Global sulphur cap 2020

MAN PrimeServ

Challenges, options and how MAN PrimeServ can help you to stay competitive after 2020

Global sulphur cap 2020

What do you need to know?

The global 0.50% sulphur cap has been introducied with the beginning of 2020 and affects all sizes of ships globally.

This global limit on sulphur in fuel oil used on board ships significantly reduces the amount of sulphur oxide emitted from ships.

There are several options to ensure compliance, but time is running. What is your plan?

This paper will be updated regularly whenever new information is available.

Start date
Since 1. January 2020, the new global limit of 0.50% sulphur (S) applies.

Regulation
Under the new global cap, all ships have to use fuel oil with a sulphur content of no more than 0.50% S or an approved equivalent SO_x reduction alternative solution, e.g. a scrubber.

Control areas
The sulphur cap applies globally. This means that all ships worldwide are affected by the 0.50% S regulation.
The SO_x Emmission Control Areas (SECAs) established in 2015 will maintain a limit of 0.10% S.

Carrier ban
In addition to the global sulphur cap, IMO also decided on a carrier ban for non-compliant fuel. Due to the global sulphur cap it is not necessary to have high-sulphur fuel in the fuel tanks of vessels without scrubbers installed. Therefore, the carriage of non-compliant fuel will be forbidden from 1 March 2020.

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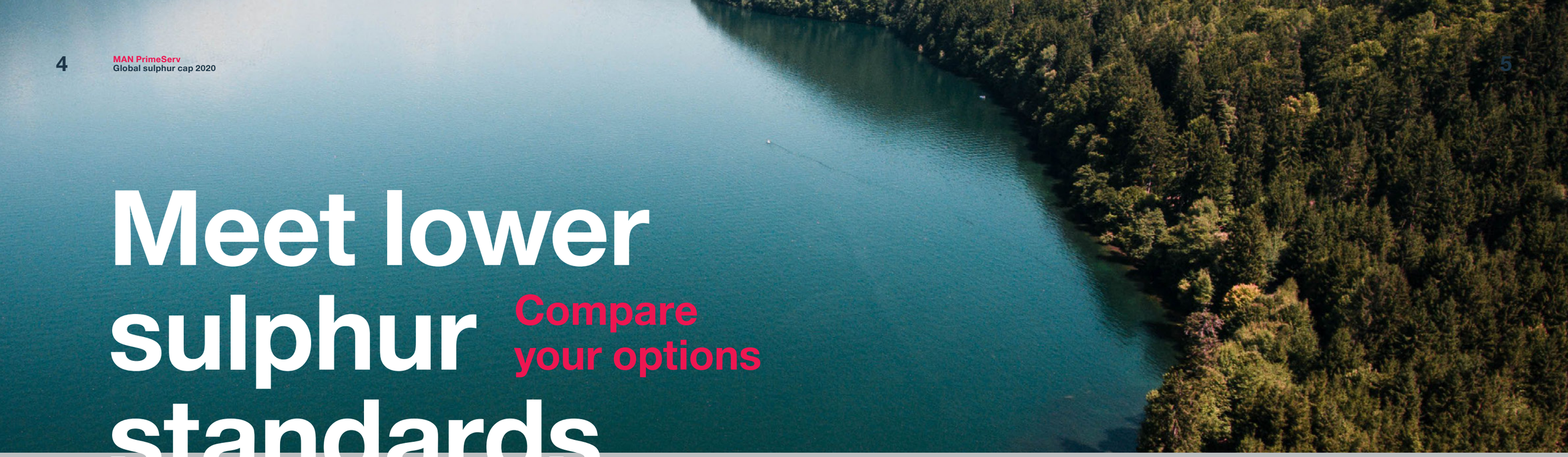


Meet lower sulphur standards

Compare your options

It is time to take a look at the different options and face the opportunity of switching from high-sulphur heavy fuel oil (HSHFO) to a compliant alternative.

There is no one-size-fits-all solution, and the best option depends on various parameters. We know about the upcoming challenges. Let's talk about it and find a smart solution together!

Contact us

Very-low-sulphur fuel oil max. 0.50% S (VLSFO)

Benefits

- Distillate and new compliant fuel oils are usable for all engine configurations.
- Short preparation time to comply with regulations.
- The technical complexity of this solution and initial costs are comparably lower.

