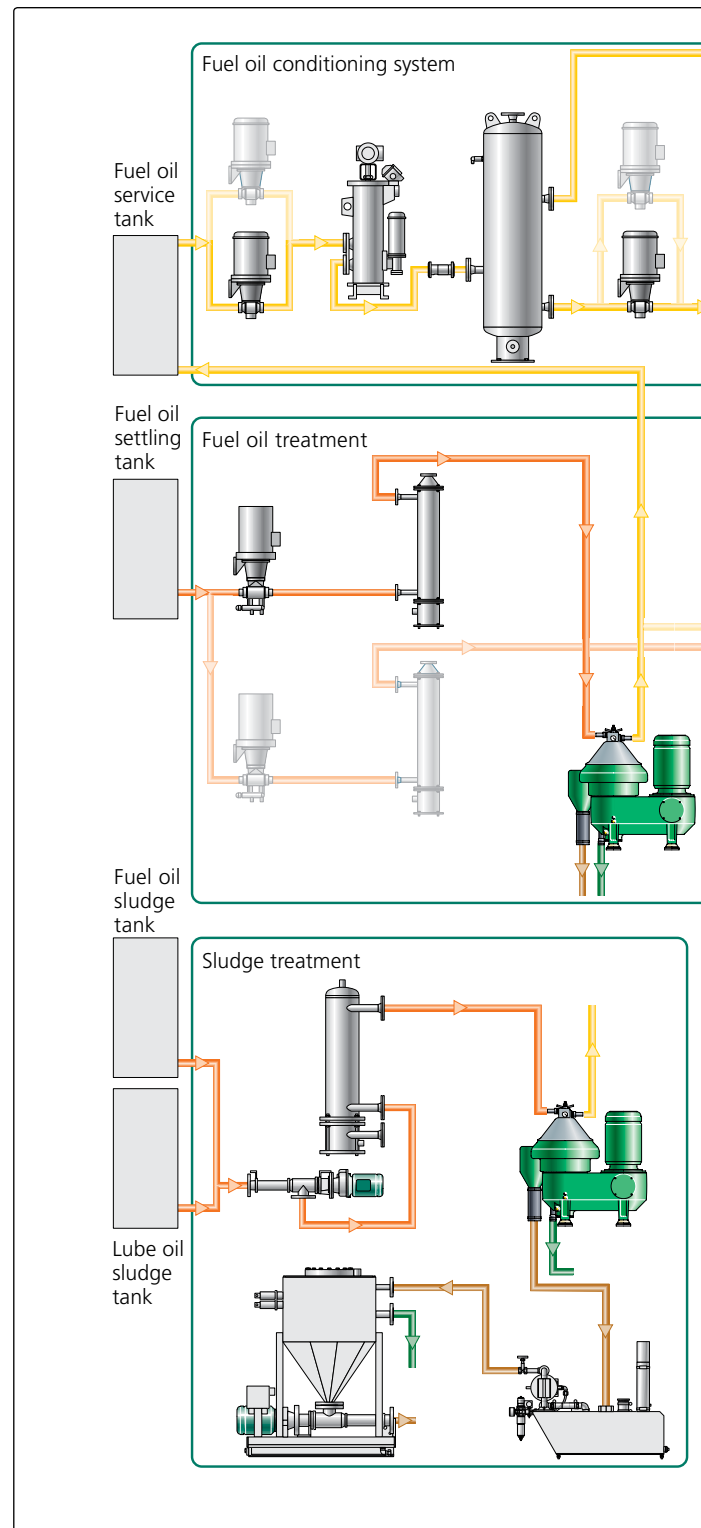
High Performance Equipment for the Engine Room

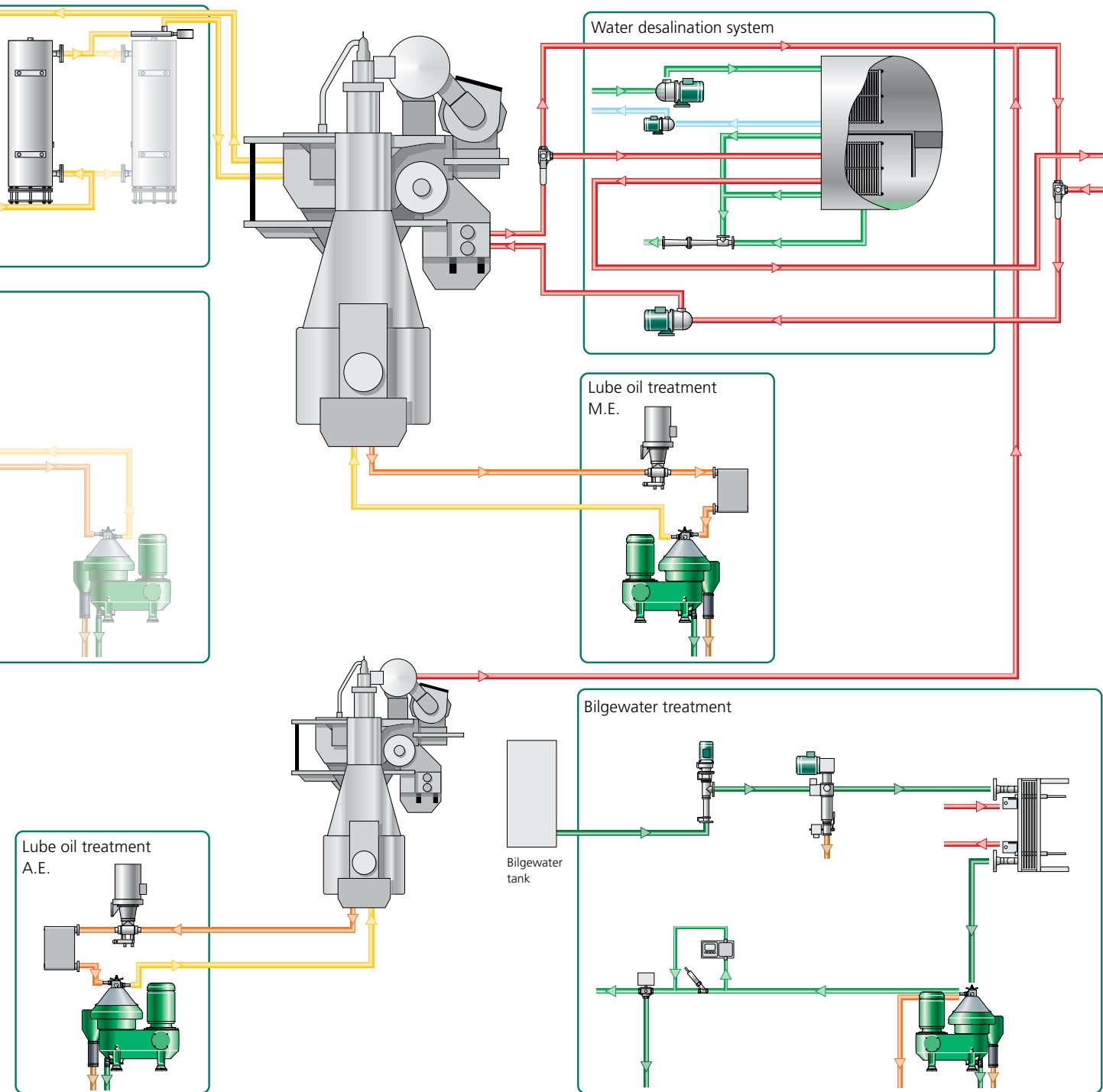
Overview of Westfalia Separator® **seaprotecsolutions**

GEA Westfalia Separator offers leading technologies and individual systems for oil industry use. Be it system engineering from one source, high quality workmanship or unrivalled worldwide service – GEA Westfalia Separator provides a system to rely on.

