

# Setting sail for 2050: Imagining the future of marine lubrication

A white paper exploring the impact of impending shipping industry developments on cylinder lubrication





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# Foreword

These are turbulent times for our industry. Ship owners have been thrust from the relative comfort of gradual change to seismic shifts and mounting complexity – a process set in motion by the International Maritime Organization’s (IMO) 2020 sulphur cap on marine fuels. This pace is set to accelerate as the various hurdles of greenhouse gas (GHG) emissions reductions looms towards 2050 targets.

Driven by regulatory and commercial pressure, the progression towards more efficient engines and lower sulphur fuels will require increasingly sophisticated technology from bow to stern. This is especially true in the area of cylinder lubrication, where higher levels of performance will be instrumental in meeting evolving engine needs.

It’s a situation ExxonMobil is prepared for – we have been here before as an industry. In a process which began 20 years ago in on-highway transportation, engine lubrication proved a critical enabler for leaps forward in engine design, fuel quality and emissions performance. Importantly, our experience proves that operators can never be too prepared. The 2050 deadline may seem far away, but vessels being designed and commissioned today may still be on the water in 30 years, rendering the timescale rather more immediate.

In this white paper, we will explore what the changes we expect over the coming decades mean for marine lubrication, and how this knowledge can help operators build resilience into their businesses ahead of IMO 2050.

# Rising to the challenge of more severe operating conditions

## Next generation marine engines will require next generation oils

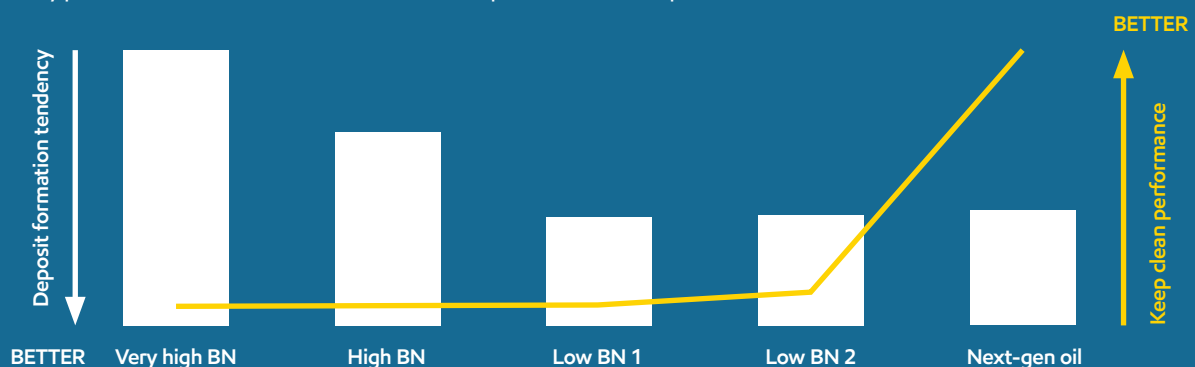
Meeting the IMO's 2050 GHG reduction targets requires engine builders and ship designers to deliver significant efficiency improvements. To achieve this, many operational fundamentals are changing. Next generation engines will operate at higher pressures and combustion temperatures, creating a far more severe environment for lubricating oils.

Put simply, as OEMs continue to push the boundaries of engine design, there is a pressing need for cylinder lubricants to 'do more'. Otherwise, inadequate lubrication performance can cause insufficient engine cleanliness and protection, resulting in lubricant related deposits and engine damage, higher maintenance costs and increased engine downtime. Given the competitive nature of the shipping market, this is a risk operators can ill afford.

Like developments seen in on-highway lubrication, the solution will come in the form of more advanced, higher quality oil formulations. Cylinder lubricants of the future can, therefore, be expected to offer improved high-temperature viscosity, greater thermal stability and better detergency. Product lifecycles are also likely to shorten significantly, favouring suppliers who can invest heavily in R&D to keep pace with engine builders' performance requirements.

