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The impact of IMO's global sulphur cap the shipping industry and the latter's countermeasure

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The Impact of IMO's Global Sulphur Cap on the Shipping Industry and the Latter's Countermeasure

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Chapter 1 Introduction

1.1 Background

The IMO (International Maritime Organisation) will enforce a 0.50% Sulphur cap from the 1st of January, 2020, that means that until the 31st of December, 2019, for ships operating outside ECA's (Emission Control Areas), the limit for Sulphur content on ships' fuel oil is 3.50% m/m. After this date the new limit of 0.50% m/m will apply. The low Sulphur cap regulation was confirmed at the 70th session of IMO's Marine Environment Protection Committee (MEPC) held in 2016.

This is the continuation of environmentally focused initiatives taken by the IMO since the 1960's, to minimise the substantial impact of air pollution produced by ships. The IMO monitors the Sulphur level of fuel oil around the globe, by sampling residual oil, most commonly known as heavy fuel oil, as well as distillate fuel oil or light fuel oil, more widely used in emission control areas.

According to the IMO, the latest figures showed that the yearly average Sulphur content of the residual fuel oils tested in 2016 was 2.58% and the global average Sulphur content for distillate fuel in 2016 was 0.08%.

The ultimate target aimed by the IMO is to achieve a shipping industry with zero emissions by 2050.

According to IMO estimates, the 0.50% Sulphur limit for marine fuels in 2020 will affect as many as 70,000 ships.

The shipping industry will have to deal with not only the previously mentioned regulatory requirement but also the existing 0.10% Sulphur cap in designated ECA's (Emission Control Areas).

1.2 Research Purpose

The purpose of this specific research paper is to analyse the impact(s) of the 0.50% global Sulphur cap regulation (MARPOL annex VI), commonly referenced to as "IMO 2020" to the shipping industry, but specially focusing on the regulatory development and enforcement, to countermeasure the potential impacts resulting from this specific requirement within the shipping industry.

This document aims to provide guidance by not only identifying potential impacts of the regulation for the shipping industry but also to specify clear actions to be taken to counteract and reduce a significant negative occurrence for those involved.

This research paper throughout the compilation of available public information will develop a comprehensive guidance option to the industry, and this way provide one more informative tool out there to contribute with the uncertainties related to regulatory enforcement, fuel availability and alternative compliance solutions available.

1.3 Methodology

The research methodology for this research paper is literature/publication review.

This research will first review various types of impacts developing and their particular characteristics. Based on this understanding, the main impacts identified will become the centre of the research.

In the second research stage of this document, a comprehensive review of current industry practices and academic researches will provide a more in-depth approach to the impacts already identified.

Finally, a comparison will be conducted to identify significant Pro & Con factors faced by the shipping industry when choosing the best possible option to comply with the legal requirement.

Once the impact identification and Pro & Con comparison are completed, a specific set of countermeasures will form the conclusions of the research project.

Chapter 2 Literature Review

2.1 Third IMO Greenhouse Gas Study 2014

This study provides an outstanding in depth analysis in regards to Greenhouse gas emissions from 2007 to 2012 with carbon dioxide (CO2) totals for each year, as well as estimates multi-year average annual totals from all shipping, in order to calculate emissions from activity.

Also, the study provides a thorough assessment in regards to fuel trends and drivers in fuel use for the previously mentioned time period, for specific ship types.
Finally, this document presents future scenarios from year 2012 to 2050.

The 3rd IMO greenhouse gas study 2014 is a great awareness document and I believe achieves its aim and objective of providing a multi-year inventory and future scenarios for Greenhouse gas and non-Greenhouse gas emissions from shipping vessels.

2.2 Investigation of appropriate control measures (abatement technologies) to reduce Black Carbon emissions from international shipping

This investigation provides an overview of the impacts of black carbon emissions from ships with specific fuel efficiency focused improvements for black carbon reduction.

Important to highlight about this investigation is that centralises the options in clear specific available technologies and provide assessment for every each of them. From fuel efficiency to slow steaming and alternative fuels (including nuclear).