Product range overview

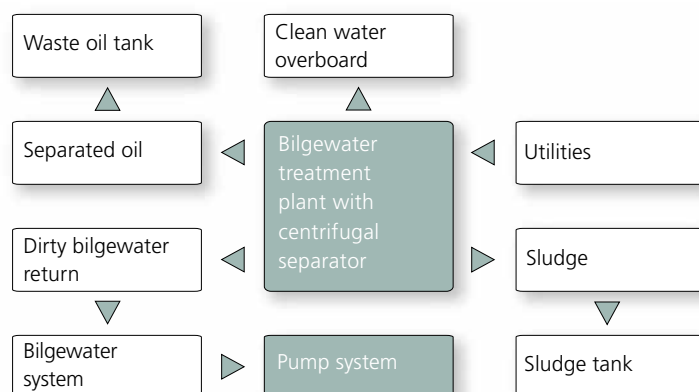
- Diesel oil dewatering
- Crude oil dewatering
- Lube oil treatment
- Sludge treatment
- Bilgewater treatment
- Central cooling system
- Lube oil cooling system
- Water desalination system
- Hydraulic oil treatment plants
- Drain water treatment
- Produced water treatment
- Drilling mud decanter centrifuges
- Slop oil treatment





Self-Cleaning Centrifugal System

Westfalia Separator® **BilgeMaster®** systems



The treatment of bilgewater on board offshore facilities is strictly controlled by national and international laws.

Bilgewater may only be discharged into the sea after prior de-oiling with specially approved treatment systems. The maximum oil content must not exceed 15 ppm. The limit has even been reduced to 5 ppm in special areas.

15 ppm is too much

Oily water from rig operations may only be discharged into the sea if the residual oil content in the effluent is below 15 ppm. This amount may seem small, but GEA Westfalia Separator believes this is still too high. Moreover, practice has shown that this value is not attained in many conventional plants under practical operating conditions. The further we can reduce this value, the greater the benefit for our oceans.

Bilgewater is a mixture of the following constituents:

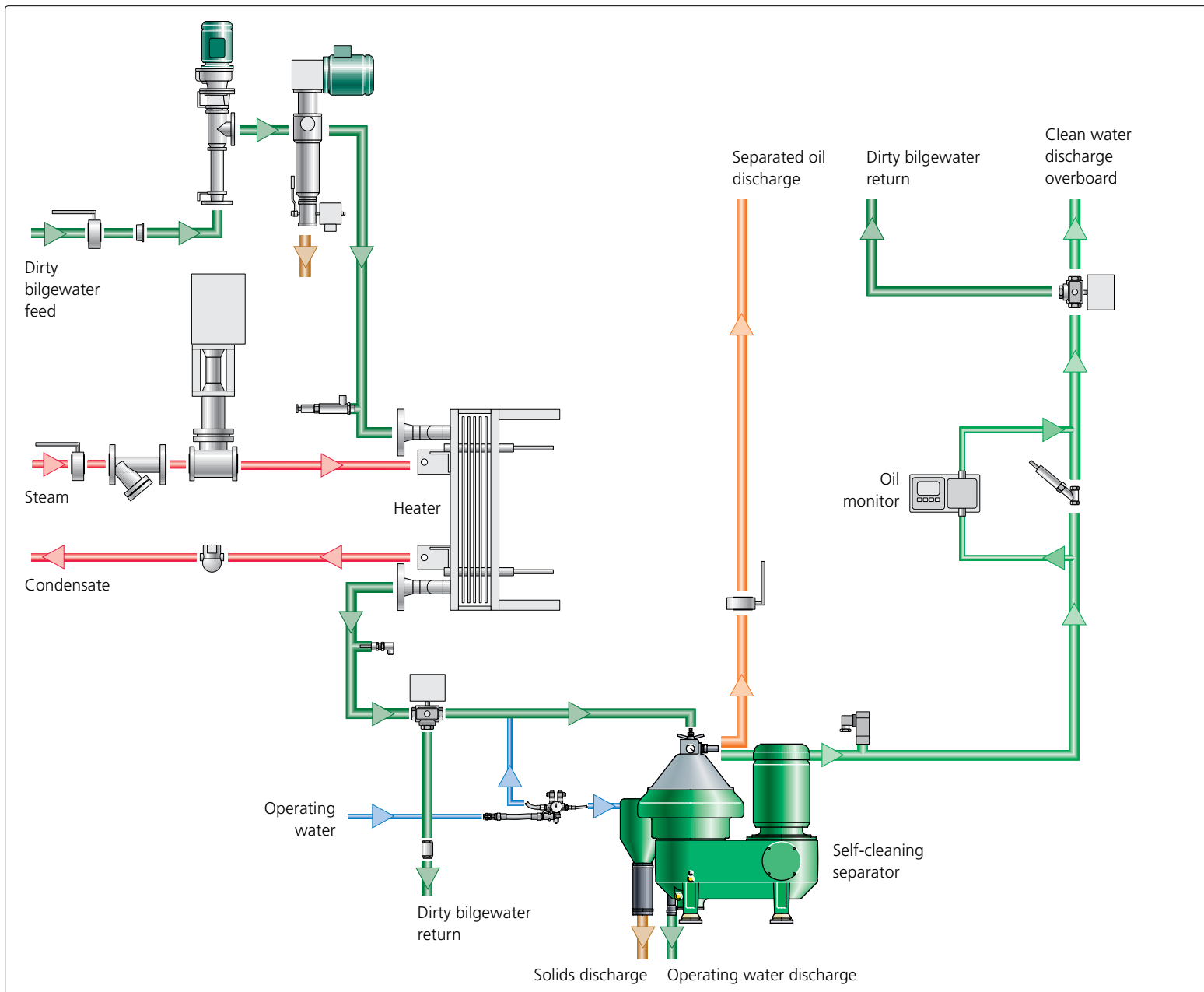
- Oil leaks, crude, diesel and lube
- Fuel and lube oil leaks
- Drainages from settling and sludge tanks
- Effluent from various cleaning processes
- Soot and dirt particles
- Mud

So That Our Water Stays As Nature Made It: Clean

The product (i.e. oily water) is sucked up from the oily water tank drainage system and fed by the feed pump through the filter and preheater via the feed valve to the separator. During the start-up or ejection program it is led back into the oily water tank. The product flows from above into the center of the separator bowl. The heavy water phase is separated from the finest oil particles and then conveyed under pressure by a centripetal pump to the discharge.

The separated impurities accumulated in the sludge space are discharged into the sludge tank periodically.

The clean water discharge is supervised by an oil monitor and discharged into the environment. If the oil content exceeds 15 or 5 ppm the water is recirculated into the oily water tank. An intelligent process control adapts the capacity of the system to the changes of the product.



Technologies to Protect the Sensitive Marine Ecosystem

Westfalia Separator® **BilgeMaster**® systems

The bilgewater treatment system is designed for use on rigs and ships.

