

A loop puts you in command

The PreBilge system for bilge water treatment



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# Essential consistency

The marine environment is fragile, and the threats it faces are complex. Unfortunately, the process of reducing those threats is also complicated, especially when it comes to bilge water treatment.

Alfa Laval understands the need for simple solutions that function as promised. This understanding is the basis for our PreBilge system. Installed as a helping hand for existing bilge water treatment systems, PreBilge forms a continuous pre-treatment loop that does away with performance issues.

At all times and in all conditions, PreBilge ensures predictable compliance with bilge water legislation. And by eliminating the need for filters, it leads to lower, more predictable operating costs.

# Take command over bilge water treatment

As authorities try to bring bilge water emissions under control, many of today's bilge water treatment systems are out of control – in terms of both their performance and their operating cost. If you use a gravitational coalescer, you have almost certainly experienced oil-in-water alarms or invested heavily in filters to prevent them.

This is because gravity alone can never compete with modern bilge water mixtures and the motion of a vessel at sea. But while more effective technologies exist, they may involve too much cost or complication to justify a switch.

## Introducing PreBilge – a pre-treatment loop

Today there is a solution that requires no switch at all. PreBilge from Alfa Laval lets you take command over your bilge water treatment system, doing away with alarms, filter maintenance and excessive filter costs.

PreBilge is installed as a continuous pre-treatment loop for your existing system, starting and ending at your bilge water tank. Just as lube oil is circulated through a lube oil separator for cleaning, bilge water is circulated through PreBilge, which uses centrifugal separation to keep the bilge tank contents from reaching a critical level.

No change to your IOPP certificate is required. And with a clean bilge water feed, your existing system can finally do what it was intended to do: discharge clean water in compliance with bilge water regulations.



PreBilge is a unique solution that solves the problems of underperforming bilge water treatment systems. Installed as a pre-treatment loop, it provides the existing system with a clean and problem-free feed.

## A loop lets you do more

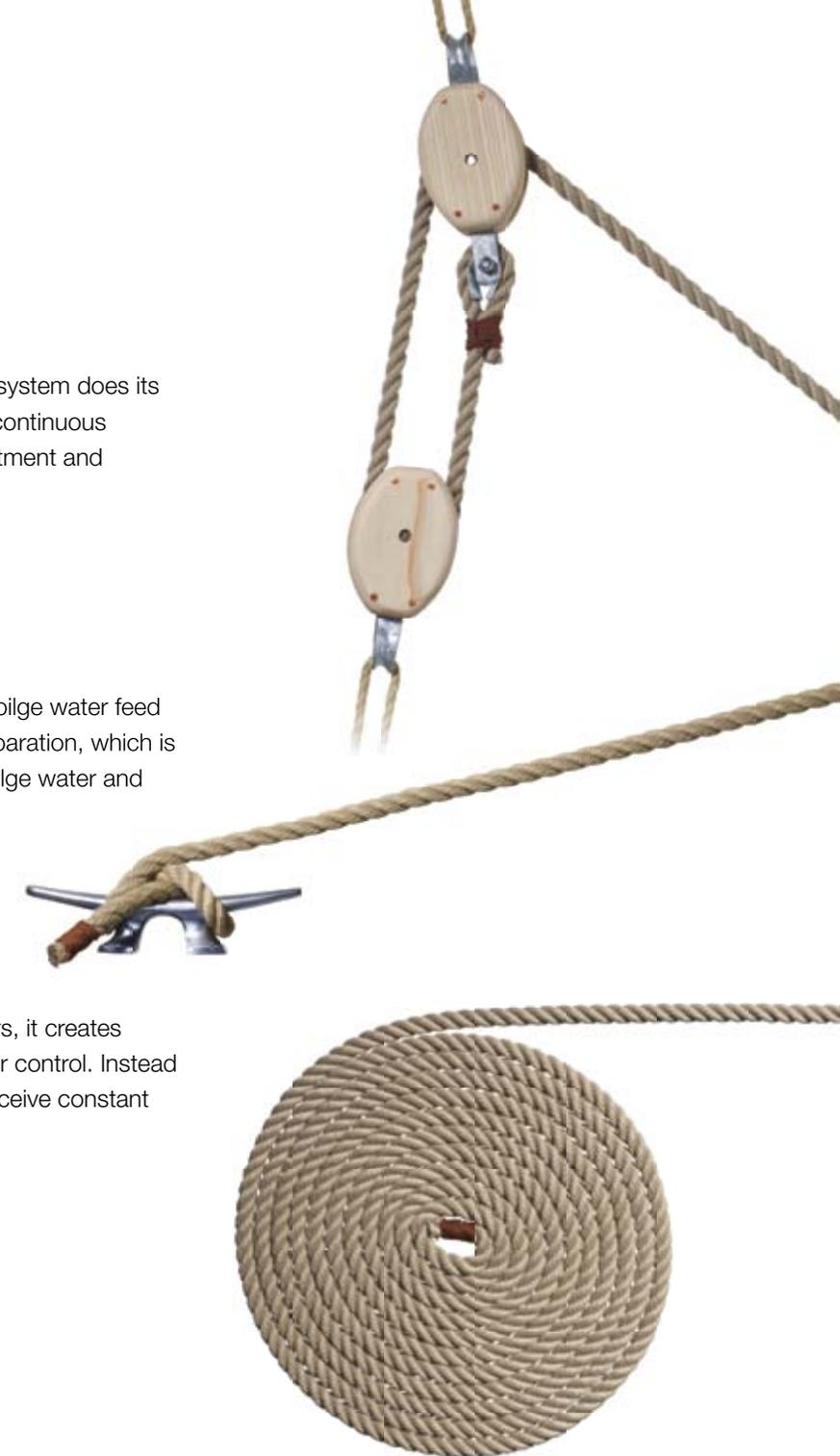
A pre-treatment loop ensures that your bilge water treatment system does its job, which gives you more time to do yours. With PreBilge in continuous operation, crewmembers waste no more time monitoring treatment and investigating oil-in-water alarms.