The document also provides to the reader a summary of costs and feasibility, which I have considered essential for stakeholders at the moment of evaluate their options after the 0.50% Sulphur cap requirement comes into place.

2.3 Methanol as marine fuel: Environmental benefits, technology readiness, and economic feasibility

As specified on its Executive Summary, the main purpose of this study *"is to determine the environmental benefits of using methanol as fuel on ships with regards to emissions of greenhouse gases (GHGs), NOx and SOx".*

In this case the document provides an important insight in the use of this specific alternative fuel, their associated technologies and readiness. Also, the document discusses slightly, the costs involved.

The study also mentions the limited use of this alternative fuel, with few examples of retrofitted ro-ro passenger and chemical tanker vessels using methanol.

I would like to highlight that this report in comparison to others, adds the safety implications of this alternative fuel, which I find highly valuable information when assessing and evaluating implications and their respective countermeasures.

2.4 Assessment of Fuel Oil Availability

The final document that I would like to mention within this preliminary literature review is the Assessment of fuel oil availability - final report.

This report is focus on three elements basically; first is the demand for marine fuels in 2020 with estimated figures, second is the projected increases in energy demand, and thirdly is the use of alternative compliance options available.

Also, this document presents/develops three possible scenarios with different potential practical cases, with conclusions in regards to the fuel demand in each of these case scenarios.

Finally, this study provides an assessment in which the main question to be answered is if the global refinery industry will be able to produce and supply according to the demand projected in acceptable sufficient quantities by the year the 0.50% Sulphur cap regulation comes into place.

This study is a very well completed assessment for this specific subject and in my opinion provides a clear comparison between demand and supply scenarios to assess their consequences in regards to the compliant fuel availability for the beginning of next year.

2.5 2020 Low Sulphur Fuel

The Australian Maritime Safety Authority presented a very thorough assessment on the upcoming IMO requirement.
The main aspect discussed on the AMSA document is the different alternatives out there available to comply with this new regulation.

According to the AMSA *"To comply with this new regulation, ships can use:*

- *Fuel oil with a maximum sulphur content of 0.5 per cent m/m or compliant marine diesel oil.*
- *Alternative fuels including methanol and liquefied natural gas (LNG).*
- *An equivalent method to reduce sulphur oxide emissions approved by the International Maritime Organization (IMO)—provided the resulting emissions are equivalent.*

Approved IMO equivalent methods include an exhaust gas cleaning system (scrubber)."

It is important to highlight that in Australia the 2020 low Sulphur Cap requirement (MARPOL Annex VI) is prescribed in the Protection of the Sea (Prevention of Pollution from Ships) Act 1983.

2.6 IMO 2020 GLOBAL SULFUR CAP

The ABS (American Bureau of Shipping), with a more technical approach to the IMO legal requirement, presents to shipowners and operators a multiple set of options and assistance to comply.

"Solutions need to be viable and sustainable in the long-term. ABS is an industry leader in the marine and offshore sectors with decades of experience providing vessel operators with the technical and operational support necessary to successfully comply with regulations."

From the document that is available to the public, I personally find interesting their techno economic analysis for fuel strategy which provides shipowners and operators with a very valuable tool for their internal decision-making processes.

2.7 IMO 2020: mayhem or opportunity for the refining and marine sectors

Wood Mackenzie provides a different point of view and discusses the extension of possible impacts for the shipping and refining sectors. It is part of my review for the simple fact that refineries have a very essential part by being able to provide alternative fuels and also be able to provide availability of the fuel.

With a very well-made analysis of the scale of the issue, the document provide specific figures and concludes that the demand in comparison to the investments made at the moment may put in risk a proper and efficient source of fuel availability in multiple areas around the globe.

The analysis also covers implications for the refining sectors, especially the clear indication that more than 2 million b/d of HSFO will be displaced from the bunker sector.

Wood Mackenzie also believes that by 2020, the price differential between gas oil and HSFO will be roughly double the 2017 differential. Making it a strong point by the maritime industry to choose for scrubbers, commercially interesting.

