

# Adapting to life in the Post IMO2020 Landscape

Talusia Universal, the single cylinder oil solution  
for all today's compliant fuels



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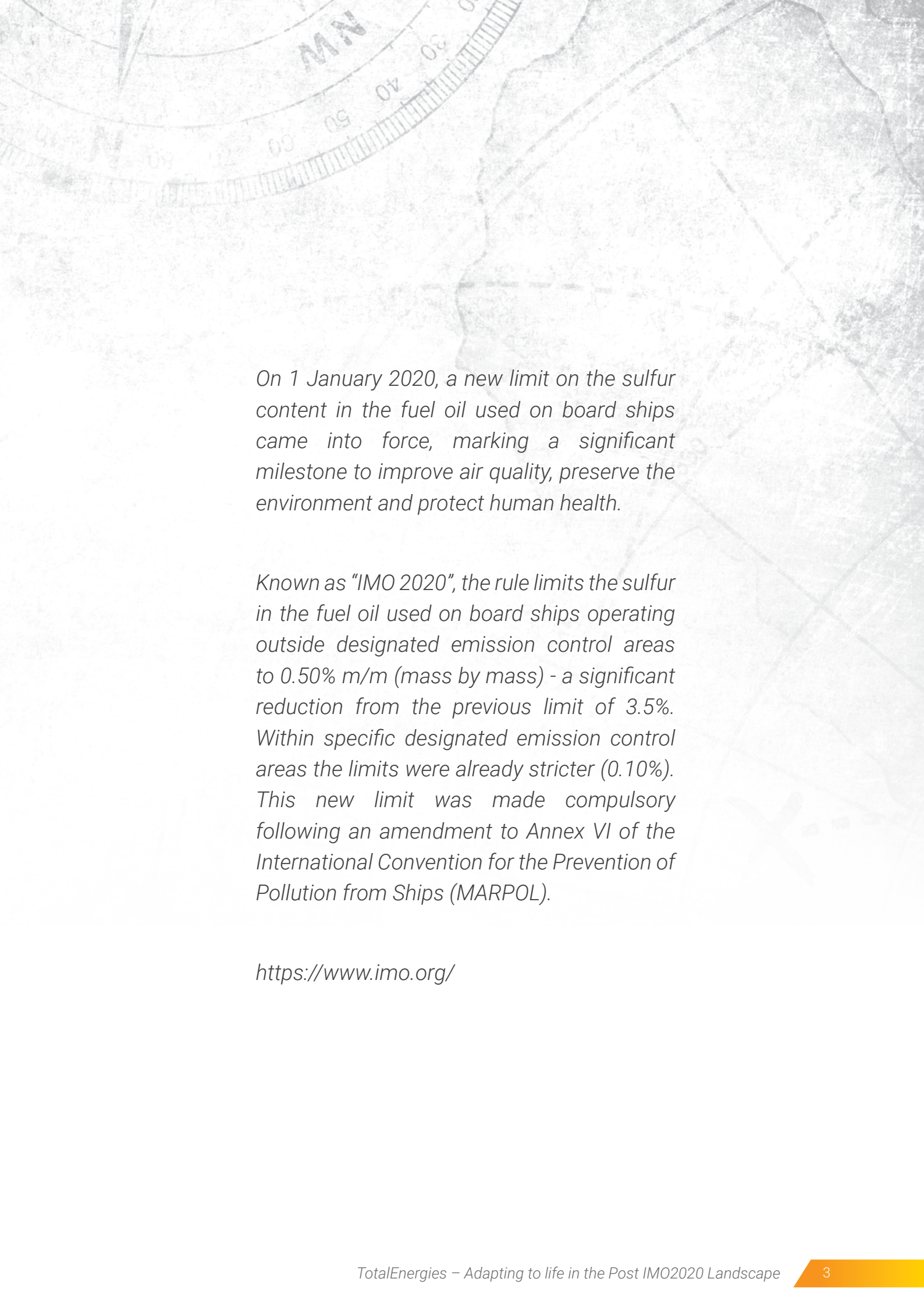
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*On 1 January 2020, a new limit on the sulfur content in the fuel oil used on board ships came into force, marking a significant milestone to improve air quality, preserve the environment and protect human health.*

*Known as “IMO 2020”, the rule limits the sulfur in the fuel oil used on board ships operating outside designated emission control areas to 0.50% m/m (mass by mass) - a significant reduction from the previous limit of 3.5%. Within specific designated emission control areas the limits were already stricter (0.10%). This new limit was made compulsory following an amendment to Annex VI of the International Convention for the Prevention of Pollution from Ships (MARPOL).*

*<https://www.imo.org/>*





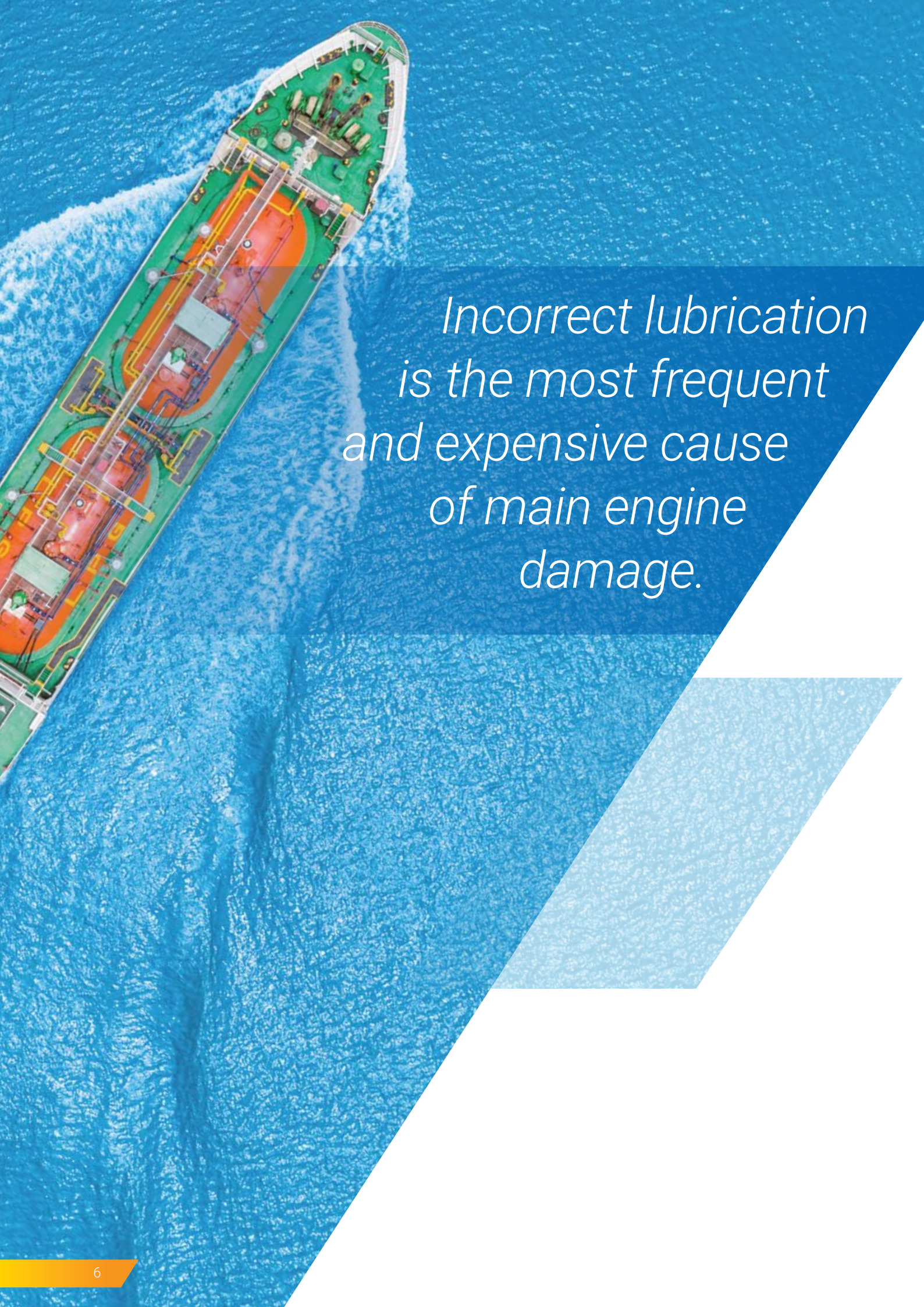


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*Incorrect lubrication  
is the most frequent  
and expensive cause  
of main engine  
damage.*



The development of low sulfur fuels through the introduction of IMO2020 has been the most significant change to the way in which the global fleet has been powered since the introduction of the diesel engines in the maritime industry a little over 100 years ago.

Whilst the use of low sulfur fuels has clear benefits on emissions reductions, what has been proven is that challenges around fuel quality have brought with them real issues for modern marine engines and in particular – 2-stroke marine engines.

