

MAHLE

Industrial Filtration

RIGHT ON COURSE

EXPERTISE ON BOARD

MARITIME OPERATIONS





PARTNER FOR SYSTEMATIC

MORE EXPERTISE, BROAD SCOPE OF SERVICES

MAHLE

Industrial Filtration

Innovative systems partner

MAHLE Industriefiltration develops and produces high-end industrial filters for all applications—since 1962. The company is a leading manufacturer and is integrated in the MAHLE Group, which is one of the top 3 systems suppliers in the areas of combustion engines and engine periphery.

In **fluid technology**, we offer our customers filter materials with exceptional properties, pioneering processes, and a modular filter and equipment range to ensure optimum prevention from pollution of hydraulic systems and lubricating liquids. Our filters, equipment, and systems for the **dust filtration** of air and other gases increase productivity and contribute to product reclamation and increased environmental protection and safety at work. In the filtration of liquids, pastes, and similar substances, our patented **automatic filters** enable optimized production processes as well as highly efficient and economic non-stop operation—with automatic cleaning and disposal procedures.

With extensive experience and continuous development of materials and production technologies, we are the innovative development and systems partner for our customers worldwide: for better, more efficient, and cleaner solutions.

Systems expertise for maritime operations

Our years of experience with complex systems and a wide range of applications has made us an innovative development and systems partner for maritime operations, in demand around the globe. Now we have significantly expanded our capabilities and are steering a clear course into the future.

SOLUTIONS

With our innovative **NFV products**, we provide comprehensive, custom-tailored solutions, especially for maritime operations and liquid treatment with mechanical **filtration and separation** processes: from oil separation, fuel and oil treatment, to ballast water, process water, wastewater, and cooling water treatment.



The **AKO product range** additionally extends our product range with simplex, duplex and backflushing filters for the **filtration** of all types of fluids in maritime operations—from fuels to lubricants to seawater.