Keep in mind:

- Prices for 0.50% S VLSFO are expected to be higher than for HFO.
- Most VLSFOs will follow the ISO8217, but might have deviating viscosity, density and pour point. Therefore, it is important to check the fuel analysis of the bunkered fuel carefully and act accordingly, e.g. by adjusting temperature and viscositiy settings.
- Cermet coated piston rings are recommended.

Exhaust gas cleaning systems / SO_X scrubbers

Benefits

- Vessels can use HSHFO, which are expected to be cheaper than VLSFO.
- Minor changes may have to be made to the engines or fuel treatment systems. SO_X scrubbers are possible as retrofit. This solution can require turbocharger re-matching and amendment of the technical file depending on the SO_X scrubber layout.
- All known scrubber concepts have the potential to meet both the 0.50% S and 0.10% S criteria.

Keep in mind:

- Significant investment cost for the exhaust gas cleaning system, and there will also be operational expenses related to increased power consumption, need for chemical consumables and sludge handling.
- This solution requires space for a scrubber tower and supporting systems.
- Equivalent arrangement must be approved by the ship's administration (flag state).

Gas as a fuel

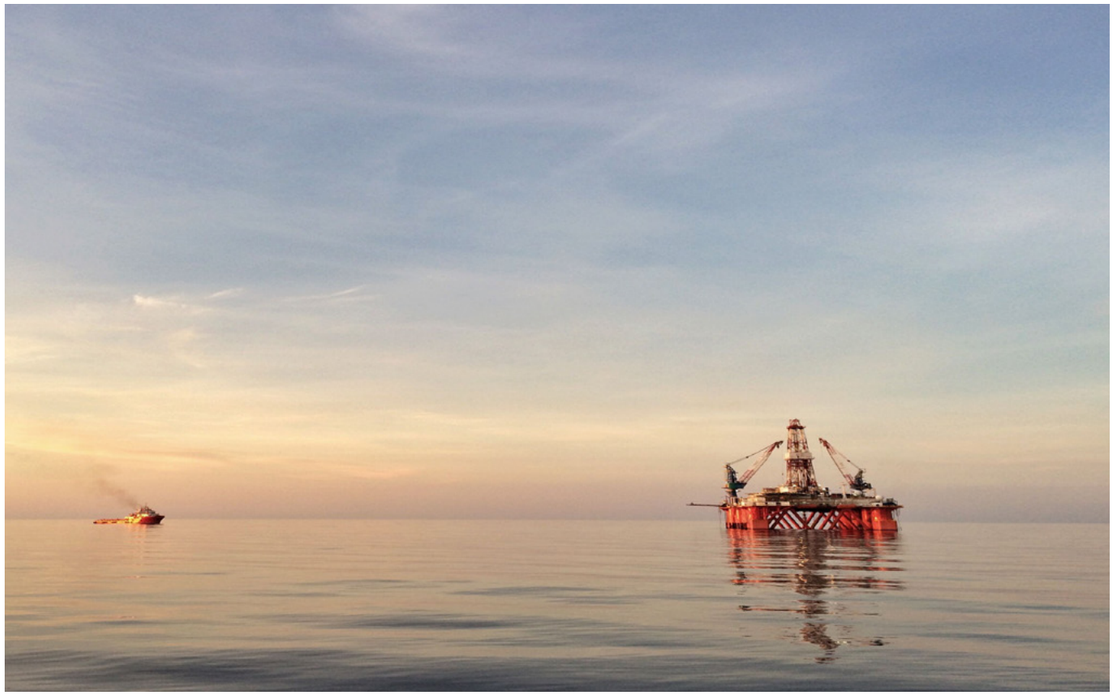
Benefits

- Good environmental performance by reduction of SO_x and particulate matter (PM) emissions.
- Positive impact on the Energy Efficiency Design Index (EEDI) of the vessel.
- Conversions to e.g. LNG are possible (retrofit).

Keep in mind:

- Bunkering infrastructure is developing rapidly. Prices can vary a lot in different regions.
- High investment costs for new builds as well as retro-fit installations.
- This solution requires additional space for gas tanks.

Very-low-sulphur fuel oil max. 0.50 % S



Most 0.50% S VLSFOs are in accordance with the ISO8217 specification, but special attention should be paid to viscosity, density and pour point.