For not only are 2-stroke engines sensitive to corrosion but they also face an increased risk of engine deposit build up – leading to problems including poor combustion, abrasive wear and scuffing damage.

So how has the shipping industry adapted to life in the Post IMO2020 landscape? What has been the impact for operators both in the initial transition stages through to today? What have the practical implications been, the pains suffered and the gains being made as a result of the learning we have all had to do as a result of IMO2020?

And as we head beyond IMO2020 how can we take the learning from IMO2020 implementation and use it to create further efficiencies, improvements and benefits moving into the future?

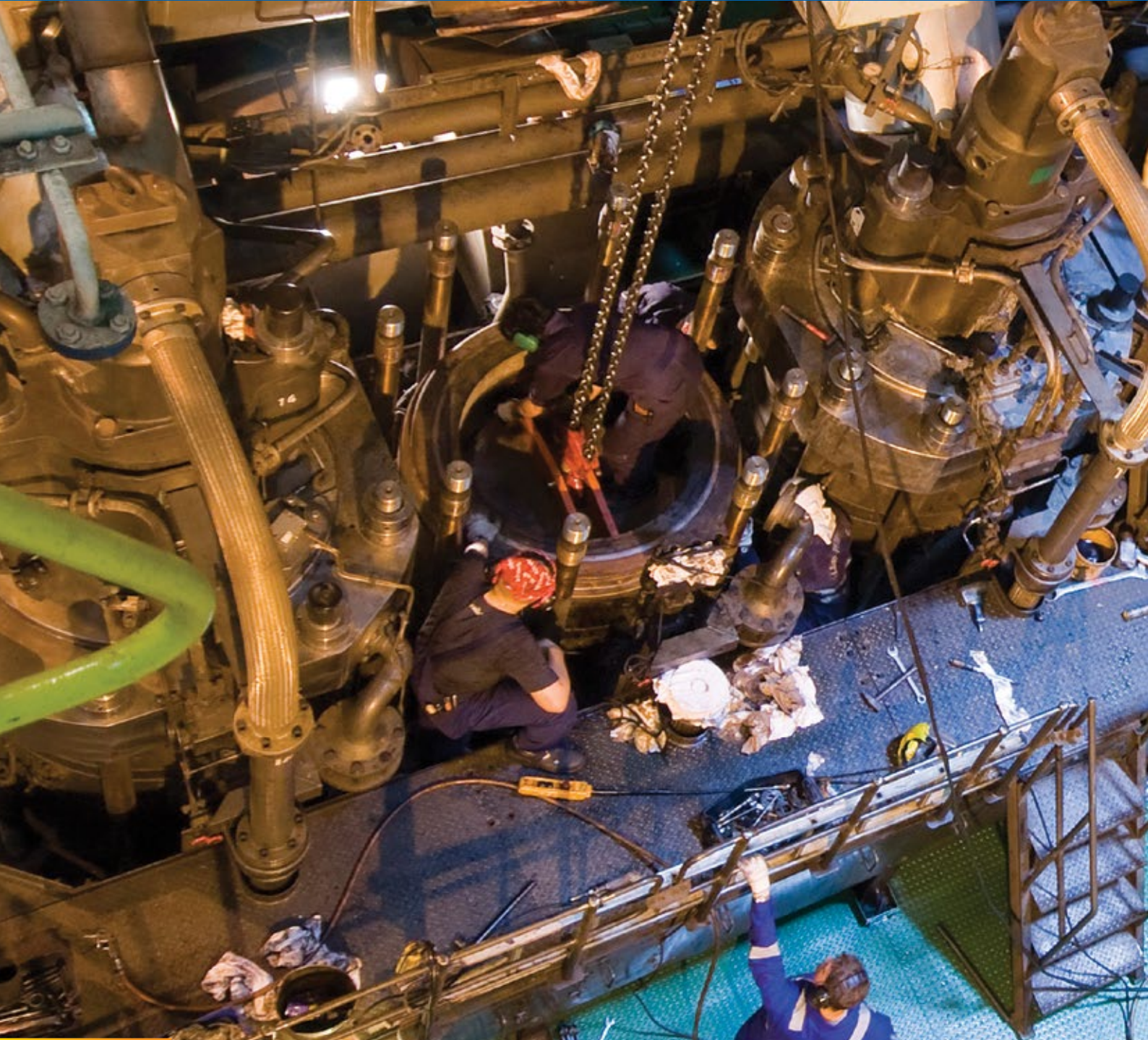
**What is without question is that selecting the right cylinder oil in tandem with a properly managed Monitoring Programme in the post IMO2020 landscape has never been more important than it is today.**

Not just in helping meet IMO2020, but in delivering effective Lube Oil Feed Rate (LOFR), Operational Expenditure (OPEX) and in preventing costly and often unnecessary engine wear and damage.

As we will see, incorrect lubrication is the most frequent and expensive cause of main engine damage. Yet this can all too often be avoided and with it many of the costs associated – in time, money and people.

Through this white paper we will look at the key steps shipping operators and owners can take to ensure safe and reliable engine operation, minimise risk, save time, save money and ultimately extend engine life expectancy.







# Fuel Quality Challenges

**The lead up to IMO2020 was a testing time for the shipping industry as it was for lubricant and fuel manufacturers, planning for the potential impact that the transition to low sulfur fuels could bring.**

Post IMO2020 industry research and feedback from shipping operators including the BIMCO 2020 Fuel Oil Quality and Safety Survey - [the transition to IMO2020<sup>1</sup>](#) – highlighted that the transition saw operators face some initial challenges.

These included fuel quality issues, including inconsistent fuel batches, likely resulting from the large number of fuel suppliers seeking to meet the new IMO standards, and in doing so increasing the risk of inconsistency in the initial transition stages.

Cat Fines were also reported as an issue in the early stages of 2020, certainly not a new problem but were highlighted by operators, as were lower viscosities.

These lower viscosities were likely a result of new fuel batches adopting MDO/MGO cuts to reach the required Sulfur levels, causing viscosity levels to drop creating fuel transfer issues, pumping issues or trouble within fuel injection.

## SPECIFIC REPORTED ISSUES INCLUDED

Consequently operators faced challenges including combustion and cleanliness issues with consequences as shown below:

- Combustion deposits
- Abrasive wear
- Corrosion
- Scuffing damage

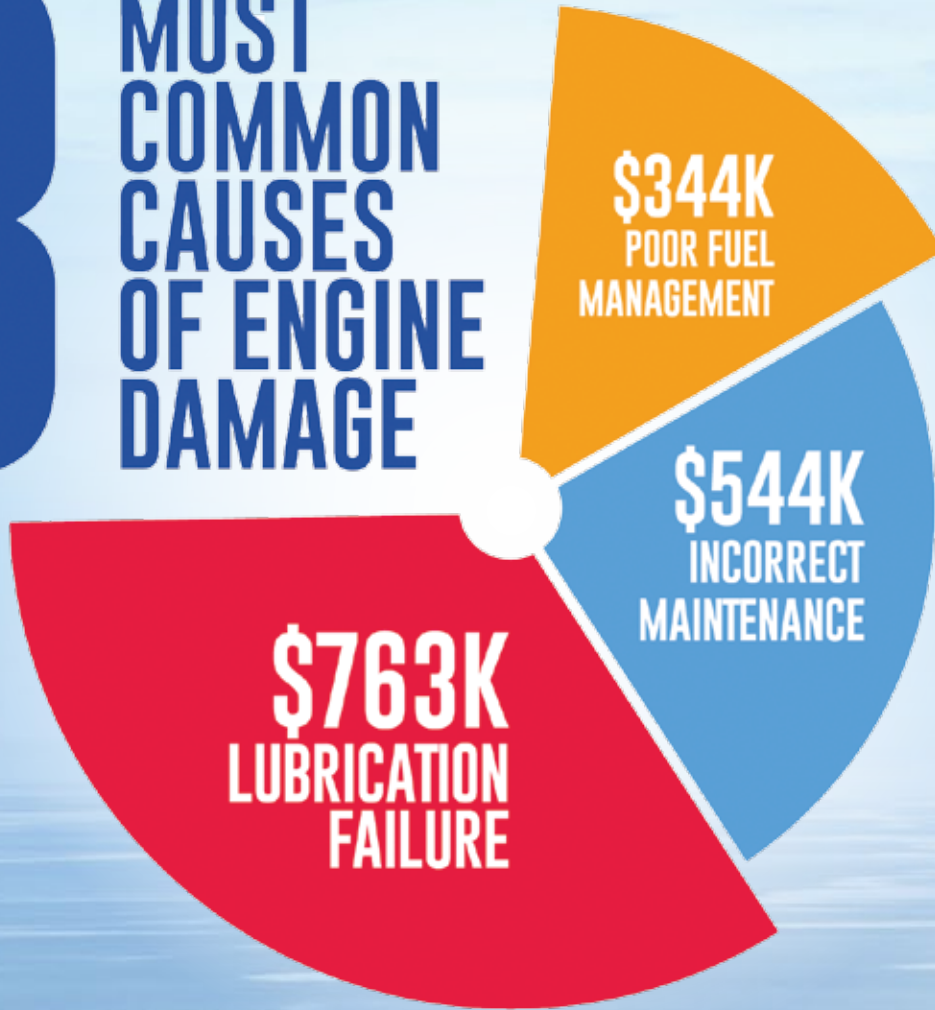
The time and cost implications for operators having to deal with issues like these were and are significant.