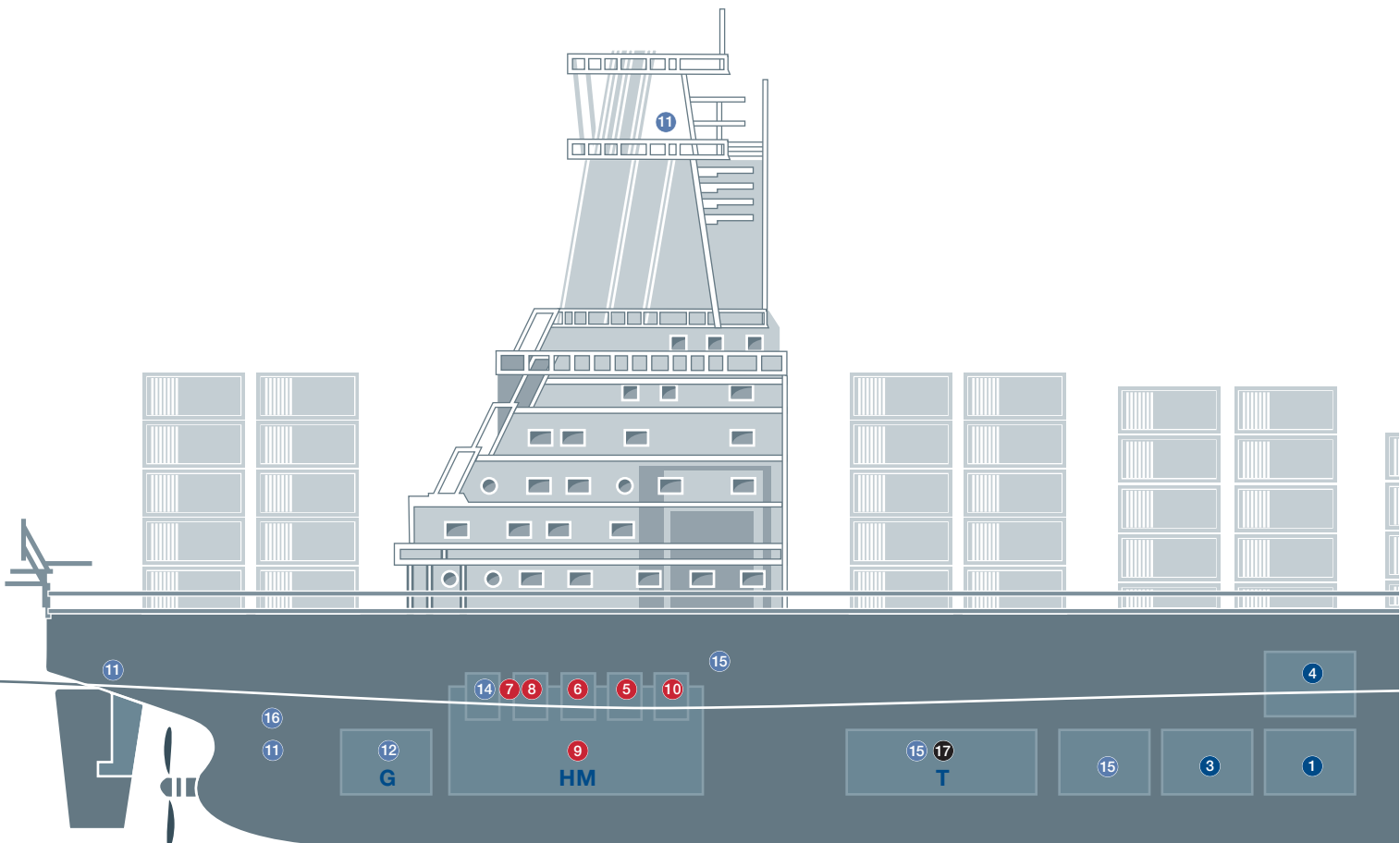
Your advantages

- Complete product portfolio, from standard items to customer-specific solutions
- All products and services from a single source, from development to production
- Worldwide distribution and service structure, local contact partner
- Modern logistics for fast availability
- Reliability, flexibility, and first-class quality
- All locations are certified to ISO 9001:2000



COMPLETE PRODUCT RANGE

RELIABLE FROM



MAST TO BILGE

In maritime operations, MAHLE systems stand for uncompromisingly clean performance.

Water treatment

- 1 Bilge water oil separation
- 2 Ballast water treatment
- 3 Process/cooling water
- 4 Oil-in-water monitor

All around the engine

- 5 Fuel treatment systems
- 6 Fuel filters
- 7 Lubricant treatment systems
- 8 Lubricant filters
- 9 Crankcase ventilation
- 10 Inlet air filters

Hydraulics and lubrication

- 11 Hydraulic filters for steering gear
- 12 Transmission fluid filters
- 13 Filters for deck hydraulics
- 14 Turbidity sensors
- 15 Filter water separators
- 16 Oil treatment systems for stern tube seals

Pipework, transfer and circulation systems

- 17 Screen basket, simplex, and duplex filters

- G** Transmission
- HM** Main engine
- T** Tank (bunker or daily tank)



WATER TREATMENT

ALL-AROUND SAFETY

FOR OPERATIONS AND THE ENVIRONMENT

MAHLE has a range of certified systems and equipment for water treatment and purification in maritime operations. They operate most efficiently and economically, improve operational reliability, and make an important contribution to environmental protection.

Unclouded performance: **water treatment**

MAHLE automatic filters with many different filtration principles and special cleaning systems are used to clean all kinds of waters—for instance, in the treatment of grey and black water.

Water protection: **bilge water oil separation**

Modern bilge water oil separation systems from NFV make an excellent contribution to worldwide water protection. For every type of ship, flexible equipment modules can be implemented in custom dimensions. Our bilge water oil separators (MPEB—multiphase demulsifier) with mechanical phase separation, emulsion breaking, and membrane technology clean bilge water so efficiently that they meet both today's and tomorrow's most stringent civil and military limits and protective regulations.

For all types and sizes of **process and cooling water circuits**, MAHLE provides efficient treatment technologies, such as seawater filters, oil separators for cooling water and condensate, and the Vario automatic filter series.

For **service and waste water treatment**, MAHLE provides pretreatment and posttreatment aggregates, as well as membrane flotation, sterilization and metering units, membrane and activated carbon filters.

For all oil-in-water applications, as well as for suds and cooling lubricant emulsions, our **mechanical demulsifiers** achieve the highest cleanliness classes.

No chance for foreign organisms: **ballast water treatment**

To protect the maritime ecosystem, new international regulations require that ballast water must be as free as possible of microfauna, plankton, germs, and other viable organisms. NFV provides a compact and individually designed ballast water treatment system (OPS), which achieves the required cleanliness in an energy-efficient manner, without chemicals.