VLFSOs are a very diversified group of fuels. There are several types with a wide range of:
- viscosity
- density
- pour point
- compatability
- cat fine level

It is important to know the characteristics of the bunkered fuel in order to act accordingly and ensure safe operation.

Liner polishing and scuffing

Adhesive wear on the cylinder liner running surface can be caused by incorrect cylinder lubrication. The BN number of the lubricating oil as well as the feed rate need to be adjusted to the sulphur content of the fuel oil. Otherwise the liner surface will polish up.

A polished liner gives a high risk of having a scuffing incidence. Scuffing can wear out the liner fast and cause an earlier renewal.

Recommendation:
Installation of **cermet coated piston rings** on all three/four rings to reduce the risk of seizures and scuffing as well as adjustment of cylinder lubrication. See also service letter SL2018-659.

Increased lube oil consumption (only for 23/30 (H+A))

Recent service experience has shown that there is a higher tendency of lacquering occuring in the cylinder liners and consequently increased lube oil consumption when operating on LSMGO. When switching back to fuel with higher sulphur content, we see that the lube oil consumption returns to a to normal level.

Recommendation:
Installation of an **improved piston ring kit** for 23/30 and increase of HT temperature in order to reduce lacquering in liners. See also service letter SL2018-661.

Heating of storage tanks

Very low-sulphur fuels can contain a higher amount of waxes, which can separate when storaged at low temperature. The wax particles can cause blocking of filters, pipes and other equipment.

Recommendation:
For residual fuels, the temperature in the fuel system should be min. 10˚C higher than the pour point of the fuel. The fuel may be heated either in the tanks or by recirculating it through an external heater.

Incompatibility

Incompatibility has always been a risk when mixing different fuels. The risk of encountering incompatibility issues can be reduced by checking the compatibility between different fuels before bunkering. This can be done manually with a kit on board.

Cat fines

As in heavy fuel oil (HFO), cat fines may also be found in fuels with 0.50% S (VLSFO). Cat fines are small, very hard particles from the refining process. They wear the engine fast, and it is highly recommended to use the fuel cleaning and condition system to clean the fuel and remove cat fines.

Recommendation:
The min. fuel temperature in the fuel separator should be 98˚C at low flow rate. The cat fines level should be kept as low as possible before the engine inlet on a max. level of 15 ppm Al + Si for a short period of time, but the normal level must be kept lower. See also service letter SL2017-638 and ‘Cat fines’ paper.

Improved time between overhauls:
Cermet coated piston rings

Piston ring kit (for 23/30 (H+A)

Cat Fines Filter

Stay competitive:
Fuel saving retrofits

Exhaust gas cleaning systems

Continuous operation on high-sulphur fuels is possible after 2020 if applying an exhaust gas cleaning system such as an SO_x scrubber. Besides the scrubber hardware, this retrofit solutions may require engine modifications and re-certification work of the technical documentation.

When a SO_x scrubber is installed, the back pressure might increase above the maximum allowed back pressure for the engine. In this case, a turbocharger rematching along with an amendment to the technical file is required.

Benefits of a turbocharger rematching:

- Fuel consumption will be as optimal as before the installation of a SO_x scrubber
- NO_x emissions will stay unchanged
- Engine heat load will stay within the range of experience

Already in the investigation phase, MAN PrimeServ can provide exhaust gas data and calculations to ensure the right scrubber layout. Find more info about the complete SO_x scrubber retrofit engineering package on page 17.

For our GenSets, it is important not to exceed the max. allowed back-pressure of 50 mbar.

Previous Gensets with allowed backpressure of 30mbar needs to be checked sperately for turbocharger rematching

Implementation time
The implementation time depends on the delivery time of the scrubber maker.
The execution of the SO_x scrubber retrofit package takes approx. 6 - 8 weeks.

Stay competitive:
SO_x scrubber retrofit engineering package

ACOM

Fuel reduction retrofits

Gas as a fuel

Gas on the move

With the global sulphur cap 2020, it is expected that gas as fuel will gain an even more favourable position as a marine fuel. Gas as fuel is a technically proven solution, and the bunkering infrastructure is developing rapidly.