And whilst the market is now adapting to these issues, it emphasises how critical the correct lubrication selection, use, analysis and management is for all ship owners and operators.

1. <https://www.bimco.org/news/priority-news/20200819-industry-survey>

# 3

## MOST COMMON CAUSES OF ENGINE DAMAGE



Source: The Swedish Club  
Main Engine Damage Report (figures quoted are average costs)





# Prevention is Better than Cure

**This approach is further reinforced by research from leading international marine insurer The Swedish Club, which highlights lubrication failure as the main cause of vessel engine damage - on average costing \$763,320 (USD)<sup>2</sup> - the most frequent and expensive cause of main engine damage.**

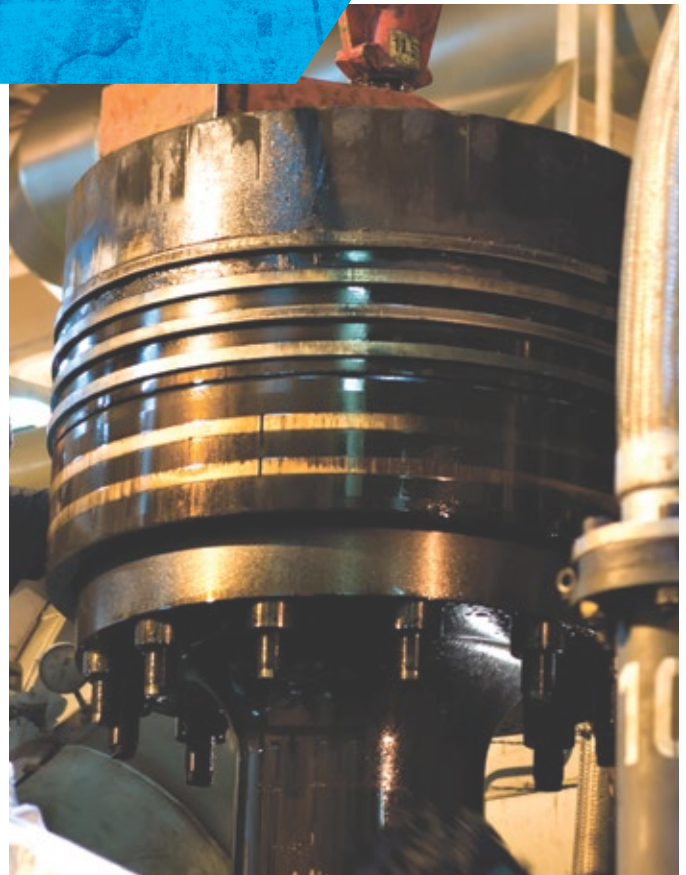
Compared to The Swedish Club's previous 2010-2014 research, lubrication failure had increased in both the number of cases and the average cost per claim – **which had increased by 15%, rising from \$663,351 to \$763,320.**

This evidence points to the fact that lubrication issues are costing vessel operators significant time and money – often unnecessarily.

Lubrication clearly remains a key issue within the shipping industry given the findings of the survey and the impact when things do go wrong is significant – not just in terms of the \$763,000 average cost but the time lost in having to deal with engine failure.

The findings also highlight that the most effective way to avoid main engine damage is through the implementation of a robust fuel and lubrication oil management system.

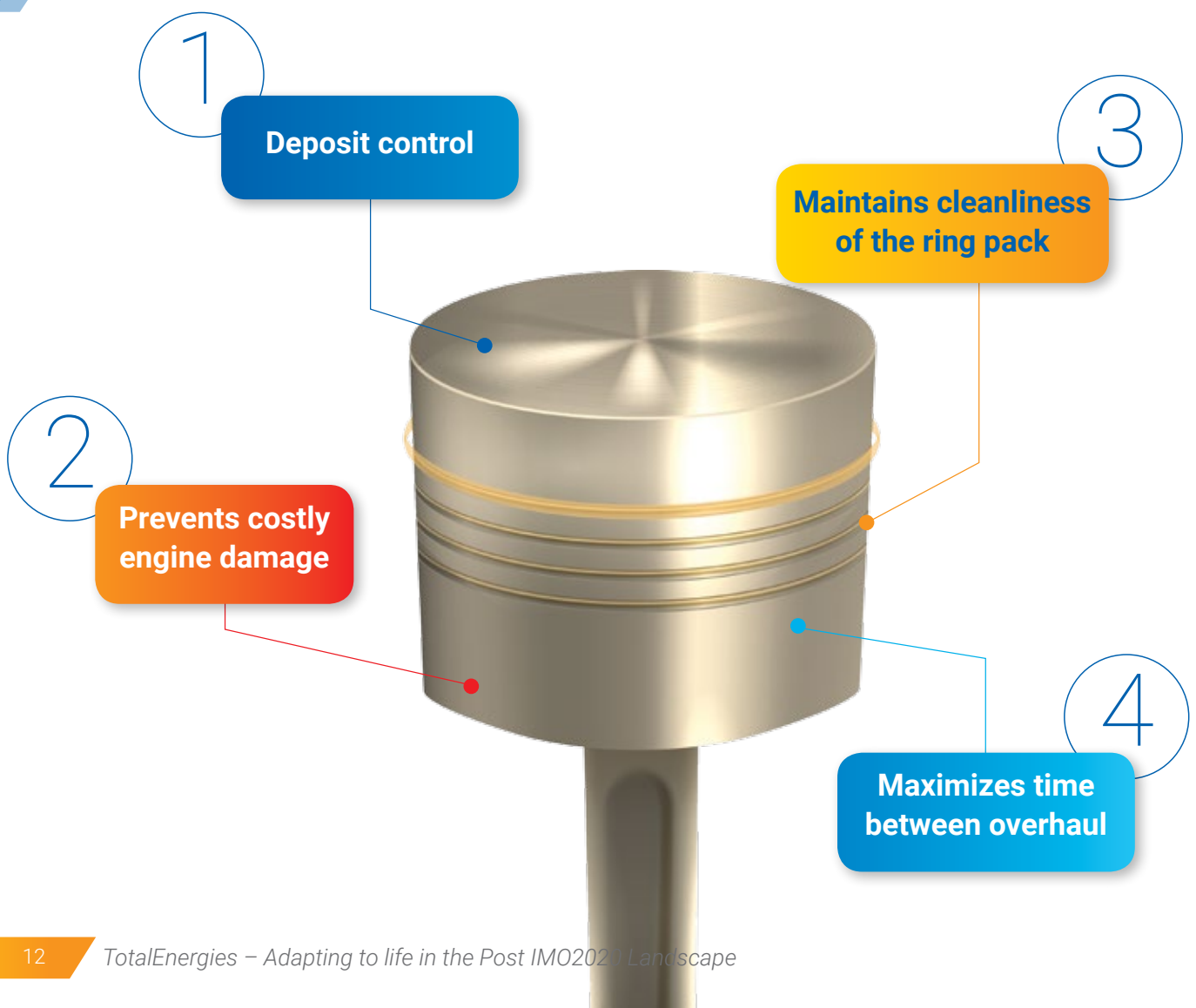
2. The Swedish Club's 'Main engine damage' report