2.8 Tackling 2020: the impact of the IMO and how shipowners can deal with tighter sulfur limits

In this shipping special report, S&P Global Platts provides to the shipping industry with a more practical informative tool. This report goes from the very common alternatives (low Sulphur fuel, scrubbers and LNG) to comply but extending them to evaluate their main pros and cons.

Also, the report provides and discusses the possible scenario of non-compliance and freight rates, as well than the challenges ahead for the shipping industry and a potential *"Refining revolution - PIRA, an analytics unit of S&P Global Platts, sees a sharp rise in middle distillate demand and high sulfur fuel oil to plummet in 2020. There is too tight a deadline for any more major capital investment to meet these changes."*

This information coincidentally agrees with the previous Wood Mackenzie publication previously discussed.

Chapter 3 Existing Sulphur Oxides Regulations

3.1 Summary

Following a comprehensive assessment in 2016 of compliant low Sulphur availability, the IMO concluded in the introduction of a 0.50% global fuel Sulphur limit by year 2020.

To highlight is that there are geographical zones within the maritime world that currently require even stricter Sulphur limits than the required 0.50% that will be required from January 1st, 2020.

These areas are known as SECA's (Sulphur Emission Control Areas) and require a 0.10% Sulphur limit in North America, US Caribbean, North Sea and the Baltic.

A recent development regarding HSFO is the carriage ban agreed (prohibiting the carriage of HSFO as cargo), excepting ships equipped with a scrubber system.

3.2 2020 low Sulphur Cap requirement (MARPOL Annex VI) Regulation Development

MEPC 68 – May 2015

Initiated the review of fuel oil availability as required by regulation 14.8.

MEPC 70 – October 2016

Agreed on 1 January 2020 as the effective date of the implementation.

MEPC 71 – July 2017

Approved a new output on "Consistent implementation of regulation 14.1.3".

MEPC 72 – April 2018

Agreed on the Carriage ban – prohibiting the carriage of fuel oil with higher Sulphur content than 0.50% after 1 March 2020.

MEPC 73 – October 2018

Adopted amendments to MARPOL and the IOPP certificate to facilitate the carriage ban.

MEPC 74 – May 2019

Approved amendments to MARPOL, new retroactive requirement for designating, or if necessary fitting, sampling points to facilitate taking in-use samples.

3.3 European Union SOx Regulations

The European Union requires a maximum of 0.10% Sulphur limit for vessels in EU port facilities. In some European Union countries, their local regulations restrict the

discharge of scrubber residual liquids, limiting the regular operation of scrubber systems.

To summarise; the Sulphur limit in all EU ports is 0.10% and certain restrictions apply for open loop scrubbers.

3.4 China SOx Regulations

At the moment, Hong Kong enforces a 0.50% cap for ships. Four years ago, China introduced emission requirements in the sea locations outside Hong Kong, Guangzhou and Shanghai and also in the Bohai Sea.

In this regard, China has taken an important approach, initially requesting a limit of 0.50% in fuel burned in specific port facilities, and then introducing the requirement to fuel levels used in the sea locations from year 2019 onwards.

Also, it has been discussed and reinforced that from the 1st of January, 2019, the expansion of the emission requirement from the previously mentioned three locations to a 12 nautical mile zone covering the entire coast line of China. This initial requirement may even become stricter, from the existing 0.50% to a 0.10% subject to an assessment due towards the end of 2019.

3.5 Sulphur Emission Control Areas (SECA's) SOx Regulations

SECA's require a 0.10% Sulphur limit in North American, US Caribbean, North Sea and the Baltic areas. Certain restrictions apply for open loop scrubbers.

3.6 California Coast SOx Regulations

The Pacific Ocean location requires a 0.10% Sulphur cap level within 24 nautical miles of its coast. Only compliance alternatives to be used for this specific zone are DMA (Marine Gas Oil (MGO) - The nearest equivalent ISO grade) or DMB (Marine Diesel Oil (MDO) - The nearest equivalent ISO grade). The use of scrubbers is restricted unless a temporary research exemption is granted.