Immediately detects oil: **oil-in-water monitor**

Our efficient oil-in-water monitor detects the slightest oil impurity in water and establishes the prerequisites for operational reliability and efficient environmental protection.



Multiphase demulsifier for oily water separation



Compact system comprising three automatic filters





Fuel treatment system



Duplex filter



Oil treatment system



Vario automatic filter series

Our **fuel care and treatment systems** ensure low-maintenance, trouble-free operations for drive engines over the longest possible time period. In their construction, quality, and design, MAHLE solutions are tuned to a wide range of application areas.

Fuel treatment systems for clean power

NFV fuel treatment systems for fuels and oils can be used with any medium distillate, such as diesel oil, light heating oil, marine diesel oil (MDO), and also lubricating oil. They provide the most efficient and economical solutions for typical impurities in these media (solid and suspended particles, sediments, and rust, as well as water).

For better performance: fuel filters

We develop optimal technological solutions for large engines. For high filter capacity especially in fuel systems, we provide, for example, duplex filters with patented one-hand changeover, as well as a modular filter system for fine-range filtration. The compact MAHLE Vario automatic filter system can be ideally adapted to the requirements of large diesel engines and gas

turbines. The AKO-COM filter series, compatible with heavy oils, allows filtration of heavy oil in viscosity classes IF 700 to 10 μm absolute. MAHLE fuel filters are approved by various classification agencies—for uninterrupted operation of engines and turbines.

For everything to run well: lubricant treatment systems

MAHLE offers a range of capable systems for the filtration and care of engine oils. Our oil treatment systems, which achieve water separation levels below the mandatory directives, serve either for the continuous treatment of the medium in the reserve tank or for point-of-use cleaning before the drive aggregates. The systems can be combined with additional units and allow optimal adaptation to the individual on-board requirements.

Filters with patented segment cleaning from the Vario modular system are used for treatment and filtration of engine oils.

ALL AROUND THE ENGINE
FULL SPEED AHEAD

Pure cleanliness: lubricant filters

For 24h unmonitored operations—while maintaining the required limit levels—filter systems are available in all performance classes and grain sizes that a modern maritime operation requires for 2- and 4-cycle engines. Lubricant treatment determines to a great degree the service life of the systems as well as pollutant emissions. We provide optimal solutions with our special product program. This is achieved with the use of our duplex filters in full flow for smaller engines, or as an indicator filter behind the special MAHLE automatic filters. Optimal filtration of flow volumes for the largest two-cycle engines can be performed reliably and the separation efficiency of the separators is dependably monitored and supported. This is achieved through the use of oil treatment systems and special automatic filters, or with the optimal combination of both systems.

Retention of oil mist: crankcase ventilation

Efficient solutions have been developed at MAHLE for crankcase ventilation. The oil aerosols are separated from blow-by gases as a liquid. The gases are reintroduced into the engine intake system.

For clean air: inlet air filters

MAHLE inlet air filters continuously supply compressors, vacuum pumps, combustion engines, and turbines with clean intake air. State-of-the-art filter elements allow low flow resistance and high dust collection capacity. Inlet silencers also reduce noise levels, if desired.

For higher dust exposure, the patented multijet nozzles provide the ability to clean filter cartridges during operations, saving compressed air at low noise levels. This results in compact filter systems with optimal service life.



Automatic lubricant filter (with bypass)



Oil aerosol separator unit



Inlet air filter



Air filter element



HYDRAULICS AND LUBRICATION EVERYTHING RUNS

Longer service life, greater operational reliability, lower maintenance requirements, and resource savings—the performance of our systems pays for itself. We have a decade of technical expertise in the care, cleaning, and filtration of hydraulic and lubricating fluids and actuation oils. We are one of the leading global manufacturers for filter systems, equipment, and accessories in fluid technology.

For optimal function: hydraulic filters for steering gears

Solid and liquid impurities in hydraulic systems, such as steering gear hydraulics, cause wear, abrasion, and corrosion and have a negative effect on the physical-chemical properties of the hydraulic fluid. MAHLE filters reduce particle contamination in hydraulic and lubricating systems to the level required for their purity class, under the typical international standards ISO 4406/1999 and NAS 1638, thus ensuring the functionality of modern hydraulic systems.