## A loop keeps you secure

Instead of adding filters, PreBilge adds security by creating a bilge water feed your existing system can handle. PreBilge uses centrifugal separation, which is the most effective means available for dealing with complex bilge water and emulsions.

## A loop brings order

Because PreBilge effectively does away with the need for filters, it creates consistency and brings your bilge water treatment costs under control. Instead of frequent filter changes and unpredictable downtime, you receive constant uptime and predictable operating economy.





## From deck to hull

Bilge water is the collective name for the contents of a ship's bilge wells, which are located just above the hull in the lowermost part of the vessel. While the name itself is simple, however, the composition of bilge water is anything but.

What collects in the bilge wells can come from practically anywhere on board. To begin with, the wells receive water and fluids from operational sources, such as technical rooms, propulsion systems and various equipment throughout the ship. In addition, they take in fluids from machinery spaces, internal drainage systems, sludge tanks and a wide variety of other areas.

Some of these flows are relatively continuous and predictable, such as the water coming from the separator sludge tank or from cleaning processes in the vessel's engine room. But others are intermittent at best. Soot, particles and fluid from leakage and spills all make their way into the bilge wells, yet their concentration can vary from one moment to the next.

This constantly changing nature makes bilge water difficult to define.

## The modern mixture

Fifty years ago, bilge water was easier to deal with. Back then, what collected in the bilge wells was mainly diesel oil and water, which could easily be separated by means of gravitational force. This is the reason for the traditional settling tanks that are still so common today.

Modern bilge water, however, is a far more complicated challenge. In addition to diesel oil and water, it contains heavy fuel oil, lube oil, hydraulic oil, oil additives, chemicals and detergents. Not to mention particles such as catalytic fines, soot and dirt.

All of these substances are channelled into the bilge water holding tank, which is kept at an elevated temperature that facilitates separation into three distinct phases. The top phase is a thin layer containing most of the oil and organic solvents, which should be skimmed off for separate treatment. The bottom phase, which is also removed for sepa-

### Flocculation of particles



### Coalescence of droplets



Flocculation and coalescence are two common and effective processes for breaking down emulsions. Both can be induced mechanically by means of high centrifugal force.

rate treatment, consists of solids and heavy sludge. In between is the phase to be handled by the bilge water treatment system, which contains water polluted by oil, chemicals and particles.

