Changing requirements of Marine Lubricants

CIMAC India NMA Webinar

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Contents

- Additive Design Challenges
- IMO2020 VLSFO
- MAN ES Category II
- Alternate Fuels



Market Drivers to IMO2050



Engaged in the debate, positioning lubricants as part of the solution



Additive Design Challenges



Combustion

Environment

Cycle



Cylinder Lubricating Oil (CLO)



IMO 2020 VLSFO

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Pre 2020, what did we know about ≤0.5% Sulfur fuel?

- 1st January 2020 overnight and <u>globally</u>
- There will be a wide range of 0.5% S blends
- Which are expected to present problems:
 - ➤ Compatibility
 - > Stability
 - Pour point issues
 - > Combustibility
 - > Asphaltene handling
- Very limited availability of samples to analyse and test
- Fuel known as VLSFO (Very Low Sulphur Fuel Oil)



Stability concerns realised in lab blends of 0.5%S fuels



IMO2020, 'robust' lube – understanding bench tests

'Legacy' 40BN

'Robust' 40BN for VLSFO



Some traditional industry bench tests no longer correlate to the engine.



VLSFO from 1st January 2020 to today

Issues

• Variability | Conditioning | Training

Engine issues in the first half of 2020 linked with VLSFO

• Liner scuffing | Piston ring breakage| High wear rates

Contributing factors

- Fuel variability
- Frequency of monitoring and maintenance
- Legacy 40BN cylinder oils not specifically designed for VLSFO

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KEEPING ENGINES RUNNING AMID 2020 FUEL CHALLENGES		

MAN ES Category II



Overview of MAN ES Cat II Development

MAN ES aim to raise the performance of cylinder oils across the market

Q4 2019 – Q1 2020

MAN ES provide initial outline of Cat II requirements

Based around historical approvals new CLOs designed for VLSFO would be Cat II acceptable Q2 2020 – Q3 2020

100BN & 140BN Cat II products listed in May 2020

D1 image raises questions around measurable requirements



Q3 2020 - Q4 2020

MAN ES provide some clarity on D1 image "Performance of a 40BN Cat II candidate should be relative to 100BN Cat II reference"

Cat II Listing for 40BN cylinder oils in November 2021

A fundamental shift in cylinder oil performance



Meeting the MAN Cat II Performance Level



Strengthening active chemistry to address engine and fuel requirements

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Alternate Fuels



Marine LNG | Pace of Adoption



DNV GL 2020 – Maritime forecast 2050



LNG Marine Fuel Institute



Transport Energy Network

- LNG represents a major bridging fuel
- It will remain in operation into 2050 (bio/synthetic LNG)
- Currently 0.5% of global fleet is using alternative fuels, however, rises to 10% when vessel order book is taken into consideration.*

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Marine LNG | A Bridging Fuel

- LNG infrastructure expanding
- Increasing number of vessels with LNG capable engines
 - ~2000 vessels ~590 2T vessels and rising
- Engine and cylinder lubricant technology
 - LNG Diesel and Otto cycle engines more severe, requires cylinder oil with improved thermal, wear and fluid film performance
- WinGD
 - June 2020 WinGD cylinder oil list now identifies 'DF Validated' products for use in DF engines

	GEI
<300 hrs	SPE
Monitor	SPE
DF Validated	SPE

VERAL USAGE: Allowed within WinGD general usage guidelines Image con CIFIC USAGE: Allowed continuously for maximum time limit stated CIFIC USAGE: Allowed but with increased frequency of Piston Underside Inspections (PUIs) and Cylinder Scrape Down Oil Analysis. CIFIC: Cylinder Oil has passed full validation trial running on LNG and liquid fuels





DF optimised product



RT-Flex50DF (4000rhrs), feed rate 0.6g/kWh

Image courtesy of WinGD

Modular Engine Designs

Modular design enables extensive retrofit options

By ensuring **full fuel flexibility and extensive retrofit capabilities with a proven record,** MAN Energy Solutions **future proof** your investment

Fuel types	МС	ME-B	ME-C	ME-GI	ME-GA	ME-GIE	ME-LGIM	ME-LGIP
0-0.50% S VLSFO	Design	Design	Design	Design	Design	Design	Design	Design
HFO	Design	Design	Design	Design	Design	Design	Design	Design
Biofuels	Design	Design	Design	Design	Design	Design	Design	Design
LNG	-	-	Retrofit	Design	Design	Retrofit	Retrofit	Retrofit
LEG (Ethane)	-	-	Retrofit	Retrofit	-	Design	Retrofit	Retrofit
Methanol / Ethanol	-	-	Retrofit	Retrofit	-	Retrofit	Design	Retrofit
LPG	-	-	Retrofit	Retrofit	-	Retrofit	Retrofit	Design
Ammonia****	-	-	Retrofit	Retrofit	-	Retrofit	Retrofit	Retrofit

MAN Energy Solutions

Public



Engine Designers recognise their role in enabling future fuels.

Additive and Lubricant companies ensure that the right products are developed to satisfy the requirements of engines and fuels

Engine Designers enabling future fuels

Future fuels for large merchant marine vessels - Webina

31

Understanding Alternate Fuels Characteristics

		Fuel Type	Inherent Fuel Characteristics	OEM ICE Modification	Operational Impact – On Engine	Lubricant Requirement
IMO2020		VLSFO	High degree of variability in the market.	Combustion asphaltene deposit.	"sticky" piston and ring deposits. Asphaltene damage (Liner scuffing).	Novel dispersant. Robustness.
Bridging		LNG CH4 (C2H6) methane (ethane)	Requires co-firing with another fuel.	Timing, coatings.	Combustion temperature / piston ring torching.	Thermal protection.
Market Viability	High	Ammonia NH ₃	Requires co-firing.			
	High	Hydrogen H ₂	Requires co-firing.			
	Bridging	Methanol CH ₃ OH	Requires a pilot fuel/ignition enhancer			
	Low	BIO Fuels	Feed stocks / type / source / variability		• /	

Continued research, information validation & exploration of testing capability



Summary

IMO 2020 VLSFO

Use cylinder lubricants designed to enable VLSFO

Conduct regular engine monitoring and maintenance MAN ES Category II

MAN ES Cat II requires a different formulating approach

Active chemistry levels will need to increase

Alternate Fuels

Understanding alternate fuel characteristics fundamental to developing future cylinder oils

Bench tests historically used for cylinder oil development may no longer be relevant



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