Chapter 4 Compliance Alternatives

4.1 MGO (Marine Gas Oil)

The obvious fuel alternative today, no switch is required to start using this type of combustible. A drawback is that the price for shipowners and ship operators will be quite high when compared to other fuels available.

From the technical perspective is recommended that fuel tanks previously used to maintain HSFO have to be cleansed properly before using MGO and this way prevent any possible false positive results in terms of compliance.

One of the potential negative aspects to be taken into account is related to the availability in port facilities and cost as previously mentioned.

MGO will account for the majority of marine fuel use as MARPOL 2020 comes into effect. It requires no investment and no new substantial operating procedures.

4.2 VLSFO (Very low sulphur fuel oil)

VLSFO will be most likely blended, also is important to highlight that aspects like machinery, engine issues may play an important part when using this type of fuel that

is relatively new and untested in an extensive manner; on the positive, financial grants are forecasted to push the use of VLSFO in the near future.

From the technical perspective, *International Standard ISO 8217, 6th Edition*, recommends not to source VLSFO's without knowing the specifications to which the supply is said to comply with.

Also, IMO has published a draft guideline *(ISWG-AP 1/2/11- Preparatory & Transitional Issues: Ship Implementation Planning for 2020)* about how to get the bunker tanks ready to take this alternative fuel.

According to Gavin Lipsith from Marine Propulsion, *"Major oil companies are testing 0.5% very low sulphur fuel oil (VLSFO) formulations and lubrication strategies with shipowners in preparation for IMO's global sulphur cap.*

Shell Shipping & Maritime has carried out tests of Shell's fuel on its 29,400-GT tanker Silver Carolyn in Singapore. The trial is one of 19 that Shell has conducted with shipowners at key ports. The company plans further tests in New Orleans, Rotterdam, and Singapore and is inviting owners to participate.

The company reported that with correct preparation fuels performed well in the engine, crews were comfortable using them and switching between grades did not result in any extra workload for the engine crew".

4.3 SOx Scrubber

Scrubber systems can be installed to reduce sulphur content levels on emissions and provide ships to consume cheaper HSFO (High Sulphur Fuel Oils). Scrubber system fitting has resulted in limited adoption so far but advances in future technology are

expected to make scrubber technology a more attractive option for shipowners and ship operators.
With year 2020 rapidly approaching, it is a major concern whether scrubber manufacturers and installers will be able to produce and install enough number of scrubber systems before the deadline ahead. There are more than 3000 ships with installed or firmly planned scrubber system installations; predictions estimate a maximum 4000 installations totally (all classes).

IMO GESAMP Study estimates a maximum annual docking capacity of 3000 ships (MEPC 70/INF.6).

According to the IMO the “scrubber wave” is now on, with 2100 confirmed retrofit installations in 2019, it is expected that the peak of installations will be between June and July this year.

4.4 LNG (Liquefied natural gas)

LNG is calculated to achieve a more advantageous situation as a compliance option, this specific fuel is proven to be an established solution and infrastructure that is constantly developing around the globe.

From the commercial perspective, the use of LNG is presenting a more interesting perspective for newbuildings and also in some cases for conversion works.

LNG requires expert use of personnel and is expected that their use to be limited to newbuilding ships due to the high expense of retrofitting, infrastructure for LNG bunkering will be a bit behind than for other fuel alternatives in January next year.

4.5 Other Alternatives

4.5.1 LPG (Liquefied petroleum gas)

By definition LPG is any mixture of propane and butane in a liquid form. Specific mixtures of butane and propane are used to achieve desired saturation, pressure and temperature characteristics.
This type of fuel is regarded to have minimal impact on the global scene but nonetheless is recognised as a valid compliance alternative.

4.5.2 Methanol

Methanol is alcohol with the lowest carbon percentage and highest hydrogen content of any liquid fuel.
Methanol can be produced from different feedstock resources, mainly natural gas or coal, but also from renewable resources like black liquor from pulp and paper mills, forest thinning or agricultural waste, and even directly from CO2 that is captured from power plants.