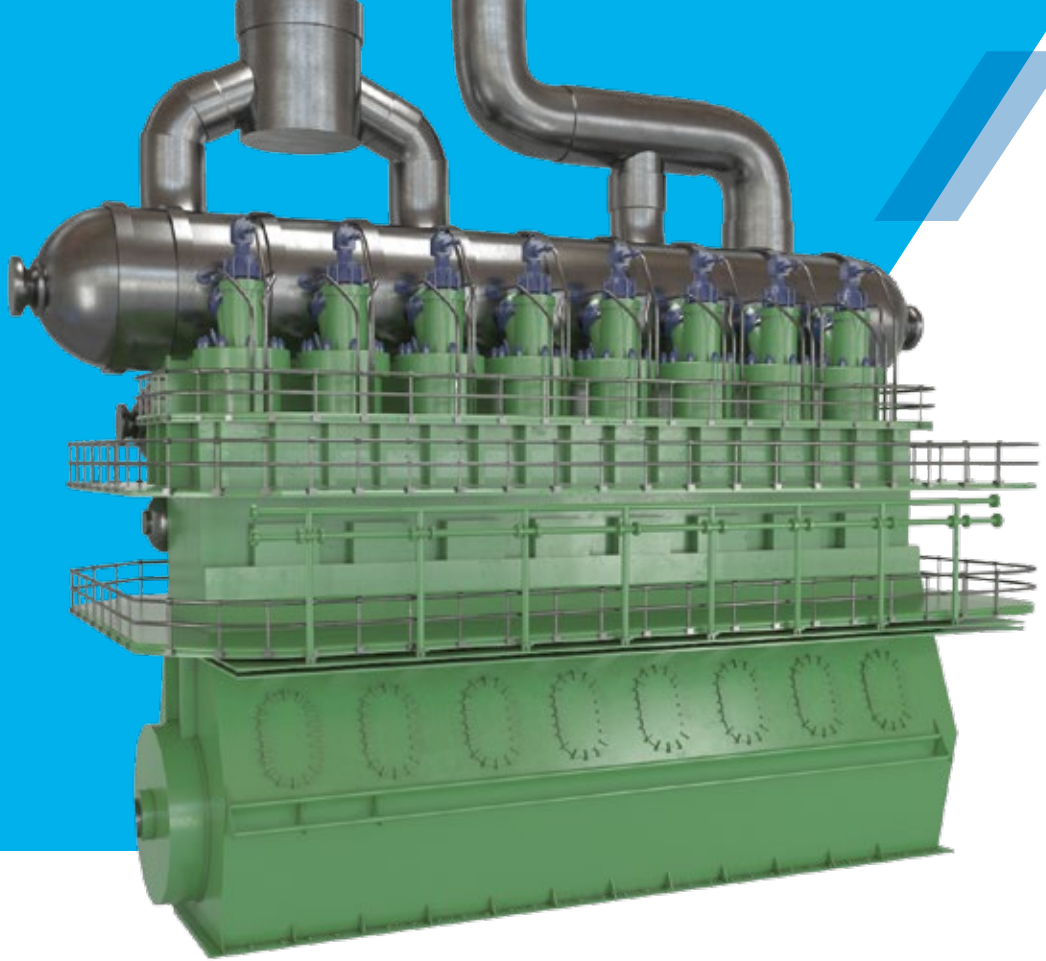
The Swedish Club technical advisors explain that statistically a vessel will suffer between one and two incidences of main engine damage during its lifetime. **Engine claims account for 28% of all machinery claims and 34% of the costs.** Through our research over the past 10 years, lubrication failure remains the most common and frequent cause of damage so is clearly an ongoing issue.

Prevention of damage is naturally preferable to cure and the first step to avoiding main engine damage is to have a robust lubrication management system in place.

# Why is Engine Cleanliness So Important?







**Engine Cleanliness is critical for any fleet operator. Achieve this and you will help protect the engine and especially the ring pack, the liner and the piston top-land, which in turn will help prevent costly engine damage, downtime and repair.**

In other words, when surfaces are clean, the oil film is well established and ensures good wear protection by minimizing the iron content, potentially delivering feed rate reduction.

As the BIMCO survey findings have revealed - **there are serious and costly implications to getting this wrong**. When it comes to engine cleanliness, effective lubrication of the engine has a key role to play.

**There are 4 key benefits associated with engine cleanliness (see the picture opposite).**

Effective engine cleanliness, will ensure clean piston toplands and crowns, minimizing the risks of bore polishing and scuffing, which in turn will help prevent costly engine damage whilst maximizing the time required between overhaul. It also ensures sealing of the combustion space contributing to improved engine performance through proper ring movement, reducing the risk of ring breakage.

The type of lubricant you use can help achieve these positive outcomes.



1

**Benefits to setting the right feed rate**

3

**Achieve the right lubrication investment**

2

**Protect the Engine**

4

**Strike the balance**

5

**OPEX management**



# Importance of Setting the Right Feed Rate

**Getting the right balance of lubricant feed rate whilst achieving optimum performance is the goal operators seek to achieve. The use of low sulfur fuels under IMO2020 means greater attention needs to be given to achieving the right balance to maintain engine performance.**

Vessel operators understand very well that under lubrication is dangerous in the long run as there is not enough active matter from the lubricant injected into the engine.

Less recognized however are the issues associated with over lubrication, which can potentially lead to excessive deposits, engine scuffing and not to mention costly repair. Not only are modern engines particularly sensitive to corrosion and corrosive wear, but also the introduction of VLSFO fuels through IMO2020 further increases the risk of engine deposit build up. Achieving the right level of two-stroke engine cylinder lubrication offers multiple benefits for vessel operators **including OPEX control savings and increased safety margins.**

## OPTIMIZING THE ENGINE LUBRICATION FEED RATE

There are multiple benefits for vessel operators seeking to achieve the optimum lubrication oil feed rate (LOFR) yet all too many still suffer from the problems associated with under or over lubrication.

### Under Lubrication

Key issues associated with under lubrication include insufficient engine protection resulting in increased, or even excessive, liner wear.

Under lubrication will also result in insufficient active matter to deliver suitable acid neutralization and detergency to help keep the engine clean.

### Over Lubrication

It is often wrongly assumed that over lubrication will not damage the engine. The reality is that excessive lubrication can also create problems, which can be extremely costly.

One of the biggest problems of over lubrication is the excess amount of unused lubricant, which can result in increased carbon deposits. Over time these deposits increase, leading to carbonization, ultimately creating a barrier between the new oil and the piston liner enhancing the potential risk of 'scuffing'.

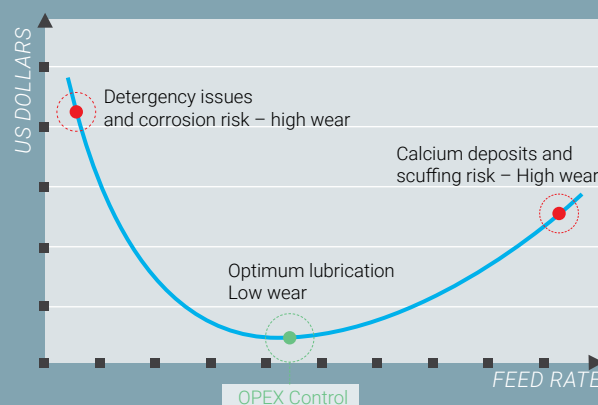
This poses a serious threat to operations and OPEX, resulting not only in an operator paying more for their lubrication usage but increasing the risk of damage and repair costs.

### Optimum Lubrication

Getting the right balance of lubricant feed rate whilst achieving optimum performance is the goal operators seek to achieve.

Optimum lubrication will deliver benefits including consistent engine cleanliness without engine deposit build up, preventing costly engine damage, downtime and repair.

This will only be achieved however through a dedicated lubrication monitoring and management programme. Drain oil analysis programmes are easy to integrate, helping optimize operations through lubrication consumption and component wear analysis with a number of support and technical programmes to choose from.





### NOT JUST ABOUT BN

Here at Lubmarine we are wholly convinced that a BN-centric approach is not the most effective way to lubricate and protect engines.

Whilst this may challenge conventional thinking in some areas of the shipping industry, we have undertaken significant research and investment to test and prove this point, both in the lab, at sea through millions of hours testing and through the approval of OEM's.

## WHAT IS EFFECTIVE AND EFFICIENT NEUTRALIZATION?

For many years base number (BN) analysis was widely regarded as the sole quality parameter of lube oil performance. Through Lubmarine's pioneering Talusia Universal chemistry, it has been clearly proven that the BN argument is now outdated.

This is because BN is a physico-chemical characteristic which, alone, is simply not enough to measure the full performance characteristics of a cylinder lubricant.

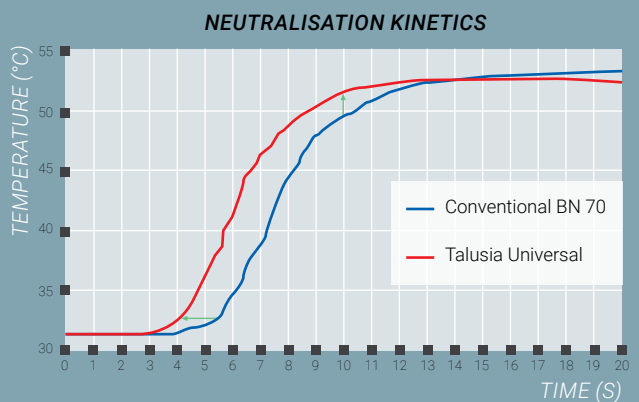
What counts is the kinematic reaction of a lubricant, proven by the temperature ( $T_o$ ) curves witnessed when there is a reaction with the lubricant in the cylinder. The faster that  $T_o$  increases, the greater the effectiveness of the lubricant: that is, the oil's ability to effectively fight acids rapidly, irrespective of simply its BN.

This change in approach was created as a result of the development of Talusia Universal because conventional chemistry used at the time was unable to rate the true performance of a lubricant above its neutralization performance alone.

Through Talusia Universal's innovative chemistry we can track the basicity performance by the shape of its reaction curve. This highlights that what is important when measuring the performance of the lubricant is the speed of the reaction.