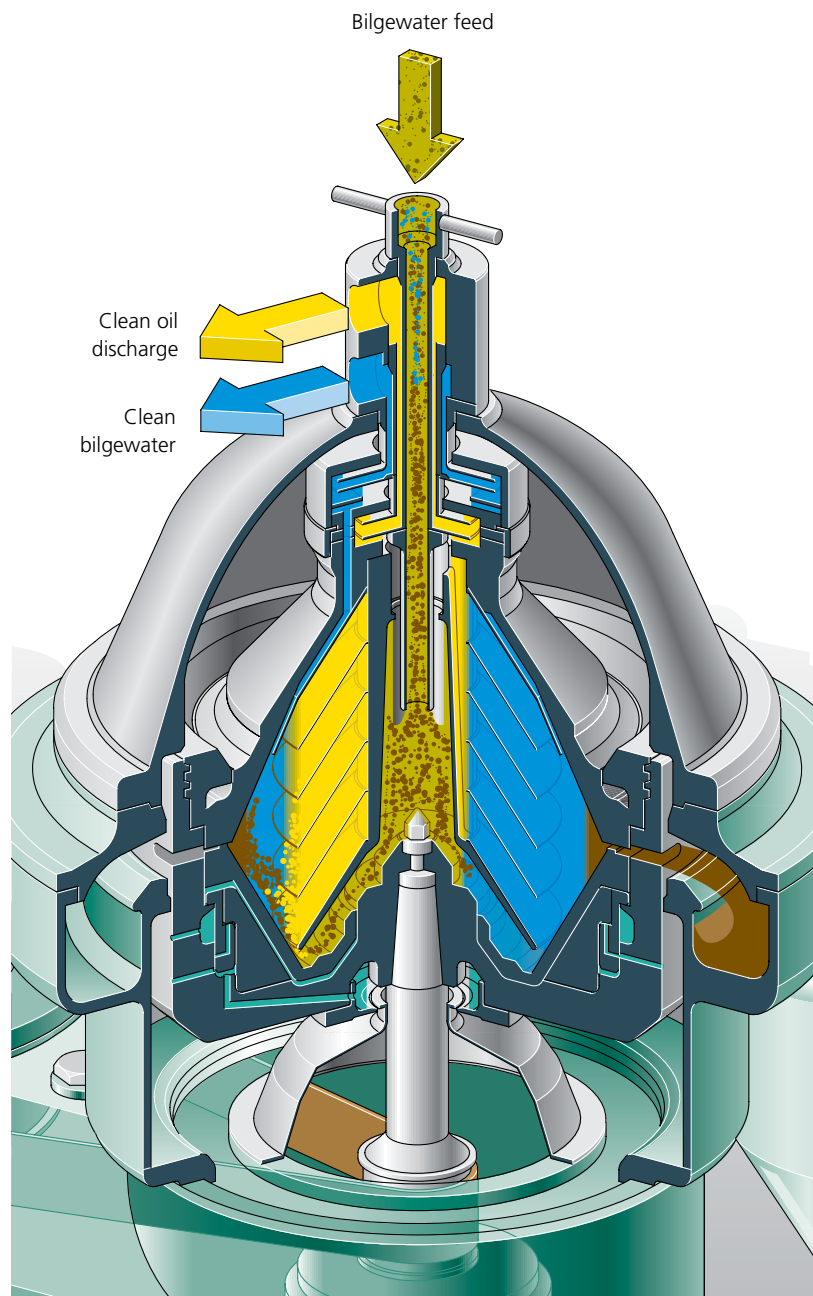
The system is supplied as a complete, self-contained Westfalia Separator centripack incorporating all auxiliaries necessary for operation.

The main components of the system are:

- Self-cleaning centrifugal separator
- Feed pump
- Filter
- Preheater
- Control panel
- Oil monitor for 5/15 ppm bilge alarms
- Base frame with small sludge tank or sludge transfer unit
- Demulsifier plant (optional)
- Adsorption filter

Benefits of the centrifuge

- High separation efficiency due to large clarification area
- Controlled de-sludging with high solid content due to the Westfalia Separator hydrostop system
- Gentle product feed due to the Westfalia Separator softstream system
- Continuous separation of oil and water phase
- Self-cleaning effect of disk stack due to total ejection
- No impact of the rig's movement on the separation efficiency
- Option: System suitable for zone 1/2 - class 1 DIV 1 or 2



The Flexible Compact Unit Design is Suitable for Both Newbuildings and Retrofits



Separation results oily water treatment

With normal feed conditions, i.e.,

solids content: < 0.1 %

chloride content: < 10,000 ppm

pH: 6 – 9

and no excessive oil emulsions in the water phase, the residual oil content in the clean water discharge is 10 – 12 ppm. By varying the pump output, it is possible to even further reduce the oil content. In the case of high oil and solids contents, it is prudent to separate the bilgewater in tank cleaning mode before discharging overboard.

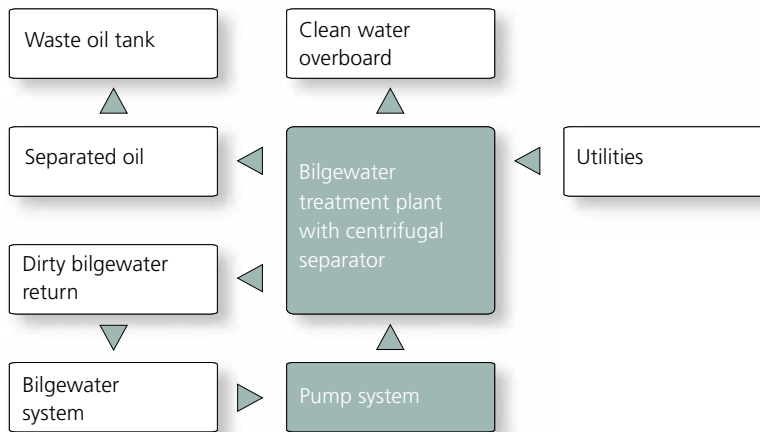
GEA Westfalia Separator expands the Westfalia Separator® **BilgeMaster**® system from three to nine sizes. The bilgewater treatment system is hence now even more precisely tailored to actual needs. This shows a Westfalia Separator **BilgeMaster-D 3000**.

Technical data	Westfalia Separator® BilgeMaster ®-D		1000	1500	2000	2500	3000	4000	5000	6000	7000
Separator	Type		WSD 8			WSD 18			WSD 35*		
Adsorption filter	Type		AF 220	AF 300	AF 410	AF 300	AF 410	AF 500	AF 410	AF 500	AF 610
Capacity	Effective throughput for oily water treatment	l/h	500 – 1000	500 – 1500	750 – 2000	1000 – 2500	1000 – 3000	1500 – 4000	2000 – 5000	2000 – 6000	2500 – 7000
Weight	Module complete	kg	1385	1400	1425	1475	1500	1525	2375	2400	2500
Dimensions	Length	mm	2630	2630	2630	2780	2780	2780	3380	3380	3380
	Width	mm	1100	1100	1100	1100	1100	1100	1500	1500	1500
	Height	mm	1550	1550	1550	1550	1550	1550	1564	1564	1564