Conversion to dual fuel (ME-GI/ME-LGI and GenSets)

The main argument for choosing LNG (liquefied natural gas), ethane, methanol, or LPG (liquefied petroleum gas) as a fuel is the significant reductation in local air pollution. SO_x and particulates emissions are removed completly.

A dual fuel system gives you the option to switch between different fuel types (diesel, VLSFO and gas), depending on fuel price, availability and trading route.

Implementation time
Please contact our gas conversion team in Copenhagen: retrofit2s@man-es.com

Stay competitive:
Gas conversion (retrofit)

How to stay competitive after 2020

It is not easy to adapt to new regulations, especially when facing investments and higher operational costs.

Don't worry, MAN PrimeServ offers products and services that help you stay competitive.

Click on the pictures to get detailed information.

Fuel saving products

PMI VIT/ Auto-tuning

MC/ME engines

The system automates the engine measurement and tuning process, thereby saving fuel and ensuring optimal engine operation at all times.

MAN EcoNozzle

MC engines

Completely redesigned fuel nozzle featuring an optimized fuel spray pattern that can save you up to 7 g/kWh.

MAN EcoCam

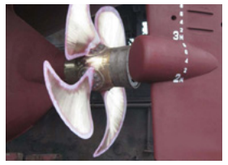
MC/ME-B engines

Adjustment of the closing time of the exhaust valves according to engine load. This leads to lower emissions and instant fuel savings between 10% and 70% load.

Turbocharger cut-out

MC/ME engines

Option of disabling one of the turbochargers for slow steaming operation. This improves the performance of the remaining turbochargers, thus reducing SFOC.



Main engine de-rating

MC/ME engines

Option of changing the engine's specified maximum continuous rating (SMCR) to match the requirements of today.

Engine power limitation

MC/ME engines

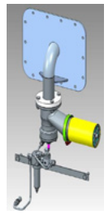
Fuel oil savings can be obtained with turbocharger cut-out or propeller retrofit when combined with engine power limitation.

Engine-specific study

MC/ME engines

Customized and vessel specific investigation that clarifies the potential of major retrofit solutions based on a combination of several technologies.

Fuel saving products



Part-load optimization (PLO)

GenSets 21/31 Tier II, 23/30(H) Tier II

Recommended when running on part-load below 75% MCR.

Drain split

GenSets 16/24, 21/31, 27/38

Recover the leak oil from HP fuel pumps when running on distillates (MDO/MGO) and save up to 1% of your SFOC by ‘collect and reuse’.

Low-sac nozzle

GenSets 21/31, 23/30, 27/38

Improves combustion and lowers fuel oil comsumption.

PTO

Frontend mounted

For efficient production of electrical power required for scrubber and BWT plants.

PBCF

Fuel savings of approx. 1.5% can be achieved.

Propeller retrofit

Reduction of power demand by 3-6% leading to reduced fuel consumption.

Turbocharger retrofit

Engines from MAN & other brands

Increased turbocharger efficiency lowers fuel consumption

Part-load optimization for Turbocharger

Gensets 8L32/40CD Tier II

Reduce temperatures before turbine when running on partload below 75% MCR

Improved time between overhauls

Cermet coated piston rings

Reduction of seizures and scuffing risk.

Cat Fines Filter

Fuel cleaning system.
Reduction of engine damage risk.

Piston ring kit

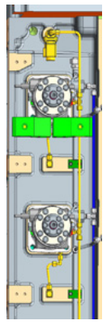
GenSet and propulsion 23/30 (H+A)

Reduction of lube oil consumption.

Improved material for inlet and exhaust valves

GenSets and propulsion

To counteract excessive wear due to lack of lubricity we recommend to upgrade to improved material T400 for inlet and exhaust valves to get the best TBO and lifetime.



Sealing oil in fuel pumps

GenSet and propulsion 27/30

Sealing oil must be switched on at each fuel injection pump, when operating on VLSFO.

HT temperature increase

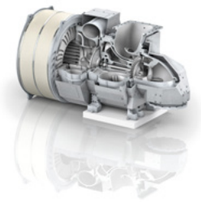
GenSets 23/30, 28/32

If lacquering in the cylinder liners is experienced during distillate operation you can counteract this by installing new cooling water HT thermostatic elements and thus get a longer liner lifetime and less lube oil consumption.