When we look at the basicity performance of Talusia Universal – it is about its reaction speed. This is why a BN 57 product such as Talusia Universal provides better performance compared to classical BN 70 products on the market. Its basicity reserve is high enough to ensure effective neutralization of acids produced during combustion, regardless of the fuel's sulfur content.

With its combination of neutralization properties and detergency, ensuring engine cleanliness, Talusia Universal provides a unique solution for modern engine lubrication in a post 2020 landscape.









# Taking a Multi-Layered Approach to Engine



**RIGHT CYLINDER OIL**



**RIGHT FEED RATE**



**RIGHT MONITORING PROGRAM**



# Cleanliness

**Using the right lubricant in the right amount to deliver optimum performance and effective engine cleanliness is just one piece in the puzzle.**

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Rising to the challenge requires an understanding of the multiple operating parameters of the engine, combined with smart engine monitoring and drain oil analysis and interpretation - something that can only be achieved with the support of a lubricant specialist.

By carefully and regularly monitoring lubricant and vessel machinery condition, ship owners together with their oil supplier can proactively detect and react to any abnormalities and contamination issues.

This can be achieved through **a range of tailored solutions designed to help deliver multiple benefits**, notably by combining a high performance, proven engine lubricant with regular drain oil analysis services and ongoing technical interpretation and support.

All OEM guidelines recommend careful engine monitoring and a sophisticated intelligence-led approach allowing for the most prudent management of two stroke marine engines.



# Key Steps to LOFR\* Optimization in the Post IMO2020 Landscape

## STEP 1 - THE LUBRICANT SOLUTION - TALUSIA UNIVERSAL

Talusia Universal is a fully OEM approved cylinder oil with a patented chemistry, proven with over 125,000,000 successful operating hours.

Tests show that Talusia Universal performs better than BN 40 in cleaning ability (detergency) and provides higher residual BN, enabling you to optimize the feed rate and maintain the iron content into the limits determined by the OEM's during long-term operation.

This delivers additional safety margins by achieving the lowest recommended LOFR when based on visual inspection and drain oil analysis.

Thanks to its formulation (BN57 and innovative chemistry), Talusia Universal is perfectly balanced to help prevent calcium carbonate deposit build up compared to higher BN lubricants.

Its additional surfactant molecules provide additional reassurance and confidence in delivering engine cleanliness, helping extend the operational efficiency of ship engines, saving vessel owners and engineers, both time and money in the long term.

*\* Lube Oil Feed Rate*





## STEP 2 - IMPLEMENTING A ROBUST ANALYSIS PROGRAMME

Implementing an effective Drain Oil Analysis Programme is simple, reliable and proven way of helping optimize operations through lubricant consumption and component wear analysis.

Drain Oil analysis programmes can offer differing levels of insight ranging from basic services providing a snapshot, focusing on OEM conformity in regards to iron and residual BN levels, through to more advanced programmes delivering comprehensive engine analysis reporting including system oil contamination and finally optimum analysis services looking at detailed mid-to-long term performance measurements including specific LOFR optimization advice and insight.

## STEP 3 - MARINE EXPERTISE & THE HUMAN ELEMENT

The third layer in achieving optimum engine performance including its cleanliness profile is to enlist the support of highly experienced Engineers to assist with lubrication optimization and any lubrication issues vessel operators might be experiencing.

This level of support can include:

- Ship engine inspections and trouble-shooting
- Lubrication survey and technical investigations
- Shipyard and switchover support
- Vessel machinery assessment and long-term follow-up

This third step enables operators to utilize the skills of dedicated specialists they can bring aboard a vessel to provide wider practical insights and approaches enabling and supporting decisions to be made on the best courses of action specific to their vessel.

## BENEFITS OF THIS APPROACH

**There is no single solution to achieving the benefits that LOFR optimization can deliver. It takes a multi-layered approach, utilizing the technical knowledge and infrastructure of a specialist lubricant manufacturer and the range of services available to support vessel operators.**

# Learning from the Post 2020 Experience

**Ship operators and owners need the confidence and added reassurance that they are making the right lubrication decisions to ensure operational efficiency through proven performance.**

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As part of its recent requalification with both MAN ES and WinGD, Talusia Universal undertook 12000+ hours of field-testing with IMO2020 compliant fuels.

Building on the previous OEM approvals, Talusia Universal was treated as a completely new formulation to ensure it would perform to the same standards necessary for 2020 compliant fuels.

**The test results provided conclusive evidence** as part of the awarding of new IMO2020 compliant fuel NOL's from both MAN ES and WinGD.





*Discover  
our 5 case  
studies*





## CASE STUDY #1

# TALUSIA UNIVERSAL MAN ES Field trial - FUEL <0.5%S



### TALUSIA UNIVERSAL - MAN ES FIELD TRIAL FUEL <0.5%S

- IRIS ACE (RoRo)
- MAN ES 8S50MC-C
- 4,100 hours
- <0.5%S IMO 2020 Compliant fuel

The field test with MAN Energy Solutions(ES) was performed with an 8S50MC-C engine operating on Very Low Sulfur Fuel Oil with less than 0.5% sulfur.

It was compared side-by-side with a conventional BN40 cylinder oil.

After more than 4,000 running hours as per OEM requirements with regular inspections, the end of test inspection revealed the ring pack showed excellent

cleanliness and excellent wear rates on the running components.

Compared with conventional BN40, the improved cleanliness was clearly visible (as pictured) with the ring lands and piston top land.

The results highlight that the standard choice, namely BN40, does not always provide the necessary detergency to maintain the ring pack in good condition.

This successful test led to the issuing of a No Objection Letter (NOL) from MAN ES for use on all MAN B&W two-stroke engines operating with 2020-compliant fuels, Very Low Sulfur Fuel Oil (VLSFO) with less than 0.50% sulfur, as well as fuels with a sulfur content ranging from 0.5 to 1.5%.





## CASE STUDY #2

# TALUSIA UNIVERSAL MAN ES Field trial - DUAL FUEL



≈2000 HOURS W/ CONVENTIONAL BN 25



≈1400 HOURS W/ TALUSIA UNIVERSAL

### TALUSIA UNIVERSAL - MAN ES FIELD TRIAL DUAL FUEL

- GASCHEM BELUGA
- MAN ES 7G50ME-C9-GIE
- ≈ 2,000 hours
- Ethane

Talusia Universal was also tested onboard an ethane fueled vessel.

The test results showed a better engine cleanliness compared, this time, with conventional BN 25 cylinder oil. We also saw (pictured) the ring lands were markedly cleaner as a result of Talusia Universal outperforming the BN25 cylinder oil during the short trial.

MAN ES has adopted different philosophy (when compared to WinGD) when it comes to issuing NOLs. They prefer not to validate the CLO performance with

fuels that are not in the recommended sulfur range based on the CLO's Base Number.

So, in this case (as the Talusia Universal has a BN 57), MAN ES did not renew the NOL issued just a few months before.

However, they confirmed that we can use the test results and extracts and photos from the official MAN ES inspection reports as proof of suitability for the use of Talusia Universal in GI engines.



## CASE STUDY #3

# TALUSIA UNIVERSAL WINGD Field trial - FUEL <0.5%S



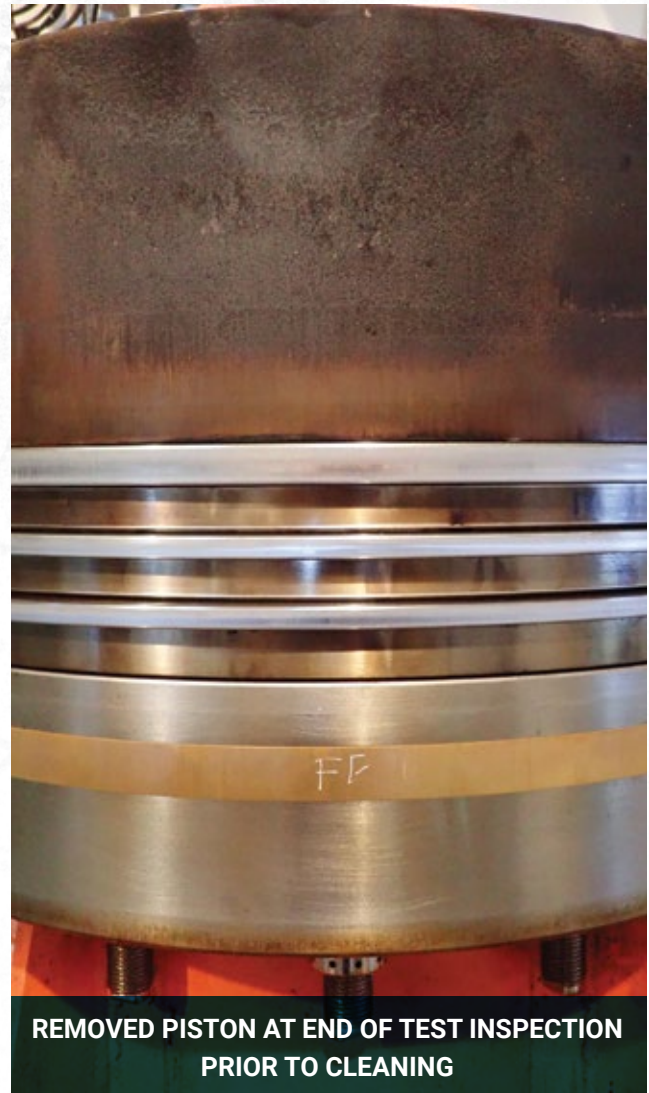
### TALUSIA UNIVERSAL - WINGD FIELD TRIAL - FUEL <0.5%S

- KOTA SEGAR (Containership - 3,800 TEU)
- 6X72 (21,130 kW)
- 2,000+ hours
- <0.5%S IMO 2020 Compliant VLSFO

The results from the field trial on Talusia Universal showed an excellent level of cleanliness of the ring pack and minimal deposits on the crown.