### Cylinder Oil Performance

Typical in market lubricants comparison at equal feed rates used.



## Adjusting to a multi-fuel reality

### Evolving fuel mix requires enhanced flexibility from lubricants developers

Following the IMO 2020 sulphur cap, and in preparation for 2050 emissions targets, vessels' inventories will increasingly comprise a variety of fuels, including alternative fuels. Operators also need to prepare for more fuel switching as legislation evolves, further impacting the engine and cylinder oil requirements.

Given the unpredictability ahead, ship owners will need engine designs that offer maximum fuel flexibility. They will also need strategies to cope with increasing complexity, placing growing emphasis on strong relationships with fuel and lubricants suppliers, as well as on lubrication solutions that meet their changing needs.

Again, we can expect shorter product lifespans and a growing need for formulations to be flexible – both to changing fuel specifications and quality. Critically, cylinder oils of the future will need to control deposit levels more than ever before. Detergency and oxidation control will become increasingly important, and we may even see oils that are compatible with multiple fuel types.

## Exploring real time engine oil optimization

### The rise of instant engine monitoring solutions

Over the coming decades, we will also see growing on-board digitalization, accompanied by a proliferation in available performance data. Given the introduction of more complex engine and fuel technology, it will be critical to make full use of this potential.

Scrape down oil analysis services such as [Mobil Serv<sup>SM</sup> Cylinder Condition Monitoring](#) have already seen an increase in development due to its ability to deliver a range of critical preventative maintenance and operational benefits, from optimising cylinder oil feed rates to identifying issues with abnormal wear. Importantly, they can be tailored to the needs of each operation and supported with training to ensure maximum long-term gains.

### **Mobil Serv<sup>SM</sup> Cylinder Condition Monitoring helps triple piston ring life**

Orient Overseas Container Line (OOCL) was looking to safely extend piston ring life in a vessel's engine, beyond the designer's recommended 24,000 hours. ExxonMobil suggested implementing Mobil Serv<sup>SM</sup> Cylinder Condition Monitoring as part of a Condition Based Overhaul (CBO) approach. An engine inspection after 53,000 hours revealed that components were free from deposits, and that wear on the piston rings was well within acceptable tolerances. This information enabled the vessel operator to extend the life of the piston rings to 72,000 hours, achieving significant savings and reducing downtime.

## Preparing for tomorrow, today

As the industry charts its course towards 2050, ship owners face a journey punctuated by disruption. The increasingly severe operating conditions of next generation engines will change several important parameters. These, without optimum lubrication, risk causing significant maintenance issues - more frequent machinery replacements, increased downtime and escalating costs - with a direct impact on operators' bottom lines.

In short, it has never been more important to start planning for tomorrow, particularly if you are considering purchasing new build vessels now and running them for their full lifecycle - by which point the 2050 deadline will be upon us.

## Looking to next generation lubricants for help weathering the storm

Lubrication will be a critical factor in helping newer, more efficient engines achieve optimum performance. Faced with an ever-expanding operational envelope, next generation cylinder oils will require a far greater investment in development and testing, and reformulations will become more common. In parallel, cutting-edge condition monitoring platforms will play a growing role in identifying potential issues and offering solutions to mitigate them.



# Act now to stay one step ahead

Rising to the challenges outlined in this white paper will require new levels of sophistication and collaboration throughout the industry. Operators looking to safeguard the efficiency of their fleets tomorrow need to understand and prepare for the changes to come today. Lubricants manufacturers, meanwhile, should be well on their way.

Backed by over 60 years of heritage of our MobilGard™ marine lubricants, ExxonMobil is already addressing these challenges by working closely with leading engine builders and components manufacturers to keep ahead of the curve. Is your lubricant supplier doing the same? Find out what they are doing to ensure their offer supports the long-term resilience of your operation.

To find out more about ExxonMobil's marine lubrication solutions, visit [www.exxonmobil.com/en/marine](http://www.exxonmobil.com/en/marine).



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