* Also available as Westfalia Separator® **CombiMaster**® with a sludge capacity

Westfalia Separator® minimaxx® – Manual Cleaning Centrifugal System

Westfalia Separator **BilgeMaster**® systems



Plant concept

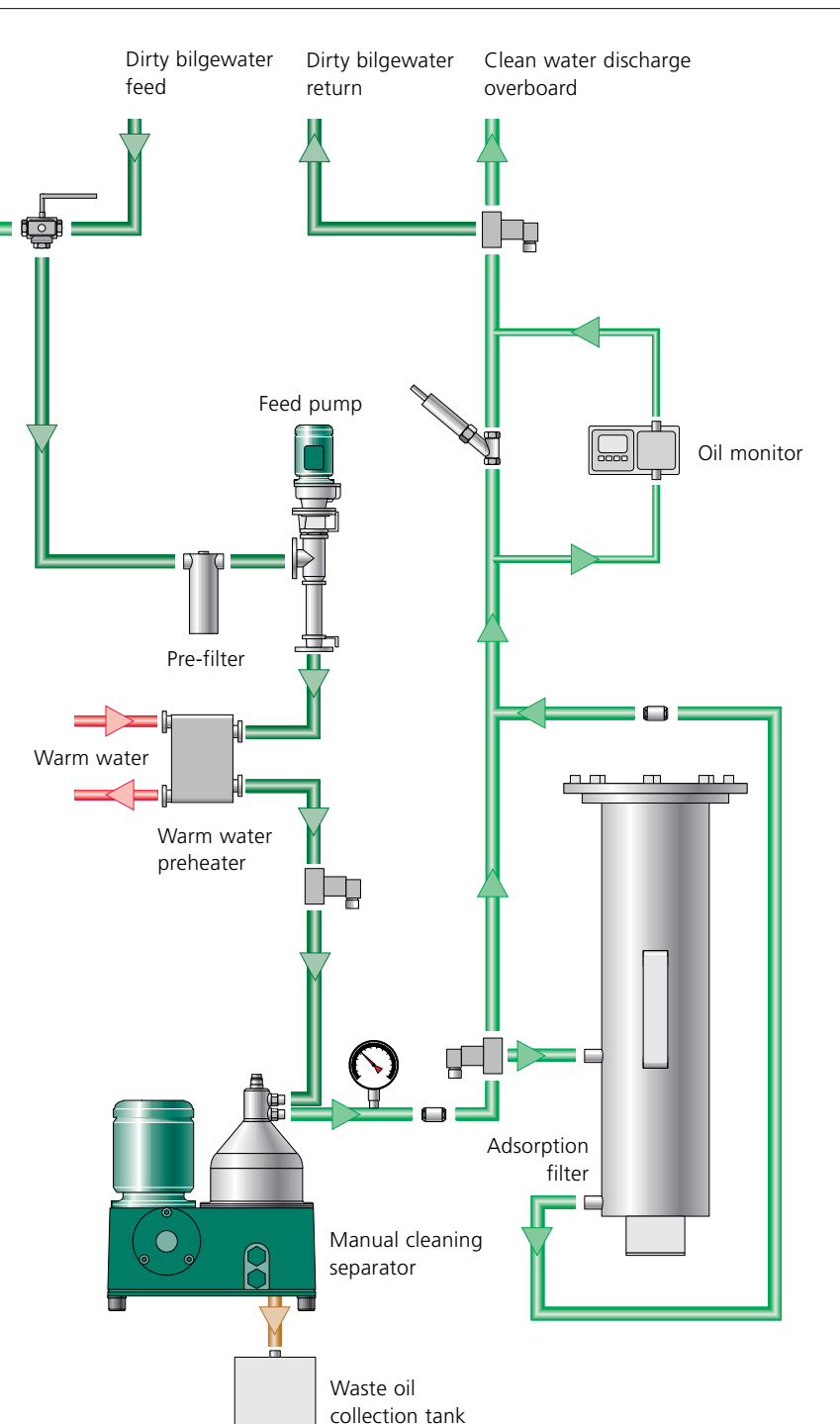
The bilgewater treatment system will be supplied as a 'Compact Unit' (CU). The CU consists of five main components:

- Westfalia Separator minimaxx separator
- Pump/pre-filter
- Preheater
- Adsorption filter
- Control unit

All the components are small and lightweight to make them easy to transport and to fit into any space. The components are installed on a common base frame. The modular concept can be incorporated in an existing system.

Safety water
feed





The clever solution

The new bilgewater treatment system with the Westfalia Separator minimaXx separator type WTC was specially designed for the rough conditions offshore.

The product is fed by the feed pump via the preheater into the center of the separator bowl. Within the rotating bowl, the product is separated into a heavy and light phase.

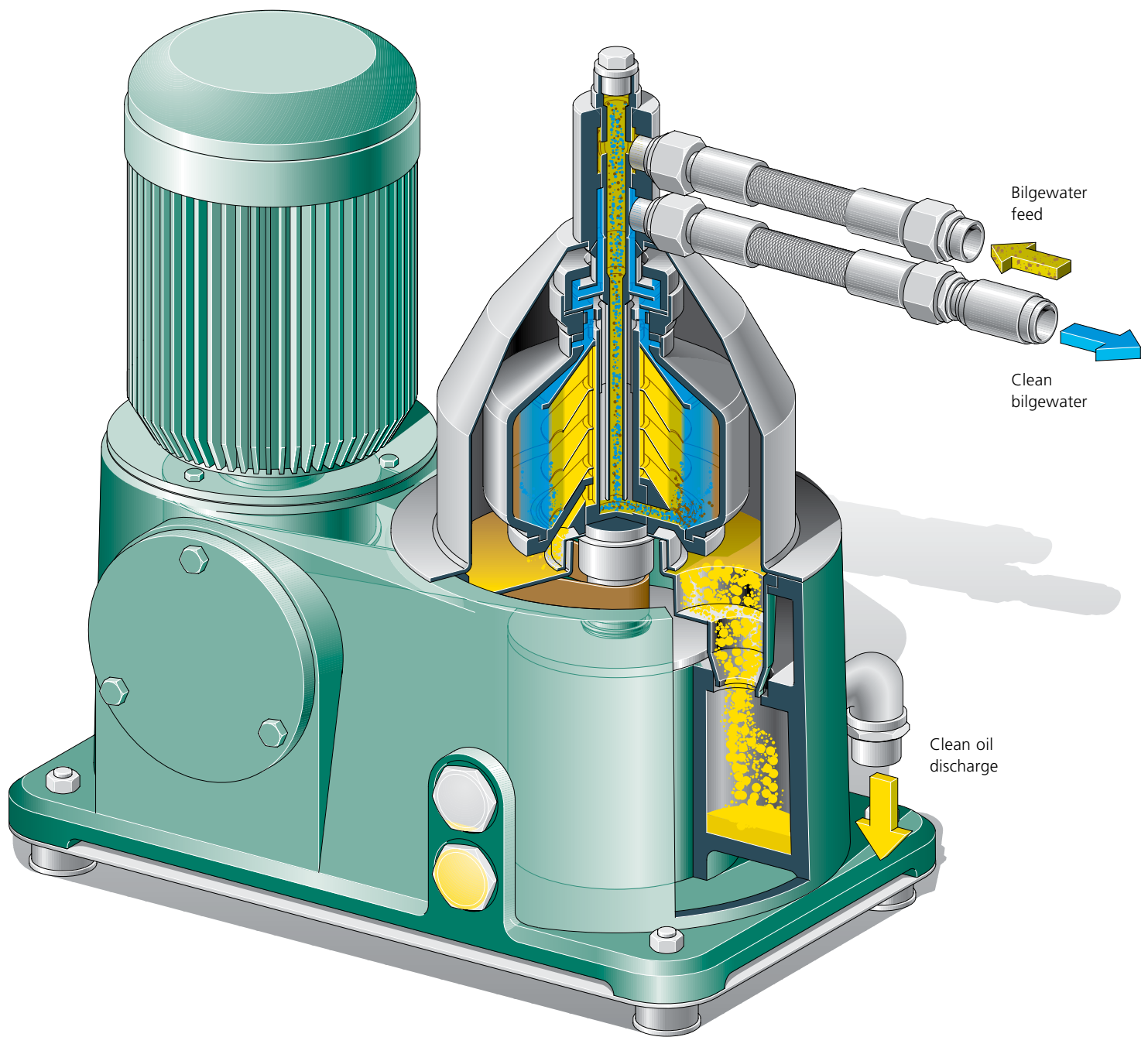
The heavy water phase is separated from the finest oil droplets and dirt particles and then conveyed under pressure by the centripetal pump to the discharge. If the oil concentration on the clean water outlet of the centrifuge exceeds 15 ppm the water is led through an adsorption filter. The lighter oil phase flows to the center of the bowl and is discharged by gravity.