While gravity is enough for this primary separation, it has difficulty achieving the secondary treatment needed before bilge water can be discharged.

## Inseparable difficulties

A major reason why gravity fails to separate modern bilge water completely is the presence of emulsions. Emulsions are smooth and even mixtures of liquids that do not dissolve in one another, such as the mixture that occurs when pump agitation or valve throttling blends small droplets of oil into the aqueous phase of bilge water.

Emulsions can be difficult to break down in normal circumstances, and they are often stabilized by the presence of

particles and surfactants. Surfactants, which lower the surface tension of liquids and facilitate spreading, have become increasingly common in the detergents and chemicals used for cleaning and maintenance.

To destabilize emulsions, methods that induce flocculation or coalescence are most often used. Flocculation is a process in which particles aggregate without losing their individual identities, whereas coalescence is a process in which smaller droplets combine to form larger ones. These two processes can be encouraged by raising the temperature and pH value of the bilge water, or by adding chemicals that cancel out the repulsive electrostatic forces between particles and droplets.

In addition, there is a simple and chemical-free alternative. Both flocculation and coalescence can be induced mechanically by means of high centrifugal force.





## Taking chances

All ships must have systems for bilge water treatment, including an oil-in-water monitor that sounds an alarm when the oil content is higher than 15 ppm.

IMO resolution MEPC 60(33) and MEPC 107(49) allows only separated bilge water with an oil-in-water content of 15 ppm or less to be discharged into international waters, and today tougher limits can be found in more sensitive regions. In the Great Lakes region of North America, for example, an oil-in-water limit of 5 ppm is already in effect.

The penalty for non-compliance with these regulations is severe. Even minor infringements can lead to massive fines, and both company management and individual crewmembers can receive lengthy prison sentences for bilge water violations or improper recordkeeping.

Given the consequences of failure, ship owners and ship operators are eager to comply. But with the solutions that are common today – including those approved by IMO – many are still forced to take risks.

## Questionable standards

Despite the clarity of the bilge water limits, many vessels are struggling to meet them. In part, this is due to the type approval process that regulates bilge water equipment.

Prior to 2005, type approval was governed by IMO resolution MEPC 60(33), which required only that treatment systems be tested with a mixture of oil and water. Because no emulsions or heavier oils were involved in the testing, simple gravitational coalescers had no difficulty gaining approval.

In fact, the wording of MEPC 60(33) acknowledges its own insufficiency. The resolution clearly states, “It should be understood that a gravitational filtering equipment cannot be expected to be effective over the complete range of oils which might be carried on board ship, nor can it deal satisfactorily with oil of very high relative density or with a mixture presented to it as an emulsion.” In addition, the resolution suggests that “care should be taken that the bilge water is fed to the filtering equipment after the emulsion has broken”.

Today’s MEPC 107(49) is stricter, requiring testing with a stable emulsion that contains fine particles and a surfactant chemical. However, it still does not reflect reality. Whereas MEPC 107(49) requires testing with one chemical, real bilge water is a complex and ever-changing cocktail of chemicals. Moreover, the tests are performed for a short duration of just 2.5 hours in stable conditions on shore.

Without having to handle realistic bilge water, a realistic timeframe or the pitching and rolling that occur at sea, marine manufacturers have it easy. They have continued to use the same gravitational coalescers that were approved under

MEPC 60(33), employing the questionable practice of adding an absorption filter simply to pass the brief emulsion test.

Most of today’s bilge water treatment systems are constructed and dimensioned specifically for the type approval process – which leaves them inadequate for dealing with real-world conditions.

## Uncomfortable choices

Put simply, countless ship owners and ship operators have bilge water treatment systems that either cannot do the job or cannot do it economically. Gravitational coalescers are sensitive to oil shocks and ineffective against difficult emulsions, and they lose their efficiency in rough weather and rolling seas.