Very economical: transmission fluid filters

Ready for use around the clock, with no interruption in operations. This significant factor, among others, sets our duplex filters apart and thus allows high-efficiency performance, long service life, and low flow resistance, even at high viscosities. Thanks to their systems technology, our Vario series filters can be adapted to nearly any application and reduce extensive oil cleaning, while saving space and costs.

For smooth operations: deck hydraulics

For any installation site and function, we provide suction filters, pressure filters, duplex filters, return-line filters, external loop filters, air breathers, filter units and elements for all pressure levels, as well as accessories and service units.

Fast reaction: water identification

With the MAHLE turbidity sensor, water entry into a system can be detected quickly and reliably. It can be effectively applied in hydraulic and fuel systems, where the risk of contamination by water exists.



Low-pressure filter



Duplex filter



Duplex filter



Turbidity sensor



Coalescer filter



Oil treatment system

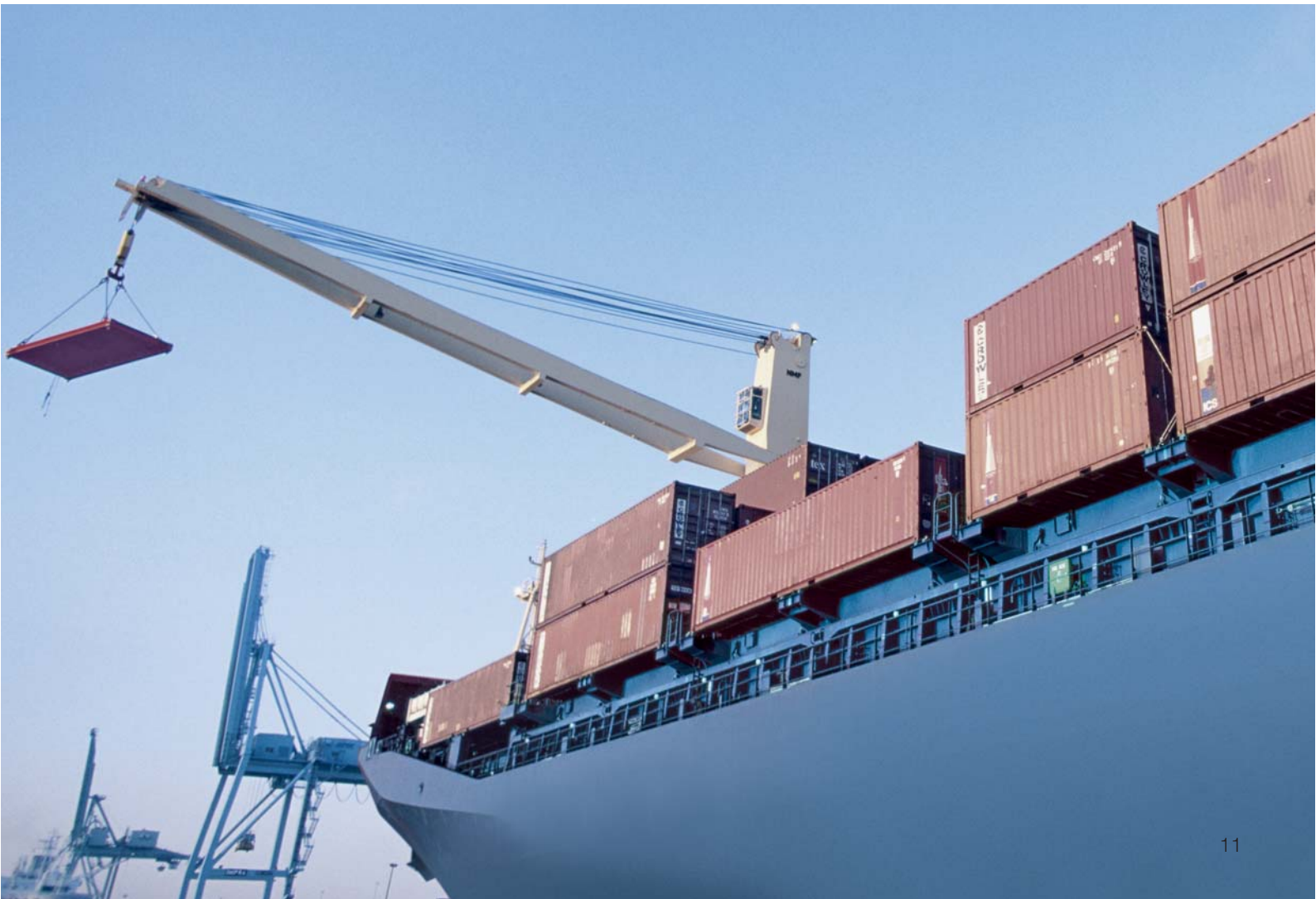
SMOOTHLY

Purity law: filter water separators

The coalescer filter was developed for the retention of free water from oils and fuels. It works without absorption media, simply and inexpensively: Specifically arranged special filter materials collect the small water droplets that float in the fluid and separate them.

Oil treatment for stern pipe seals

Our oil treatment can be used for any medium distillate and also reliably separates water and other typical impurities from the medium to be treated with filter coalescer elements. Our NFV systems are laid out vertically or horizontally, depending on the requirements and available space on the ship, and thus allow space-saving, highly efficient, and low-maintenance filtration and water separation.



PERFECT PROTECTION FOR
SYSTEM RELIABILITY





*Screen basket
simplex filter*



*Screen basket
duplex filter*

Perfect protection: screen basket filters

One of the main causes of problems and loss of operations is still dirt, which leads to premature component wear. MAHLE provides screen basket filters for prevention, a cost-effective method to protect pipework or the treatment and maintenance of fluids. Screen basket filters are available as simplex or duplex filters and are suitable for the use of all types of fluids, due to their mature design. They are equipped with cleanable metal filter elements, which combine ease of service and cleaning with high durability and long service life.

Pipes clear: simplex filters

Simplex filters are the introduction to the product range, which is oriented toward cost reduction and user-friendliness. The housing of the simplex filter is available in different sizes, while the screen basket filter element always sees flow from inside to outside. When the permissible contamination level has been reached, the filtration operation is interrupted, the filter is opened, and the screen basket is removed and cleaned off with water or steam. The differential pressure rating of our simplex and duplex filter inserts of up to 5 bar, which is still achieved by only a few manufacturers of screen basket filters, allows us to use the filters specifically under the most challenging conditions. In this context, it is advantageous that the simplex as well as the