The separated sludge is collected in the solids holding space and must be removed manually.

An intelligent control and monitoring system assures problem-free, round-the-clock unmanned operation. It also ensures that only water with an oil content lower than 15 ppm is released into the environment.

Westfalia Separator® minimaXx® – Clean and Compact

Westfalia Separator® **BilgeMaster®** systems





Separation results for oily water treatment

With normal feed conditions, i.e.,

solids content: < 0.1 %

chloride content: < 30,000 ppm

pH: 6 – 9

and no excessive oil emulsions in the water phase, the residual oil content in the clean water discharge is 10 – 12 ppm. By using the adsorption filter in the clean water discharge the residual oil content can be dropped down below 5 ppm.

Benefits

- Water outlet less than 5/15 ppm
- Reliable
- Easy handling
- Low maintenance cost
- Small dimensions
- Low weight
- Quick return on investment

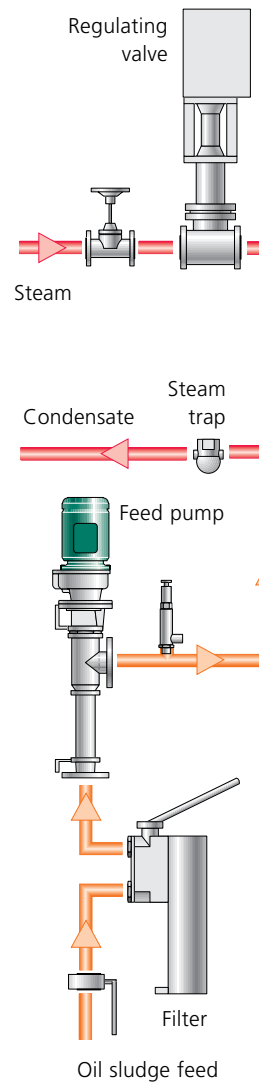
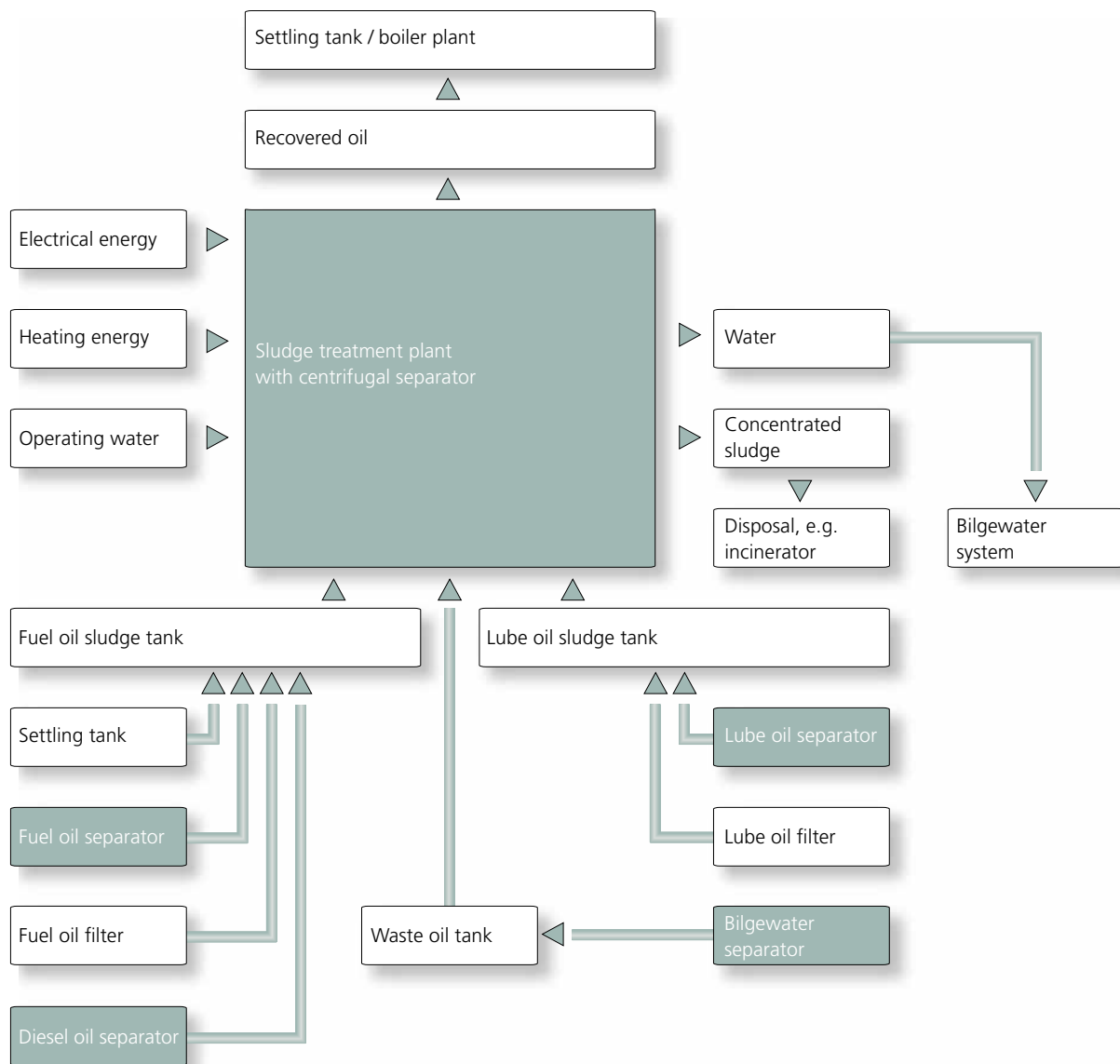


Technical data		Westfalia Separator® BilgeMaster® 200
Separator	Type	WTC 2
3-phase	Power	1.1 kW
AC motor	Speed at 50 Hz	3000 min-1
	Speed at 60 Hz	3600 min-1
Centripetal pump	Light liquid phase	–
	Heavy liquid phase	0.5 bar
Capacity	Effective throughput for oily water treatment	200 l/h
Weight	Module complete	265 kg
Dimensions	Length	900 mm
	Width	725 mm
	Height	1200 mm

Process Overview

Westfalia Separator® **SludgeMaster**® system

The trend towards burning higher viscosity and higher density fuel oils together with an increasingly common usage of residuals as the fuel for medium speed diesel engines means that the amount of sludge being created from both fuel and lube oil systems is increasing.