This puts ship owners and ship operators in a difficult position. Few vessels have the manpower for proper good housekeeping or the space for additional holding tanks. Extra filters can be added, but these must be stocked on board and add considerably to operating costs. If the tanks are full and no spare filters are available, there is simply no choice but to risk pumping waste overboard.

Up to now, the only true fix has been upgrading to a high-performance bilge water treatment system, such as a stand-alone centrifugal separator. But even this is not a perfect solution for all vessels. Space limitations, cost issues or the complexity of updating the vessel’s IOPP certificate can make this an unattractive option.

Today, however, there is yet another option in the form of PreBilge.





## Economical assistance

PreBilge is a new way of thinking, and one that provides an effective and economical fix for underperforming bilge water treatment systems. Although it is a centrifugal separator – the most effective technology for dealing with complex bilge water – it is not designed to replace your existing system.

PreBilge works together with gravitational coalescers and other bilge water treatment systems already approved according to MEPC 60(33) or MEPC 107(49). Compact and efficient, it acts as a helping hand, providing pre-treatment that keeps the bilge water composition at a manageable level. Since the discharge and oil monitoring are handled by your existing system, PreBilge does not require its own type approval or affect the vessel's IOPP certificate.

In other words, PreBilge is an easy opportunity to solve bilge water treatment difficulties. You can now ensure regulatory compliance and reduce operating cost, but with minimal effort and no change to the vessel's paperwork.

## Continuous pre-treatment

PreBilge is a pre-treatment solution for bilge water, but one that operates continuously rather than in a single step. Placed anywhere in the engine room, the PreBilge separator is connected in a loop that starts and ends at your bilge water tank.

The setup is comparable to that of a lube oil separator, which is connected in a loop to the lube oil tank. Lube oil leaves the tank and passes through the centrifugal separator, after which the cleaned oil is returned to the tank.

Just as the lube oil separator keeps the oil in the lube oil tank clean, PreBilge uses centrifugal separation to remove impurities from the bilge water tank. And like a lube oil separator, PreBilge is designed to run non-stop, even on rough seas and in harsh conditions.

In fact, PreBilge requires only routine maintenance once every 2000 hours.

## No alarms, no wasted time

Using centrifugal force that is 6000 times stronger than gravity, PreBilge removes the heavy oils, particles and emulsions that pose difficulties for gravitational coalescers. This creates a problem-free feed to the existing bilge water treatment system, which effectively does away with oil-in-water alarms.