Fuel upgrade package

GenSets and propulsion

Backflush filter, MAN by-pass depth filter and fuel oil safety filter.

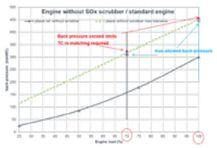


Turbocharger retrofit

Engines from MAN & other brands

New turbocharger technology lead to extended life time of wearing parts

Scrubber solution



SO_x scrubber retrofit package

Recommendations on turbocharger re-matching parts and recertification work for engine modifications.

Fuel upgrade package

GenSets and propulsion

Backflush filter, MAN by-pass depth filter and fuel oil safety filter.

ACOM

Mixing device for optimal cylinder oil mixture when operating on fuel with varying sulphur content.

Gas conversion

Conversion to dual fuel engine

Conversion of ME engine to dual fuel engine.

PVU

Pump vaporizer unit

Pressurize and vaporize the LNG to the pressure and temperature required for the ME-GI engine.

Conversion of GenSets

GenSets 23/30, 28/32 DF

Convert your existing GenSet to run on natural gas and reduce emissions and comply with the IMO 2020 sulphur regulations.

Fuel-switching process

Be prepared

Before turning our backs on high-sulphur HFO and replacing it with a very-low-sulphur fuel alternative, there are several things to keep in mind.

Viscosity

The minimum viscosity at engine inlet is 2 cSt. This applies to all fuels. This min. viscosity is also needed for most pumps in the external system (supply pumps, circulating pumps, transfer pumps and feed pumps for the centrifuge) for them to function properly.
Remember: Fuels with different viscosity must be heated to different temperatures to reach the same viscosity. Please make sure that the viscorator is working properly and is set to max. 2˚C/min.

Lubrication strategy for 0.5% S VLSFO operation

It is important to match the cylinder oil type with fuel used in order to achieve a good cylinder condition. The recommendation is to follow the cylinder condition closely by taking and analysing drain oil samples and by making regular scavenge port inspections.

We recommend using cylinder oils with the following main properties:
- Kinematic viscosity:
  - min. 18.5 cSt at 100˚C
  - min. 21.9 cSt at 100˚C
- Viscosity Index (VI): min. 95
- High detergency: Keeping ring grooves, ring-lands and piston rings clean is important to ensure free movement of the rings.
- Alkalinity or base number (BN) in accordance with the engine requirement, e.g. corrosive level and fuel sulphur content.
- Cylinder oil with 40-70 BN depending on the corrosive level of the engine.

