

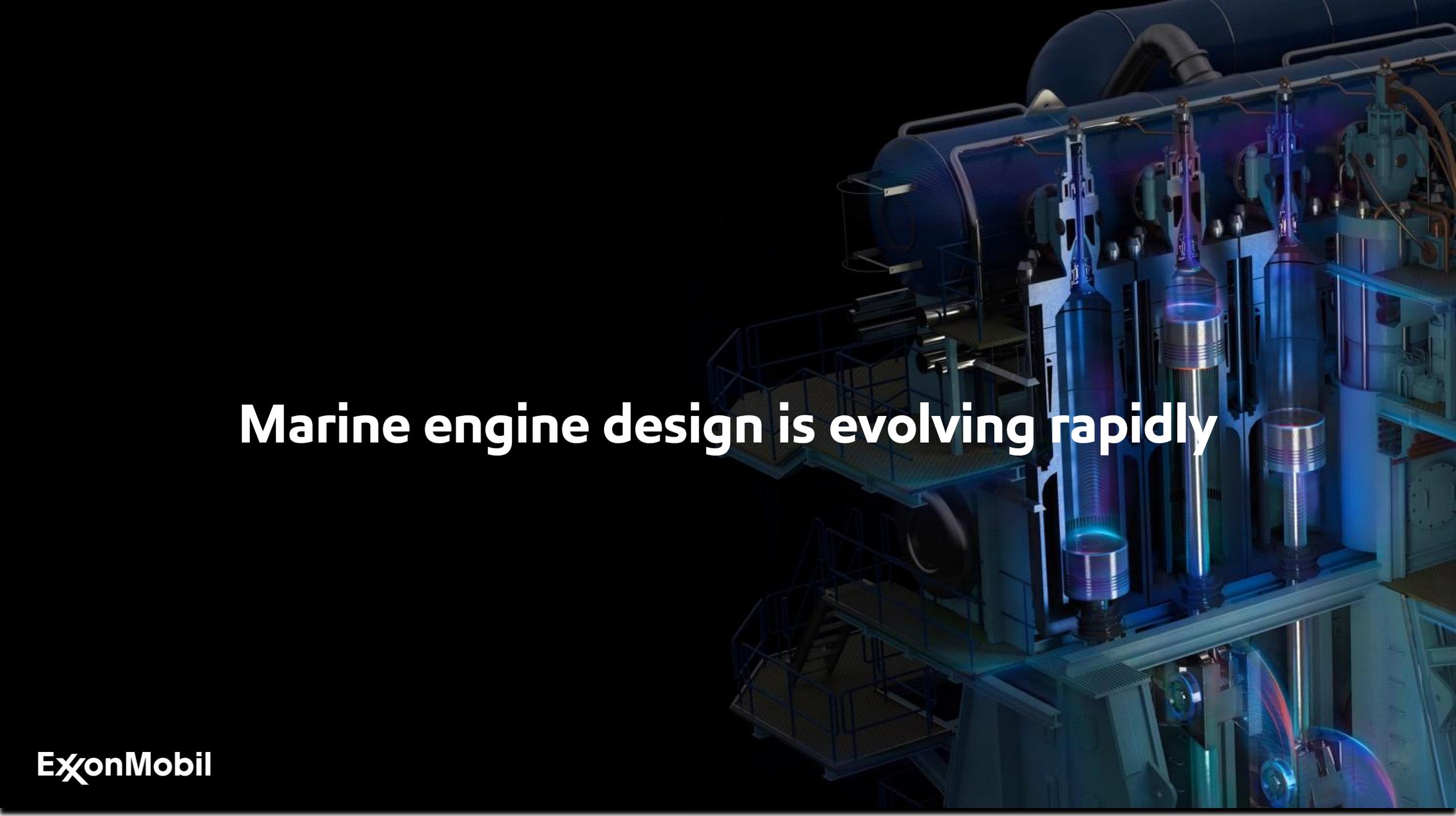


ExxonMobil

# Introducing Mobilgard™ 540 X

ExxonMobil's newest high-performance marine diesel engine cylinder oil

May 2020



**Marine engine design is evolving rapidly**

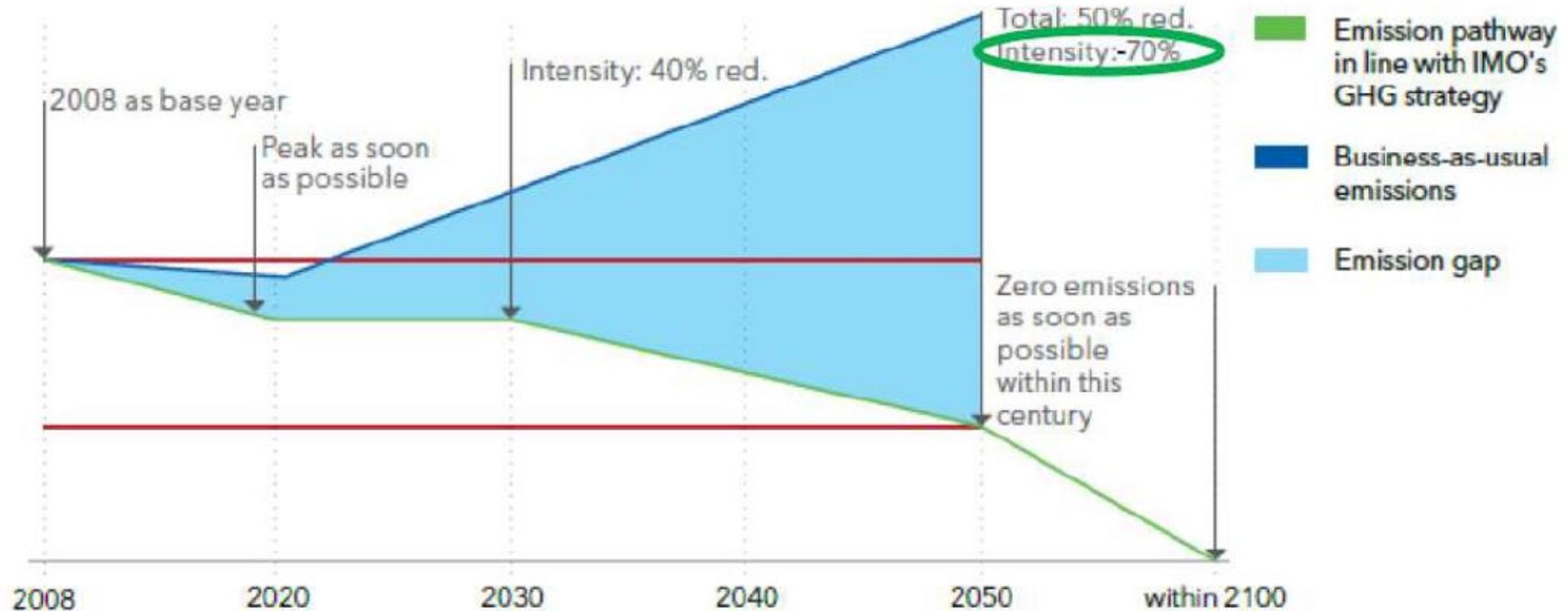
# The current landscape

- Meeting the IMO's 2050 GHG reduction targets requires engine builders to deliver **significant** efficiency improvements
- These targets **will not** be met without change
- To achieve this, many operational fundamentals are changing now
- This results in higher operating pressures and combustion temperatures



# Vessels meeting 2050 requirements will look very different to those of today

GHG emissions



Carbon intensity is measured as CO<sub>2</sub> emission per tonne-mile, while Total is the absolute GHG emission from international shipping.

# Next-generation marine engines require next-generation lubricants

More severe engine conditions create a much harsher operating environment for lubricating oils



Today's cylinder oils will struggle to work under this pressure



Inadequate lubricant performance does not provide sufficient engine cleanliness and protection, resulting in

Lubricant-related engine damage

Increased engine downtime

Higher maintenance costs

**ExxonMobil**

**All risks operators simply cannot afford**



# The demand on cylinder oils is evolving

Today's new engine designs require cylinder oils to 'do more':

⇒ **Lubrication is a critical factor** in helping newer, more efficient engines achieve optimum performance



## More important

Deposit control

Detergency

Oxidation stability



## Less important

Acid neutralisation

This is critical **today**, given engines are already being built for vessels that will still be sailing in 2050