duplex filters can be provided in an optional heated version, whereby they can also be used in fuel circuits.

Consistent cleanliness: duplex filters

The efficiency and economy of systems is ensured to a large extent by their continuous usability. MAHLE duplex filters are equipped with two filter vessels, which allow non-stop operation of the filter and consistent cleanliness of the media to be cleaned. When the maximum contamination level is reached, flow is switched to the other filter vessel without interruption, and the filter that is not in use can be cleaned. In addition to efficiency, constant cleaning of the media promotes the protection of the pipework as well as the transfer and circulation systems, and reduces the repair costs for the pipework system due to corrosion or deposits.

EXPERTISE AND SERVICE RELIABILITY

IN ANY STATE OF THE SEA

On all seas, we ensure trouble-free, economical maritime operations. With powerful systems, high standards under all important international norms, customer-friendly spare part service, and a well-attuned team. We provide personnel training in professional operation and maintenance, and our service technicians are on site around the globe for commissioning and maintenance.

Your specialists for custom filtration and separation

Optimal technical and economical design of systems requires experienced specialists who know their way around complex maritime operations. We consider the ship as a complete system, starting with sources of contamination, and take into consideration a great deal of information, data, facts, and system parameters, in order to optimally adapt our technology to your requirements.

MAHLE Service

Our worldwide recognition as a high-quality systems provider for filtration and separation systems, especially in maritime operations, is backed up by our global service network. In addition to qualified personnel for commissioning and maintenance, we also keep in stock spare parts in the accustomed high quality, around the world. This gives us a good feeling and ensures the efficient operation of your fleet.

The result: worldwide trust

The leading manufacturers of ship engines, the shipyards of the world—they all have used our systems for decades for reliable protection of engines and oceans. In order to live up to this trust in the future as well, we are increasing our research and development activities with the construction of a new applications and customer center for separation technology in Hamburg, Germany. MAHLE is sending a clear signal that our customers can continue to expect—and receive—renewed expertise, innovation, and service from a single source.



Service vehicle



Portable contamination measuring system



Sampling case





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