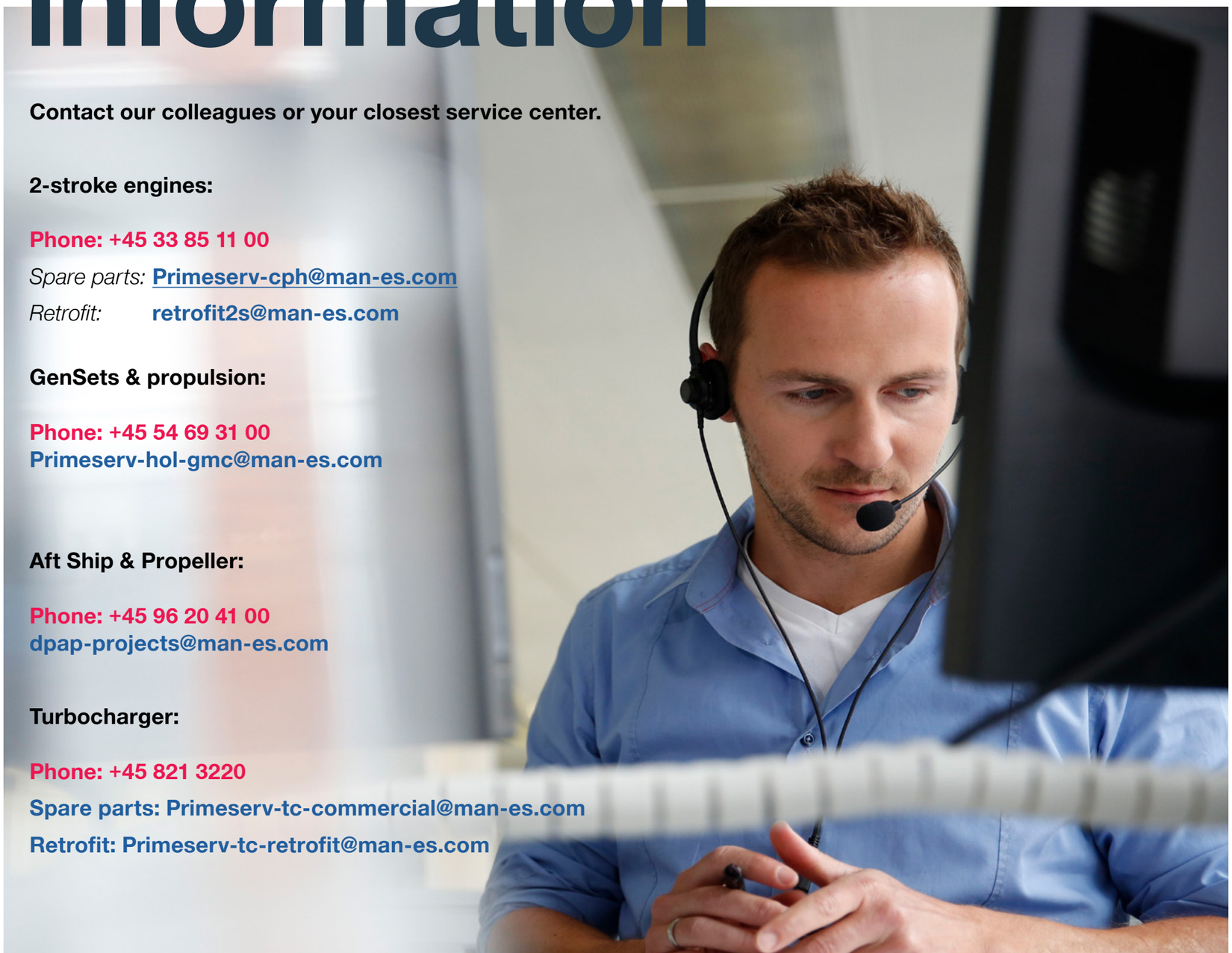
These recommendations are valid for all engine types, Mark numbers, and lubricator types (electrical and mechanical).

Fuel oil drain tanks

Incompatibility is expected between different types of 0.50% S fuels. Therefore, it is recommended to have separated tanks for fuel oil drain oil, which is pumped back to the storage tanks.

More information

Contact us



Contact our colleagues or your closest service center.

2-stroke engines:

Phone: +45 33 85 11 00
Spare parts: **Primeserv-cph@man-es.com**
Retrofit: **retrofit2s@man-es.com**

GenSets & propulsion:

Phone: +45 54 69 31 00
Primeserv-hol-gmc@man-es.com

Aft Ship & Propeller:

Phone: +45 96 20 41 00
dpap-projects@man-es.com

Turbocharger:

Phone: +45 821 3220
Spare parts: Primeserv-tc-commercial@man-es.com
Retrofit: Primeserv-tc-retrofit@man-es.com

You can also read more in our Service Letters:

- *SL2018-665: SO_X scrubber retrofit on two-stroke engines in service*
- *SL2018-663: Cylinder and system oils*
- *SL2018-661: New piston ring package*
- *SL2018-659: Cermet coated piston rings for operation on low-sulphur fuels*
- *SL2017-640: Heavy fuel oil cleaning - removal of abrasive particles*
- *SL2017-638: Cleaning of heavy fuel oil and maximum 0.1% sulphur fuels*
- *SL2014-593: Guidelines for operation on fuels with less than 0.1% sulphur*
- *SL2013-577: Fuel safety filter*
- *Service Letter: TC rematching for 8L32/40CD GenSets*

Find all Service Letters here.

Worldwide service

Represented in all key markets and major ports, with a network of more than 100 service centers, and with skilled field service managers at the ready to provide first-class technical support, MAN PrimeServ is fully primed to provide 24/7 service, wherever you are.

In power plants, engine & marine systems and turbomachinery, offering reliable technical support when you need it most, our service solutions include OEM spare parts, engine and machinery maintenance and repairs, customized service agreements and individual consulting.

We also offer retrofitting and upgrade services to bring engines and turbo-chargers already in service up to the very latest standards of performance and efficiency. Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ academies around the world.

For more information please visit
www.man-es.com/primeserv

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