# Impact of multiple fuels

- Compliance with International Maritime Organization (IMO) legislation requires new fuel options, and for many ships, multiple fuel types
- Post-IMO 2020, and pre-2050, vessels will often need to alternate between several fuel types
- For optimum performance, lubricating oils should be switched in parallel
- This creates operational challenges, additional costs and downtime and procurement complexity



# Introducing Mobilgard™ 540 X

- **Mobilgard™ 540 X** is the latest addition to our advanced MobilGard™ cylinder oil range
- It has been specifically formulated to meet the needs of **current and next-generation engines** operating at **higher pressures** and **combustion temperatures**
- And designed for use with **0.10%, 0.50% sulphur fuels and LNG**
- Its **advanced formulation**, contains **enhanced detergency** that delivers **outstanding performance** and **reduced deposit formation** across all three fuels

# Mobilgard™ 540 X: Benefits with different fuels

## 0.10% S

- Approved for continuous use in ECAs
- Reduced deposit formation

## 0.50% S

- Potential for substantial feed rate reduction
- Reduced deposit formation

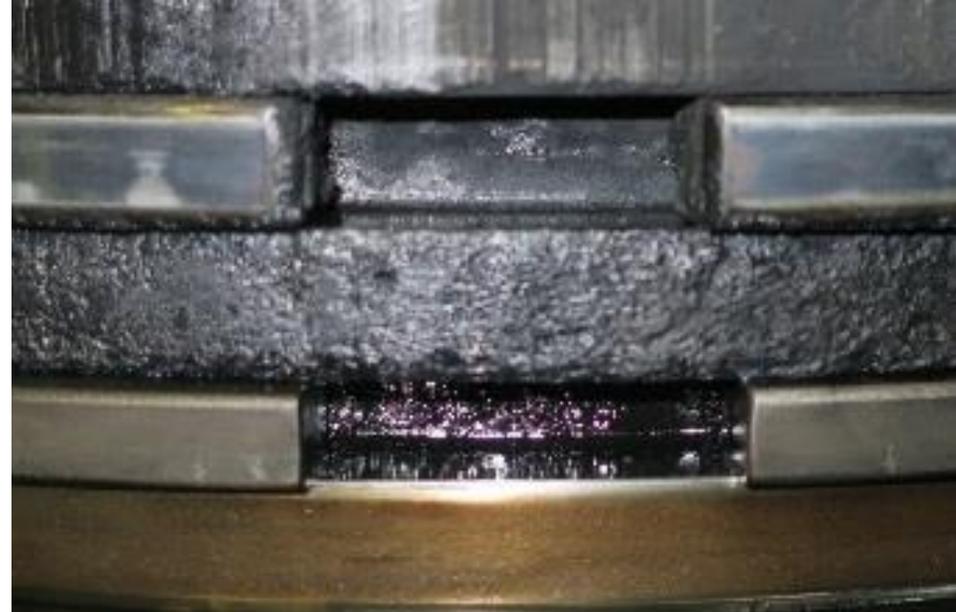
## LNG

- Approved for use in the latest WinGD engines
- Shown to allow for up to 25% feed rate reduction (WinGD)

# Exceptional deposit control

Mobilgard™ 540 X has been formulated with enhanced oxidation stability and effective detergency to reduce deposit formation

It delivers exceptional deposit control across all low sulphur fuels under high combustion temperatures and pressures (particularly prevalent in LNG fuel operation)