System Concepts for the Future

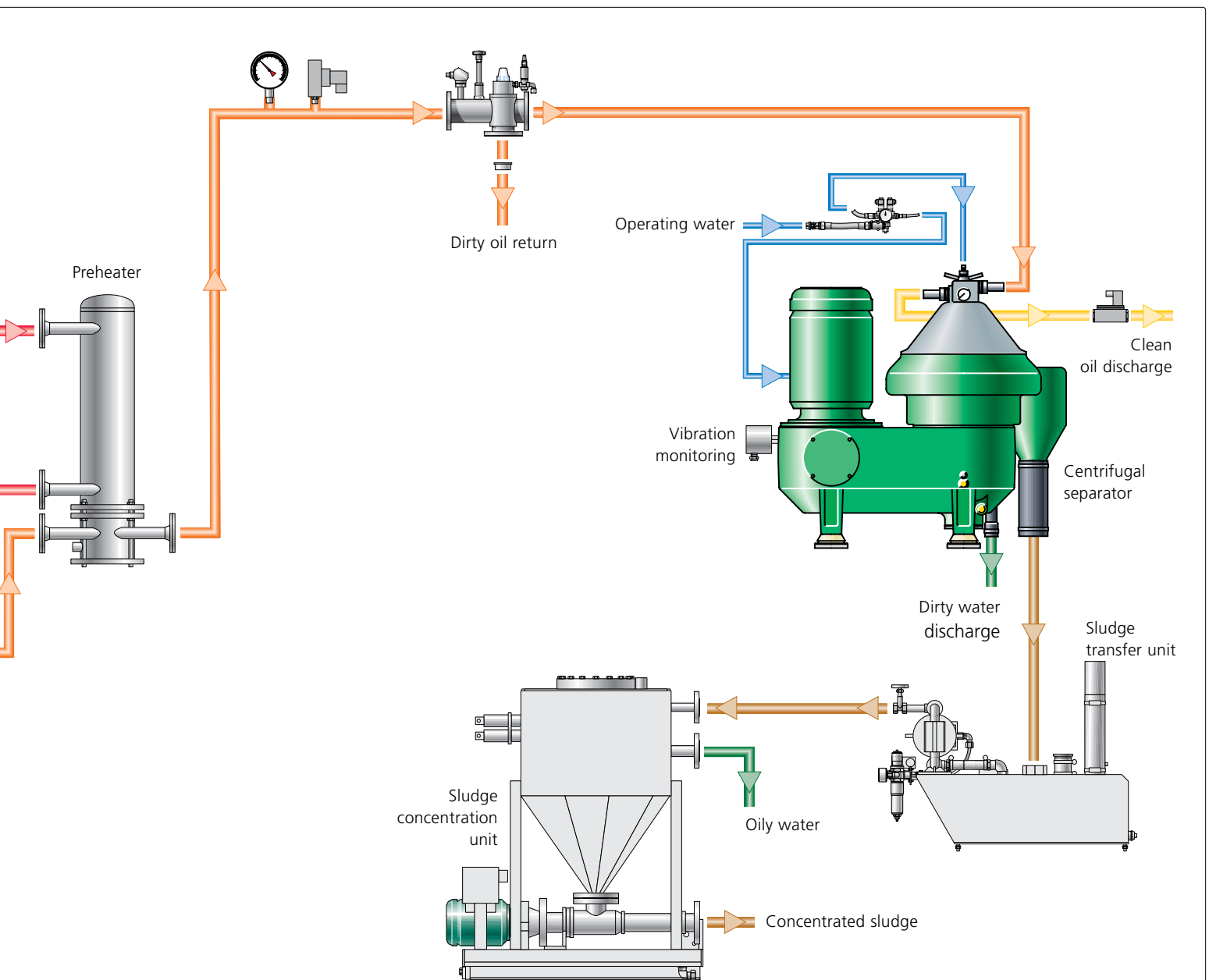
The sludge is pumped from the sludge tank by an eccentric screw pump and is fed via a heater to the centrifugal separator.

The sludge components of water, oil and solids are separated in the separator by centrifugal force. The recovered oil and water is discharged under pressure by centripetal pumps. The concentrated sludge is discharged intermittently via the sludge transfer unit into a heated sedimentation tank where final

concentration takes place. Excess water and oil is allowed to overflow back to the sludge tank.

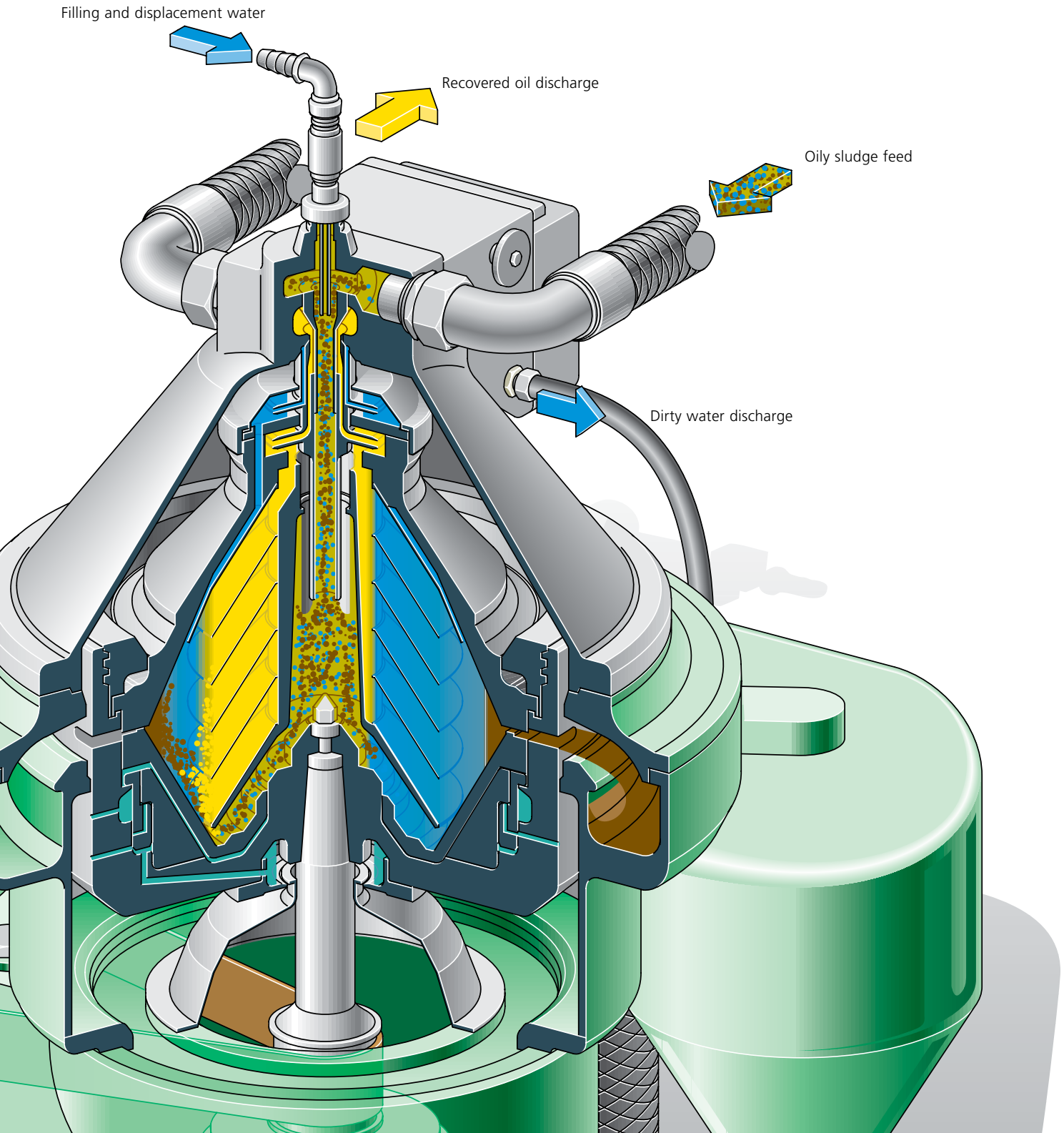
The concentrated sludge is pumped from the unit automatically by a solids discharge pump controlled by a level switch.