The photo of the piston and ring pack (pictured) was taken immediately after the removal and the rings had been only lightly wiped with a rag. The piston topland has minimal deposits and most are easily wiped away.

The ring grooves also have minimal deposits, which ensures proper ring movement when the engine is running.



**REMOVED PISTON AT END OF TEST INSPECTION  
PRIOR TO CLEANING**



## CASE STUDY #4

TALUSIA UNIVERSAL  
WINGD Field Trial - FUEL 0.1%SRING BACK AND GROOVE CONDITION  
AFTER RING REMOVALTALUSIA UNIVERSAL - WINGD FIELD TRIAL -  
FUEL 0.1%S

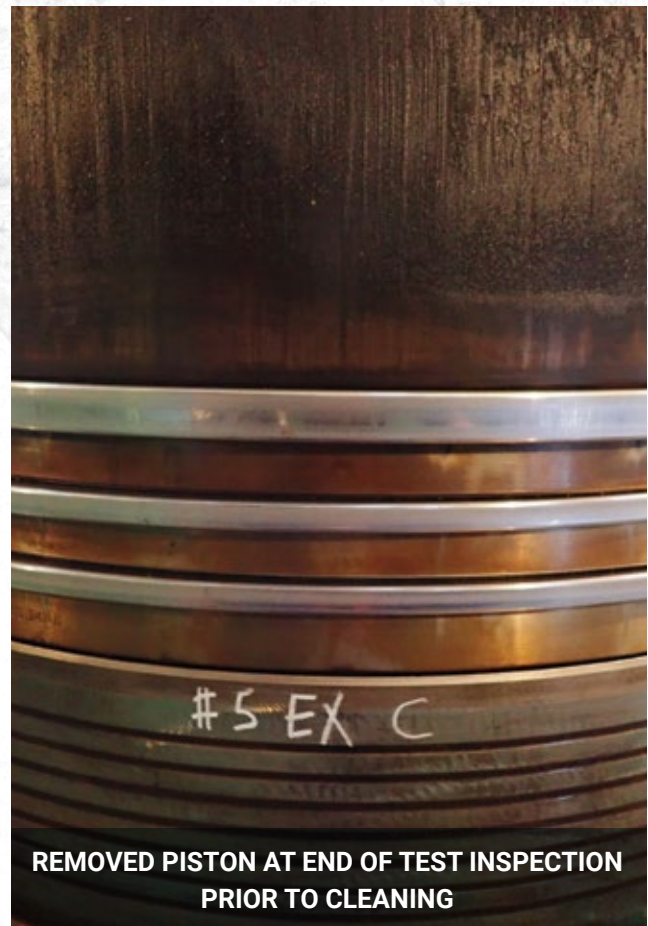
- KOTA SETIA - (Containership - 3,800 TEU)
- 6X72 (21,130 kW)
- 2,000+ hours
- 0.1%S ULSFO

In addition to the 0.5% sulfur test, tests were also carried out using Talusia Universal with an ultralow sulfur fuel oil with less than 0.1% sulfur.

Whilst it was a very clean fuel, it was highly paraffinic which could lead to potential deposits.

With the broad range of fuel qualities in 2020 compliant fuels, it was important to test on a fuel blend that could be available.

The results of the test were excellent, and again Talusia Universal provided exceptional cleanliness and wear protection for the engine. Upon removal, the piston and rings looked in like new condition (pictured) after running for over 2,000 hours.

REMOVED PISTON AT END OF TEST INSPECTION  
PRIOR TO CLEANING





## CASE STUDY #5

# TALUSIA UNIVERSAL WINGD Field trial - Dual Fuel: VALIDATED



REMOVED PISTON AT END OF TEST INSPECTION  
PRIOR TO CLEANING

### TALUSIA UNIVERSAL WINGD FIELD TRIAL - DUAL FUEL: VALIDATED

- SK AUDACE (180,000-cbm LNG tanker)
- 2 x WinGD 6X62DF (14,310 kW)
- First X-DF powered vessel in operation
- 4,800+ hours operational field test in gas mode

Talusia Universal was tested on the latest engine technology in the marine industry, that being WinGD's X-DF engine.

The conditions in an X-DF engine are the most severe a cylinder oil can experience, with combustion temperatures over 2,000°C, sustained liner temperatures over 190°C and direct contact with the combustion flame.

The results of the test were very good. The piston and ring pack revealed particularly good cleanliness and provided outstanding wear rates. There was almost no liner or ring wear after nearly 5,000 hours of testing, even under the most severe conditions.

The long-term test with LNG has given us great in-

sight on this fuel and engine type:

- LNG is a challenging fuel, a bit contra-intuitive considering it is sulfur free and because there should be limited soot caused by the MGO pilot fuel
- LNG requires detergency that most low BN products cannot provide, but also significantly improved thermal stability to ensure proper lubrication of the piston running components
- However, the danger when going up with the BN is the risk of deposits and this risk is mitigated and controlled thanks to the unique chemistry of Talusia Universal

At the time of production of this document (2021), Talusia Universal is the 1st single oil product to have received WinGD's DF-Validation notation.

With the DF-Validation of Talusia Universal, it has become a true single oil solution for DF engines as it can be utilized with any compliant fuel in operation on X-DF engines.





## OEM VALIDATION

**Talusia Universal is fully approved by MAN ES for use on all engines operating on <0.50% S VLSFO and with residual fuels containing from 0.5% to 1.5% Sulfur. It also bears a DF validation and a NOL by WinGD for use on all engines and all fuels with Sulfur content ranging from 0.0% to 1.5%, including LNG.**

**The concept of the Single oil solution is not only still valid but particularly relevant because the product offers flexibility in a wide spectrum of operating conditions.**

### THE SINGLE OIL CONCEPT

*Prior to the year 2000, the shipping industry did not require a large range of lubricant options as the vast majority were burning high sulfur fuels.*

*In 2005, with the creation of the ECA Zones this need for wider lubricant choices was amplified further with not only fuels having to be switched upon entry and exit of the ECA zones but lubricants also having to reflect those fuel changes.*

*In 2007 Lubmarine came up with the breakthrough, single oil concept. Thanks to its unique chemistry this highly innovative approach enabled the engine performance to be maintained using only one lubricant, regardless of the fuel selection.*

*That single oil concept was Talusia Universal. Its performance enabled it to better neutralization efficiency performance compared to higher BN lubricants (compared to traditional BN 70 lubricants) whilst at the same time preventing the build up of calcium carbonate deposits when used with low sulfur fuels.*

*This ability to deliver effective results for both high and low sulfur fuels – detergency and cleanliness – was unique in the market.*

*Back in the mid-2000's, acid neutralization performance was critical. Today detergency and cleanliness are critical and the single oil concept covers all these requirements.*

*Talusia Universal's additional surfactant molecules provide effortless reassurance and confidence in engine cleanliness, helping extend the operational efficiency of ship engines, saving vessel owners and engineers, both time and money in the long term.*