Legacy 40 BN oil

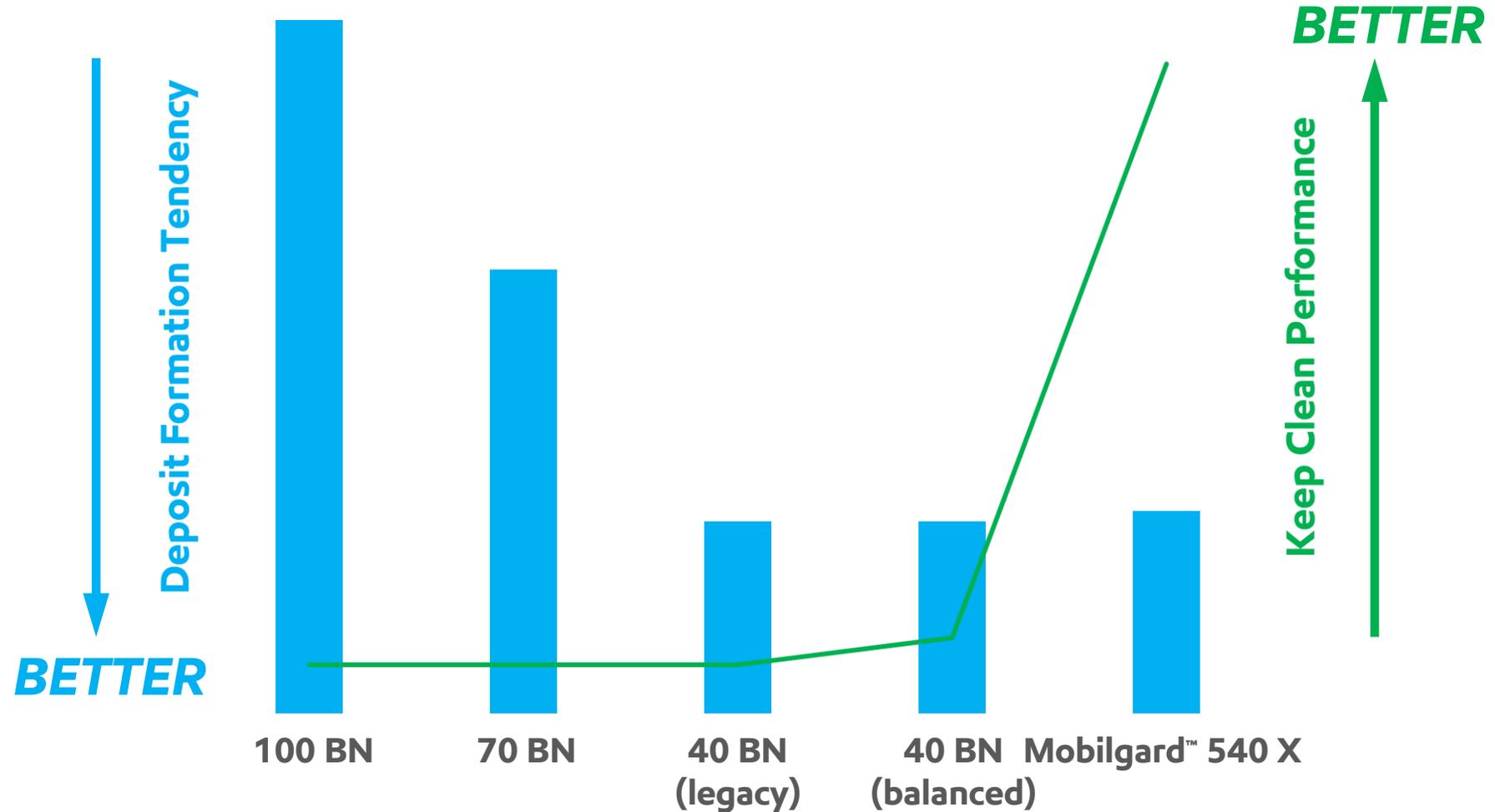


Mobilgard™ 540 X

# Superior detergency

## Cylinder Oil Performance

Mobilgard™ 540 X offers superior detergency performance when compared with other cylinder oils



# Outstanding wear protection and optimised cylinder oil feed-rates

- Mobilgard™ 540 X offers outstanding protection and optimised cylinder oil feed-rates whilst effectively neutralising acid
- It has been shown to allow a feedrate reduction of 25% when running on LNG in WinGD engines
- Result achieved through sophisticated monitoring system to ensure safe operation at minimum feedrate



Commercial 25 BN oil



Mobilgard™ 540 X

# Streamlined inventories, allowing operators to seamlessly switch fuels

- Mobilgard™ 540 X cylinder oil delivers reduced complexity, giving operators the confidence to seamlessly switch between fuels
- Thanks to its advanced formulation, detergency technologies, and low Base Number (BN), it also demonstrates exceptional deposit control across all low sulphur fuels under high combustion temperatures and pressures, outstanding protection and optimised feedrates