A microprocessor-based control cabinet supervises and controls the complete concentration process.



Economical Advantages – Ecological Merits

Westfalia Separator® **SludgeMaster**® system



Payback time of a sludge treatment plant

Assumption

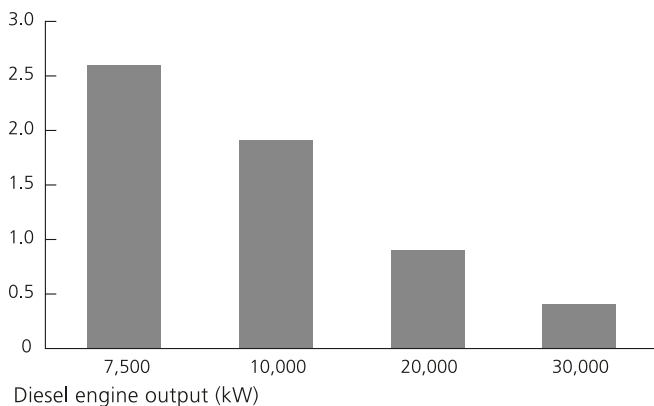
Operating time: 300 days/year

Average load: 85 %

Sludge amount: 2.5 % fuel consumption

Actual figures depending on current rates of fuel oil process and sludge disposal costs.

Payback (years)



With increasing environmental awareness as well as strict regulations and controls, most rig operators dispose of this sludge by incineration or by shoreside disposal using contract companies. In either case, sludge disposal is becoming an expensive problem for offshore operators.

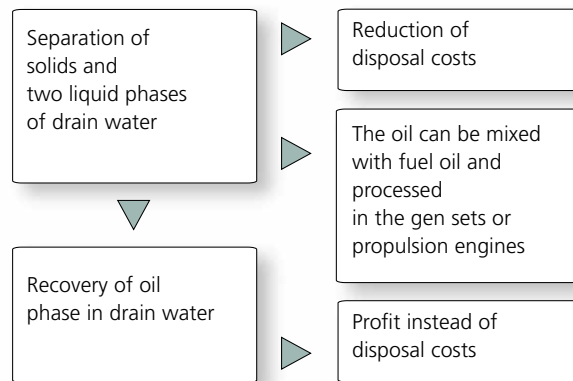
The GEA Westfalia Separator sludge treatment plant incorporating a specially designed centrifugal separator capable of reducing the volume of sludge for disposal by up to 90 %. In addition, fuel oil is recovered for re-use and recovered lubricating oil can be used as boiler fuel.

Technical data		Westfalia Separator® SludgeMaster® 300
Separator	Type	ESD 18
3-phase AC motor	Power	5.5 kW
	Speed at 50 Hz	3000 min-1
	Speed at 60 Hz	3600 min-1
Centripetal pump	Light liquid phase	2.0 bar
	Heavy liquid phase	2.5 bar
Capacity	Effective throughput for oily water treatment	300 l/h
Weight	Module complete	900 kg
	Bowl	72 kg
Dimensions	Length	2450 mm
	Width	1000 mm
	Height	1950 mm

Benefits

- Saves up to 90 % disposal costs
- Recovers valuable fuel oil
- Unburdens the bilgewater system from oil residues
- Protects our sensitive marine ecosystem





Drain Waters with High Solids Content

Cleaning highly contaminated drainage waters with the combination of a decanter and a disk stack centrifuge

On platforms, drilling ships, and rigs all kinds, drain fluids are produced. They come from drainages, residues, cleaning processes, drilling cuttings, rain and seawater. Most of these drain liquids contain a high percentage of oil and solids. If this drain water is treated, disposal costs can be reduced and profit can also be generated with the oil phase recovered from the drain water.

Oil and water content can vary from 10 to 90% and the solid content can vary from 1 to 10%, so either disk stack centrifuges or decanters can be used for

treatment of the drain water. Decanters are normally used in feed with a solid content of more than approx. 5% (by vol.) A disk stack self-cleaning centrifuge can be used downstream of the decanter to polish either the oil or water phase or both. For the final water phase treatment, GEA Westfalia Separator applies the IMO certified system as described on page 7. This way the whole process can be considered as certified in accordance to IMO Resolution MEPC 107(49).