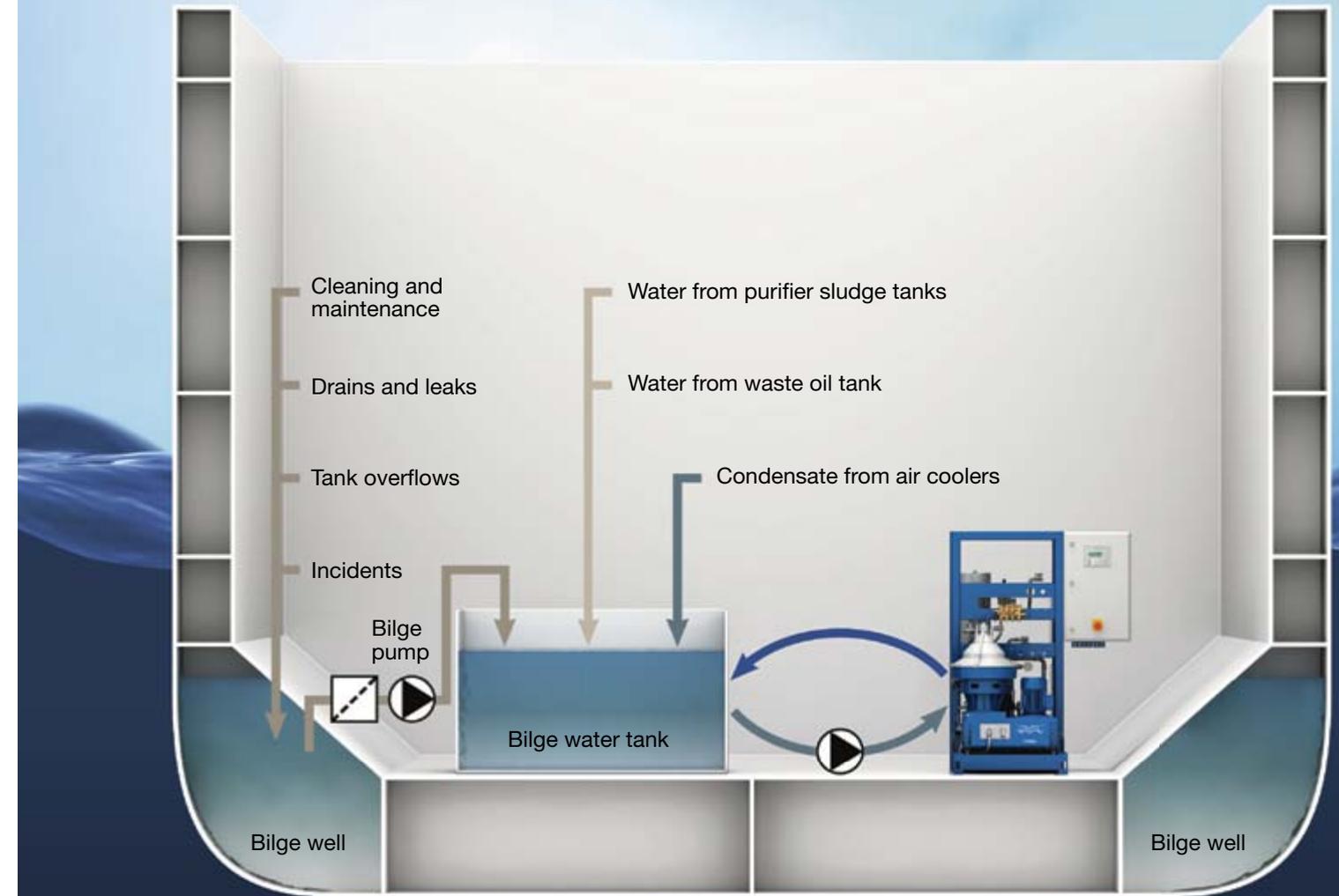
In turn, this reduces the demands on the crew. When no alarms are triggered, there are no problems for crewmembers to investigate and rectify. Even on the roughest of seas, the bilge water treatment system can operate independently – so that no one has to spend time in the engine room monitoring its performance.

## Space and money saved

A clean feed to the existing bilge water treatment system also removes the need for a filter backup, which has a number of positive effects. Apart from saving the crew the time of changing absorption filters, it frees up considerable space when no filters have to be stored on board.

Most importantly, eliminating filters can reduce a vessel's operating costs by thousands of euros per year. Filters are expensive, so when PreBilge is put into operation, the operating costs for the existing bilge water treatment system are instantly minimized.

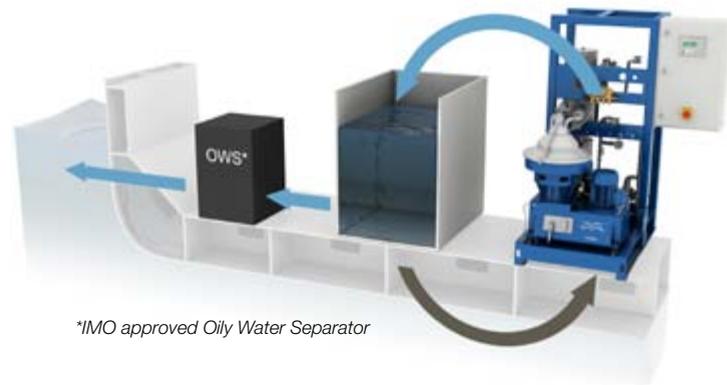
With PreBilge, not only is the performance of the bilge water treatment system consistent, the costs of operating it are as well.