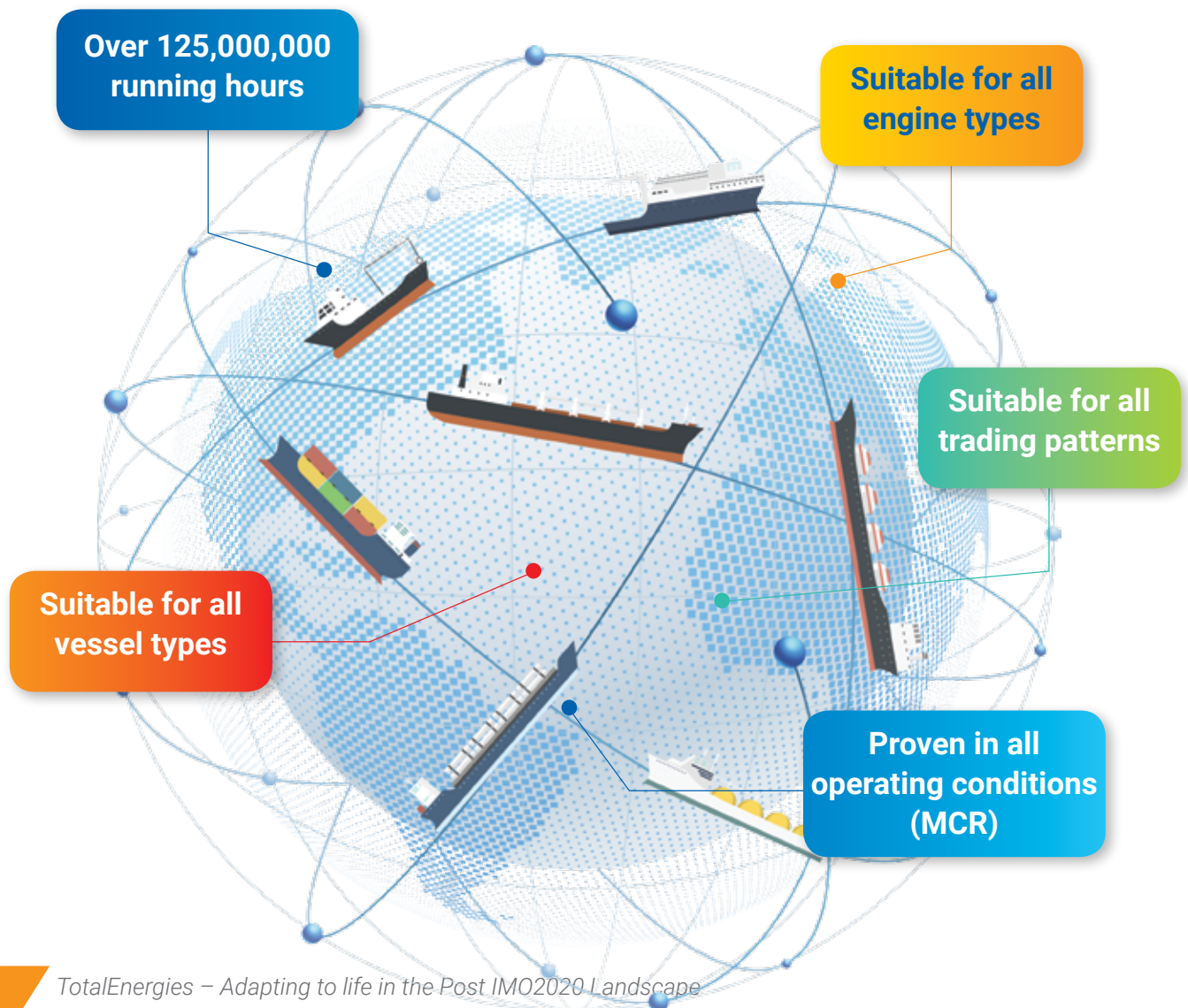
*The single oil concept is ultimately about delivering efficiency, flexibility and simplicity for both vessel operators and crews alike.*

*The single oil concept is a major success story and it remains as effective today as it was when the product was launched, having been completely requalified in line with all IMO2020 compliant fuels, including LNG.*

*Such was its impact in the market that TotalEnergies was also the pioneer of the Efficient Basicity methodology recognized by ASTM (EBAS) and has been incorporated by them into Active Standard ASTM D8126.*



# Single Oil: Delivering Real Flexibility







**Flexibility and correct lubrication selection go hand in hand, helping deliver a significantly simplified lubrication strategy whilst creating operational efficiencies and benefits including:**

- Avoiding complex BN management and CLO switching
- Removing the challenge of matching lubricants to different fuel types
- Simplifying lubricant management operations for crew
- Delivering flexibility to meet a vessel's lubrication tank arrangement
- Mitigating any risk of human error
- Creating simplified lubrication logistics, storage and administration processes
- Reducing the risk of engine corrosion and engine deposit build up
- Delivering time and cost savings

As a result of the combination of OEM validation and unique chemistry, Talusia Universal offers ship opera-

tors this flexibility by delivering a number of key benefits including:

- Over 125,000,000 successful running hours
- Suitability for all vessel types
- Suitability for all engine types
- Suitability for all trading patterns
- Proven in all operating conditions - from the Sub-Zero temperatures of Alaska to the high temperatures and humidity of Indonesia
- Able to be used continuously with all 2020 compliant fuels with confidence
- Assurance for anyone using variable fuel batches
- Certified for ECA regions (No need to switch when entering/Exiting ECA)

The combination of proven performance with full IMO2020 fuels OEM approvals and enhanced engine cleaning capabilities delivers an effective solution to the challenges faced by operators today providing enhanced peace of mind against the issues highlighted by industry research including the BIMCO 2020 Fuel Oil Quality and Safety Survey.

**Talusia Universal is increasingly helping ship operators around the world maintain engine cleanliness without engine deposit build up – preventing costly engine damage, downtime and repair.**



# Dual Fuel and the Future







**LNG is the cleanest marine fuel solution available at scale today and will be the bridge to lower carbon fuels for at least 2 generations of operational vessels, covering the next two decades.**

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It delivers:

- Clear environmental benefits
- A pathway to lower-carbon and even carbon-neutral bioLNG,
- Mature supply chain that allows for scalability and affordability, and
- Growing bunkering infrastructure at key bunkering ports.

The benefits of LNG in reducing Greenhouse Gas Emissions are immediate and measurable, **offering carbon reductions of up to 23%** on a well-to-wake basis compared with current oil-based marine fuels.

It emits virtually no Sulfur oxides (SOx) and particulate matter (PM). Compared to existing heavy marine fuel oils, LNG can, depending on the technology used, emit up to 85% fewer nitrogen oxide (NOx) emissions. As such it is compliant with both SOx and NOx emissions limits in coastal Emission Control Areas (ECAs) and the IMO's global sulfur cap.



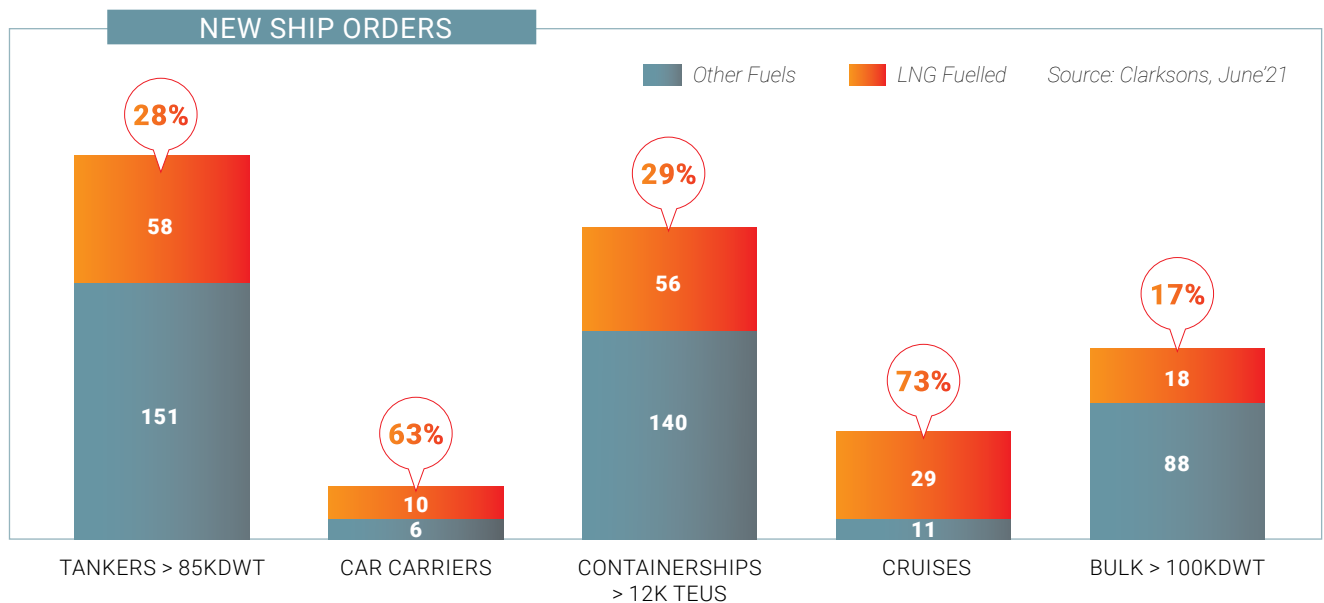
Importantly, LNG also provides us with the gateway to the development and application of lower-carbon bioLNG, which will serve as an important pathway to reach the shipping sector's decarbonization goals.

More ship owners globally are either fully embracing LNG or actively investigating it behind the scenes. The investment TotalEnergies is making in LNG infrastructure globally is giving them added confidence to make those decisions.

