

# Market Update Note



16 August 2018

## Decarbonisation by enhanced system engineering

### Newest IMO targets are in line with MAN Energy Solutions' declared policy on decarbonisation

In April 2018, the IMO MEPC 72 (Marine Environment Protection Committee) meeting was held in UK, setting ambitious targets for reducing the emission impact of the marine industry.

This MUN outlines MAN Energy Solutions' (MAN ES') position on how we meet these latest IMO targets for CO<sub>2</sub> and greenhouse gas (GHG) emissions.

IMO has agreed on a reduction target of the total CO<sub>2</sub> emission for the total fleet, including existing ships. Compared to the 2008 level (IMO reference year with respect to emissions), the targeted reduction is 40% by 2030 and 70% by 2050. One way to meet these levels could be by changing to fuel types promoting decarbonisation, i.e. LNG, on both new and existing ships. This ambitious level will also emphasise the importance of enhanced research in combustion physics and an optimal combustion of carbon-neutral fuels, such as ammonia (NH<sub>3</sub>), Power-to-X, bio-fuels, etc.

With respect to GHG, IMO has agreed to target a total GHG emission reduction of 50% in 2050 compared to 2008. The difference between the 70% CO<sub>2</sub> reduction target and that of 50% for GHG, is that the latter has been set to allow for an expected increased shipping (dwt and distance) and a change in the ship-type pattern.

IMO has split the work to reach the targets for CO<sub>2</sub> and GHG emissions into short-, mid- and long-term measures. The short-term measures have to be agreed upon during the period 2018–2023, mid-term measures in 2023–2030 and the long-term measures have to be agreed on later

within the framework of IMO. In total, the measures consist of 20 action points.

Reaching the targets calls for a combined effort within the marine industry, involving not only that the prime movers have to be more emission efficient but also the total propulsion system including propellers and hull design.

Ever since the reference year, new two-stroke engines have passed through extensive design changes and development to adapt to the decarbonisation strategy. Four new low-carbon fuels (methane, ethane, propane and methanol) have been introduced to the marine market, and when comparing the combustion of these to the traditional liquid marine fuel oils, all four reduce emissions. In addition to the above on CO<sub>2</sub> and GHG reduction, also NO<sub>x</sub> control equipment, i.e. SCR and EGR, has been optimised to meet contemporary and expected levels.

The fully developed and validated ME-GI and ME-LGI platforms represent a solid foundation for decarbonisation as they will be very well-suited for adaption to existing and possible future carbon neutral fuels. Furthermore, engine efficiency has been increased by optimising performance parameters and by using the latest technology, for example EcoEGR for lower CO<sub>2</sub> emission operation on SO<sub>x</sub> compliant fuels.

LNG is a very effective means of reducing CO<sub>2</sub> and GHG emissions thanks to the favorable carbon-to-hydrogen ratio. The two-stroke ME-GI technology of MAN ES is particularly well suited, as it has the additional advantage of operating according to the Diesel cycle, similar to the conventional

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marine-diesel-fuel combusting engines. This makes the CH<sub>4</sub> emission, also called methane slip, very low for MAN B&W diesel engines, and this also applies when operating on natural gas. The fuel efficiency can even be slightly improved when operating on natural gas compared to conventional marine diesel fuels.

Further steps will undoubtedly include more development and use of systems for waste heat recovery (WHR) for two-stroke main engines to recover and transfer that energy into power generation. In the past ten years, some 200 WHR installations have been installed on vessels with two-stroke main engines. The electric power generated by WHR has been used either for vessel hotel-load supply, enabling the operator to reduce the number of genset power units, or for transferring electric energy to the main propulsion system by means of a power take in (PTI) system. Some 10% of MCR power can be obtained by using existing WHR packages.

With the engine tuned for WHR, the total efficiency of the main propulsion system can be enhanced to well above 55% already now. A combination of the mentioned WHR/PTO/PTI solution and batteries is also getting more and more interesting when considering the development of batteries already used on some ferries.

In conclusion, the newest IMO targets are fully in line with the declared policy of MAN ES to achieve decarbonisation by enhanced system engineering. The two-stroke engines of MAN ES continue to be the backbone of marine propulsion systems allowing the ambitious IMO targets to be met.

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