# A pre-treatment loop

PreBilge is installed as pre-treatment loop for your existing bilge water treatment system, through which bilge water is continuously circulated. Because bilge water is drawn from and returned to the bilge water tank, PreBilge is not used to pump any water overboard. Rather, discharge and oil-in-water monitoring is handled by your existing treatment system.

Since PreBilge is non-essential equipment and is not involved in the pumping of bilge water overboard, it does not require type approval from any classification society.



## Delivery and connections

PreBilge is delivered as a compact module that is easy to install and can be flexibly placed in any engine room. Pipe connections can be drawn as needed, and there is no required proximity to the vessel's bilge water tank.

Although PreBilge is not equipped with its own oil-in-water monitor, both the feed pipe and clean water outlet have sample valves that allow the operator to visually check its performance.

## The PreBilge system

### Capacity:

PreBilge has a capacity of 500 l/h, although this is relatively unimportant since the system operates continuously. A capacity of 500 l/h represents a flow of more than 10 m<sup>3</sup>/24 h, which is ten times the rate at which vessels normally accumulate bilge water.

### Footprint:

The PreBilge module has a footprint of 1.5 m<sup>2</sup>. Since it can be installed anywhere in the engine room, the installation flexibility is extremely high.

### Operating power:

Different power alternatives accommodate a wide range of customer needs. PreBilge is available in 230V, 400V, 440V, 460V and 690V, 50Hz and 60Hz configurations.

### Heating options:

Several heating options are available for PreBilge:

- Steam heater
- Electric heater
- PHE to use hot water as heating media (e.g. engine cooling water)

All of these options are incorporated into the PreBilge module, which means they have no effect on the system footprint. It is also possible to install PreBilge without its own heating if heating coils or immersion heaters are otherwise available.

### Feed pump:

PreBilge utilizes a progressive-cavity feed pump, installed on a separate skid.



## A dynamic force

The central component of the PreBilge system is the BWPX 303 centrifugal separator. For crewmembers already acquainted with centrifugal separators for fuel and lube oil treatment, it offers familiar operation and a very short learning curve.

Centrifugal separation is the most efficient means of dealing with complex bilge water – and the only one that works consistently at sea. This is why even a small add-on system such as PreBilge can solve the performance problems of larger gravitational coalescers.

A high-speed, disc-type centrifugal separator multiplies the force of gravity many thousands of times. In the case of PreBilge, the BWPX 303 separator produces a gravitational force of 6000 g, which separates water, particles and oil droplets with extreme efficiency. To achieve the same result alone, a gravitational coalescer would have to possess a settling area of 3000 m<sup>2</sup>.

At the same time, a centrifugal separator counteracts the constant motion of the ship. Pitch and roll are overcome by the gyroscopic effect of circulating the liquid in the separator bowl, which means separation efficiency is ensured in any operating conditions.

### The BWPX 303 separator

|                      |  |
|----------------------|--|
| Hydraulic capacity:  | ~ 2.0 m <sup>3</sup> /h                                      |
| Utilized capacity:   | 0.5 m <sup>3</sup> /h  |
| Bowl volume:         | 1.5 l  |
| Sludge space volume: | 0.6 l  |
| Discharge volume:    | 1.0 l  |
| $\omega$             | > 9000 rpm   |
| Motor power:         | ~ 1.5 kW   |
| Bowl material:       | AL 2377  |
| CIP-enabled:         | Yes  |
| Configuration:       | Concentrator with a unique solid-handling distributor design |





## At your service

For ship owners and ship operators with difficulties in bilge water treatment, PreBilge is a cost-effective way to secure performance and ensure an oil-in-water content within the established limits. No changes are required to the existing system, and there is no need to stock filters or set aside space for oily reject.

For crewmembers, PreBilge is a boost in efficiency. Instead of monitoring the performance of the bilge water treatment system or dealing with the consequences of oil-in-water alarms, they can devote their time to better things.

For everyone, PreBilge offers security in the form of global backing. Alfa Laval has a century in of experience working with maritime industry, and PreBilge is accompanied by a well-developed offering of service and support. No matter where your ship sails, you will find access to technical assistance, onboard service and genuine spare parts from our dedicated team of peace-of-mind specialists.