# WinGD approves Mobilgard™ 540 X

Lubricants

all engines

Issue 004 2019-12

- No Objection Letter (NOL) received from WinGD for all three fuel types
- It is the first cylinder oil to be gas validated by WinGD
  - Performance demonstrated after 4,000 hour field demonstration
- Passed stringent fit-for-use testing in the most recent engine designs



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ExxonMobil	Mobilgard 525 (BN 25)	Mobilgard 540	Mobilgard 560VS (BN 60)	Mobilgard 570	Mobilgard 5100 <sup>8</sup>	Mobilgard 5145 (BN 145)
		Mobilgard 540X (DF validated <sup>10</sup> )				

8 Use in combination with < 0.1% sulphur ECA fuel is validated by field test for up to 500 h continuous operation.

10 DF validated: These products have been validated while using both liquid and gaseous fuels.

<https://www.wingd.com/en/documents/fuel-lubricants-water/lubricants-for-wingd-engines-v4.pdf/>



# MobilGard™: the complete cylinder oil range

LNG

0.10% sulphur fuels

0.50% sulphur fuels

High sulphur fuel  
with scrubber

Highly corrosive  
engines, high S fuel  
+ scrubber

Mobilgard™ 540 X

Mobilgard™ 540

Mobilgard™ 540

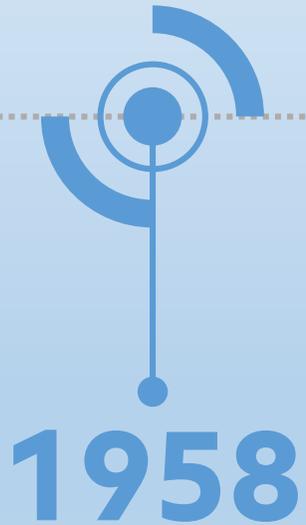
Mobilgard™ 570

Mobilgard™ 5100

# MobilGard™: 60+ years of heritage

## First MobilGard™ oil

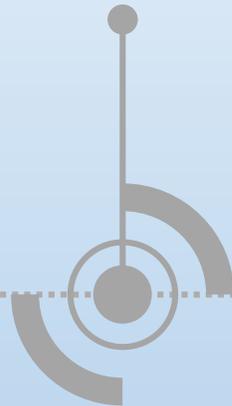
Launched in 1958, the first MobilGard oil contained additives held fully in solution (rather than as an emulsion, which was more common at the time)



1969

## Mobilgard™ 570

Mobilgard 570 saw its debut in 1969, and quickly became THE industry-leading cylinder oil for many decades



## Mobilgard™ 300 system oil

The first Mobilgard 300 system oil was introduced in the 1970s, triggering a long line of innovations



2002

## Feedrate Optimisation (FRO)

ExxonMobil publishes the results of a pioneering study into FRO using scrapedown analysis as the principle analytical vehicle



## Mobilgard™ 540 X

The first cylinder oil proven to deliver performance in modern engines across all low sulphur fuels, including LNG



# Available when and where you need it



Mobilgard™ 540 X will be available from June 2020



In major ports worldwide including Singapore, the Antwerp-Rotterdam port area, Houston, Hong Kong and Korea, plus additional locations via ExxonMobil's extensive global port network



Details and further updates will be available via our ePorts & Services Guide - [www.exxonmobilportsandservices.com](http://www.exxonmobilportsandservices.com)



# The complete package: from bow to stern

- In today's multi-fuel environment, customers need to know what is happening inside their engines
- ExxonMobil offers a range of services to help, including Mobil Serv<sup>SM</sup> Cylinder Condition Monitoring (CCM)
- In conjunction with Mobilgard<sup>TM</sup> 540 X, these advanced, real-time insights can help optimise feed rates and enhance engine protection to ultimately reduce costs and ensure peace of mind



# MobilGard™ and Mobil Serv<sup>SM</sup> Cylinder Condition Monitoring

Peace of mind as you prepare to navigate  
the turbulent waters ahead



# Exceptional performance, today and tomorrow

- Engine designs and fuel specifications will continue to evolve in line with emissions legislation, further impacting cylinder oil requirements
- ExxonMobil is already working closely with leading engine builders to stay ahead of the curve
- As always, ExxonMobil will continue to augment its product range in the future to match the needs of the industry
- You can rely on us to be with you for the journey ahead, as MobilGard™ has been for over 60 years



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