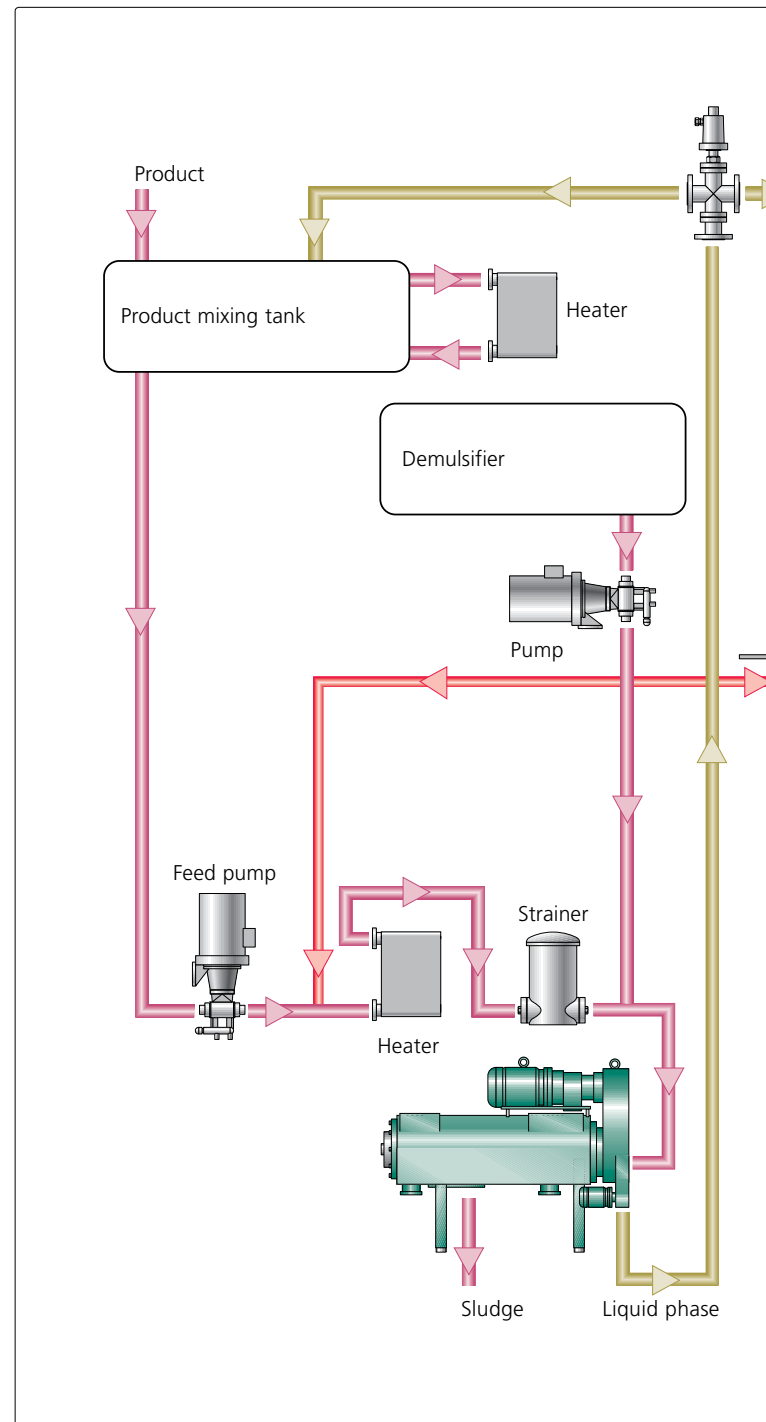
The Effective Combination

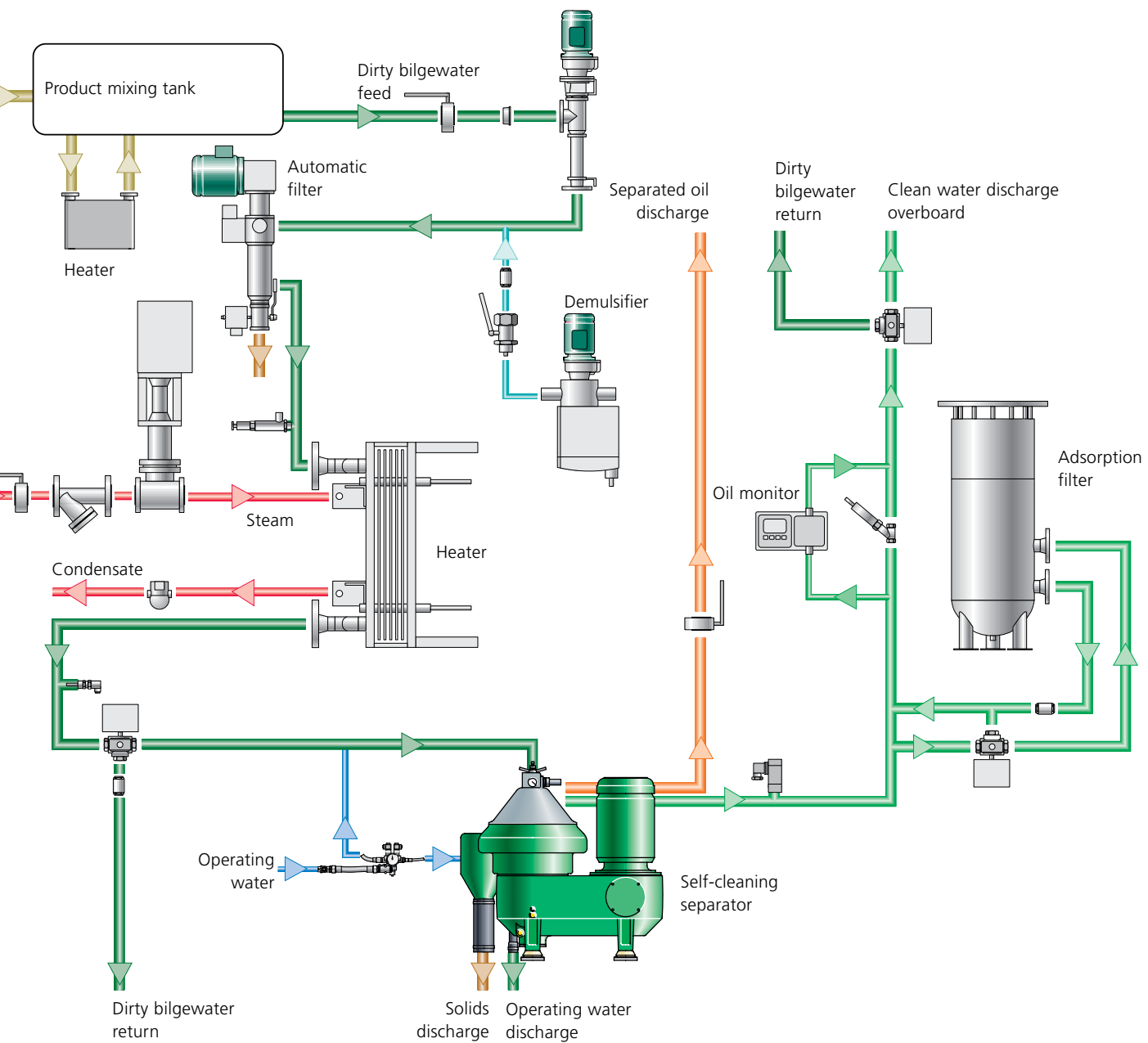
For drain water, GEA Westfalia Separator recommends the combination of decanters and disk stack centrifuges

- Two-phase decanter to separate solids from liquid phases
- Disk stack self-cleaning separator to separate the two liquid phases
- Normally, the water phase is treated further downstream to avoid disposal costs for oily water
- Optionally, the oil phase can be polished to burn it in gen sets or propulsion engines
- Oily water treatment systems from GEA Westfalia Separator can reduce the free oil content in water to 5 ppm
- As an alternative, three-phase decanters are available



CA 458 in container on the drill ship West Navigator





Westfalia Separator® **seaprotect**solutions

Systems to Protect the Sensitive Marine Ecosystem and the Value of Your Investment

Westfalia Separator® **seaprotect**solutions for your payback

GEA Westfalia Separator provides reliable and future-proofed separating technology with the Westfalia Separator® BilgeMaster®, Westfalia Separator® SludgeMaster® and Westfalia Separator® CombiMaster® systems.

The powerful processing systems protect not only endangered ecosystems in the oceans, but also assure the sustainability of your investments.

The benefits are as follows:

Reduced operating costs

- Oil recycled from the separating process can be used as fuel oil. Recovered lubricating oil can be recycled as fuel for generating heat.
- Reduced quantity of sludge means lower disposal costs thanks to separating technology.
- The sludge processing system quickly pays for itself.
- Legal certainty as the machines operate with values lower than defined limits.
- Space-saving design.

High separating efficiency

- Large equivalent clarification area (up to 25,000 m²) due to centrifugal forces of up to 8000 g (times of gravity).

- Compared with static separating systems, separators in bilgewater systems have a theoretical separating limit for oil droplets that has been reduced by a factor of 10 (1 – 2 µm).
- Continuous separation of oil and water phase. Self-cleaning effect of disk stack due to total ejection.
- Adaptation of the flow rate to the changing product conditions.
- Improvement of the separation efficiency by combination with other equipment like dosing unit for emulsion breaker
- Reduction of oil residues in the bilgewater system.

High separating efficiency

- Large equivalent clarification area due to centrifugal forces.
- Compared with static separating systems, separators in bilgewater systems have a theoretical separating limit for oil droplets that has been reduced by a factor of 10 (1 – 2 µm).
- Continuous separation of oil and water phase.
- Self-cleaning effect of disk stack due to total ejection.



- Beverage Technology
- Dairy Technology
- Renewable Resources
- Chemical / Pharmaceutical Technology
- Marine
- Energy
- Oil & Gas
- Environmental Technology
- Engineering
- Factory Reconditioned Machinery
- Original Manufacturer's Service

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