With approximately 230 LNG-fuelled vessels currently operating, shipping's transition to LNG is evident in the continued acceleration of LNG-fuelled ship orders. According to Clarkson's June 2021 data, the current orderbook for LNG-fuelled vessels (excluding LNG carriers) are as referenced in the graph below:

TotalEnergies forecasts the global LNG bunker market could reach 10 million tonnes a year by 2025 and represent 10% of the bunkering market by 2030.

And with this significant growth in the market comes the need for a Premium cylinder oil to ensure that operators are helping protect the most valuable assets on board – the engines.







*Given its proven performance in the market, its Dual Fuel validation and its associated benefits as a single oil solution, we believe Talusia Universal will have an important role to play in enabling ship operators to make a successful transition to LNG.*





# Looking Ahead to Future Market





# Needs

**The focus on reducing Green House Gas (GHG) emissions is, of course, set to continue as we head towards IMO's 2030 and 2050 targets of ultimately emitting just 50% of 2008 levels.**

Tomorrow's energy market will be more diverse and more complex than it is today and operators will need to rise to the challenge of finding the right lubrication pathway for their specific needs.

Our establishment as a leader in the global marine lubrication and marine fuels markets at TotalEnergies combined with a proactive R&D policy to develop effective solutions moving into the future will see us supporting our customers more than ever to find the right solution for them as we collectively move towards decarbonization of the global shipping industry.

Here at TotalEnergies, **our ambition is to get to net-zero emissions by 2050 for our global business.**

These aims revolve around 3 core goals:

1. Net Zero across our worldwide operations by 2050 or sooner
2. Net Zero across all our production and energy products used by our customers in Europe by 2050 or sooner
3. 60% or more reduction in the average carbon intensity of energy products used worldwide by our customers by 2050

Within our marine divisions at Lubmarine and TotalEnergies Marine Fuels, we are actively working towards meeting these targets by continually investing in the development and delivery of performance products and services supported by a global infrastructure network.

The move to Low Carbon Fuels will see engine technology develop to meet the challenges ahead. In line with those developments in engine technology, we are working on the next generation of cylinder lubricants, exploring a range of solutions including the use of low ash chemistries with high detergency performance continuing the focus on engine cleanliness.

This research and development in the next generation of marine lubricants is being undertaken in tandem with the ongoing support of both OEMs and owners.

# Shipping @ TotalEnergies

## One Approach to Achieve More Energies, Less Emissions & a More Sustainable Future for Shipping

Marine Fuels • Lubmarine • Saft • Additives and Fuels Solutions •  
Solar Installations • Shipping Operations

**As part of its aspiration to be a major player in the energy transition, TotalEnergies has brought together its knowledge, resources and expertise across the marine-related business value chain, to deliver a coherent and integrated service offering for the global shipping community.**

The Company's full breadth of activities and solutions covers across marine fuels, lubricants, fuel additives and batteries production, as well as its experience in shipping operations.

With a collective purpose and singular mindset, TotalEnergies' marine-related business affiliates are committed to support its shipping customers and industry partners with innovation and excellence.

Importantly, when any stakeholder engages with one of these business affiliates, it is in fact, opening up to an array of solutions that aims to effectively help the shipping sector reduce their overall environmental footprint, and contribute towards achieving its long-term decarbonization goals.

TotalEnergies invites you to learn more about these business affiliates:

### TotalEnergies Marine Fuels

With over three decades of market experience, TotalEnergies Marine Fuels is TotalEnergies' dedicated business unit in charge of worldwide bunkering activities. A long-term partner to the global shipping industry, TotalEnergies Marine Fuels serves more than 200 shipping customers across over 120 ports in Europe, Asia Pacific and Africa. Its headquarters is located in Singapore, with two satellite offices in Paris and Geneva.

In order to help its shipping customers adopt the cleanest available marine fuels today, TotalEnergies Marine Fuels has made key investments to supply marine LNG, bioLNG and biofuels at strategic bunker hubs. As part of its ongoing work in various maritime coalitions and cross-industry R&D initiatives, TotalEnergies Marine Fuels is also helping to shape the production of decarbonized future fuels for shipping.

<https://marinefuels.totalenergies.com/>

### Lubmarine (marine lubricants & services)

Lubmarine provides a range of sustainable and proven lubricants for all shipping sectors with presence in more than 100 countries and 1,000 ports.

Its lubricants range is based on pioneering chemistry to ensure compatibility with all IMO2020 compliant fuels including LNG, 2-stroke and 4-stroke engine technologies, and vessel types, to help ship operators achieve safer operations, and higher levels of performance in a more



complex environment. Lubmarine takes into consideration not only engine and equipment characteristics, but emission control and energy saving systems, as well as operating conditions so the teams can create solutions designed to help further reduce CO<sub>2</sub> emissions. Lubmarine's technical expertise is focused on ensuring all Lubmarine customers use lubricants and monitoring tools that deliver optimal engine performance and engine cleanliness. Lubmarine's Environmentally Acceptable Lubricants (EAL) - known as 'bio-lubricants' - are helping customers transition to cleaner methods of operation.

<https://lubmarine.totalenergies.com/>

### **Saft (Batteries)**

Saft is the battery maker of choice and a subsidiary of TotalEnergies, with 4,000 employees focused on research through to manufacturing and sales. Its high-performance batteries are increasingly being incorporated into the design of hybrid and fully electric marine vessels. Saft's technology is also used in electrified ground-support equipment in airports and seaports as part of efforts to reduce carbon emissions, fuel consumption and noise.

<https://www.saftbatteries.com/market-sectors/transportation/marine>

### **TotalEnergies Additives and Fuels Solutions**

TotalEnergies Additives and Fuels Solutions provides innovative solutions for refiners, fuel distributors, equipment manufacturers as well as sea and land transport players. Its teams develop cutting-edge additive formulations to improve fuel quality and engine efficiency for all types of marine fuels. The scope of its high technology solutions encompass asphaltene and crystallization issues as well as engine efficiency and protection through improved combustion and cleanliness. It also proposes tailor-made solutions adapted to the problems encountered.

<https://acs.totalenergies.com/en>

### **TotalEnergies Renewables Distributed Generation**

The B2B affiliate of TotalEnergies Renewables finances, installs and operates solar installations on customers' facilities, including roofs, carports and free fields. By signing long-term power purchase agreements for the green electricity produced, customers reduce their carbon emissions and energy bill.

TotalEnergies Renewables Distributed Generation has proven experience in providing solutions throughout the

shipping value chain. For example, in Jebel Ali Port in Dubai, it has offered on-site solar solutions to logistic companies such as Agility, Kuehne Nagel, GAC and Tristar, maritime services groups such as Seven Seas, and a global market leader in maritime and offshore safety, Viking.

<https://renewables.totalenergies.com/en>

### **TotalEnergies' Shipping Operations**

As a leading, integrated energy player, TotalEnergies is active in 130 countries where it deals with all aspects of oil and gas exploration, production, trading and distribution. With more than 90 time-chartered vessels and 4,000 sea voyages every year, TotalEnergies teams arrange shipping from production areas to consumer hubs worldwide under optimal safety conditions and in a timely, cost-effective way.

In line with the Company's climate ambition, TotalEnergies has been actively working to reduce its shipping emissions to build a low-carbon trading & shipping future. Through the deployment of more efficient and modern vessels into its fleet, as well as the use of new fuels, the Company has significantly improved the carbon intensity of its fleet operations.

In 2020, TotalEnergies signed pioneering agreements to charter its first two LNG-powered VLCCs (Very Large Crude Carrier) and four new LNG-powered Aframax vessels, which will be delivered over the period of 2022 and 2023. In 2020 and 2021, TotalEnergies also entered into agreements to charter 6 LNG carrier newbuildings, which incorporate the most fuel-efficient LNG carrier design and implement the latest GHG reduction technologies such as air lubrication system and shaft generator.

Concurrently, TotalEnergies is a founding member of the Sea Cargo Charter, a pioneering initiative dedicated to establishing a transparent and consistent GHG emissions reporting approach. The Company is also working closely with the industry through its participation in several coalitions, including the Getting to Zero Coalition, the Coalition for the Energy of the Future and the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping to investigate the potential of adopting new low and zero-carbon fuels for its fleet. TotalEnergies is determined to find new ways to strengthen its operational excellence, and to actively contribute strategic direction and technological innovation to the global reduction of emissions for shipping.

# Contact Us

Serving the Marine sector since 1952, today Lubmarine delivers a wide range of pioneering and market leading lubricating solutions used across the full spectrum of the marine industry by many thousands of vessels around the world operating under the most severe conditions.

Lubmarine's continual emphasis on developing innovative solutions, whilst improving existing formulations, in line with both international and OEM standards, is backed up by dedicated technical expertise and support.

With a worldwide presence in over 100 countries and 1,000 ports and its own research R&D facilities, Lubmarine is recognised as a global leader and innovator in marine lubricants and services.

To obtain more information, support and guidance around the use and performance of Talusia Universal, to discuss the range of products and services provided by Lubmarine, please contact us at:

<https://lubmarine.totalenergies.com/contact>