4.5.3 Biofuels

Biofuels are derived from primary biomass residues that are converted into liquid or gaseous forms. A large variety of processes exist for the production of conventional (1st generation) and advanced (2nd and 3rd generation) biofuels, involving a variety of feedstocks and conversions.

The production of biofuel is commonly categorised based on the carbon source:

1. 1st generation biofuels: sugar or starch
2. 2nd generation biofuels: derived from woody crops, purpose grown non-food feedstock, and wastes/residues

3. 3rd generation biofuels: derived from aquatic autotrophic organisms.

Costs related to modifications of vessel engine and infrastructure for running on conventional biofuel is estimated by engine manufacturers to be less than 5 per cent of engine cost. The operational costs for biofuel installed systems are expected to be comparable with those for oil fuelled ships without scrubber technology.

Chapter 5 Overview of Impacts

5.1 Environmental - Emissions Impact

The alternatives chosen will have a substantial impact on emissions of ships; in this regard the IMO has continuously discussed further regulatory requirements on GHG emissions. Depending on the technology selected for the IMO 0.50% cap, possibly there will be an effect on options available for compliance with NOx Tier III standards.

Compliance with NOx Tier III standards can be obtained by fitting more complex systems on ships than a scrubber system. The use of other alternatives like LNG will derive in a substantial reduction in emissions depending on what type of technology is used by the vessel.

5.2 Impact on Fuel pricing and Availability

This is one of the more discussed aspects when projecting the implementation timeframes for the 2020 cap requirement by the IMO. Future fuel availability, current bunkering infrastructure and price forecast is among the essential aspects to review.

Predicting the future price is a very difficult aspect to complete, but is commonly known that the transition to a more advanced fuel will most probably result in substantial fuel cost for the shipping industry.

Most probably, in the near future the maritime industry will see a more polarised gap between fuel solutions, with alternative compliant fuels in the upper end of pricing and more traditional HSFO for scrubbers as the cheaper fuel option available.
It is to highlight that during previously emission reduction implementations around the globe (SECA), most ship operators simply swapped to MGO fuel. Difficult to predict what would be the main trend for the upcoming year.

In terms of availability, many refineries are still working on development of fuel products so it is impossible to know if the availability factor will be there when required, especially in port facilities.

5.3 Impact on Fleet Modernisation & Employment

The current uncertainty in terms of fuel costs, most probably will derive in speed reduction throughout the maritime industry for ships, this reduction will be the result of an effort to reduce and keep under control operating expenses while facing uncertainty. In this aspect, the concept of fuel efficiency will gain more ground towards stakeholders, the more fuel efficient the ship is the more competitive it will become.

While ships with scrubber systems installed may have a substantial advantage, it is also expected that this type of ship will be exposed to better charter rates, however, if more ships in a market follow this type of compliance alternative, daily rates will be reduced. Ships with no scrubber system installed will be pushed to further reduce their daily rates to unsustainable levels.

5.4 Impact on Marine Insurance Policies

This type of policies will also be affected by the 2020 IMO regulation. Insurers are worried about the possibility for mechanical damages (engine, propulsion, etc.) and other related problems arising as a result of the adoption of new fuel alternatives that are not well known at the moment within the maritime industry. Marine cargo policies are also due to be revised, to cover such cases, where the cargo suffers substantial delays due to issues related to the IMO sulphur regulations.

Other risks may include, unavailability, fuel quality and situations when there is a scrubber failure at sea and no alternative compliant fuel is available on-board.

Chapter 6 Compliance Methods Comparison

6.1 Pros & Cons

MGO	
Pros	Cons
• Available for most engine set ups • Readily available • Minimal effect on ship operation • Minimal/no investment costs	• Higher fuel cost • May create operational concerns due to lower viscosity of the fuel • Reduced fuel pressure and delivery capacity • Potential hazardous leakages • Engine power reduction, fuel starvation • Multiple competitors within the same market • Emission target not met, monetary fines • Public (customer) perception.

VLSFO	
Pros	Cons
• Price differential when compared to MGO • Residual fuel, lower price in theory when compared to MGO • No extra workload for engine crew • Economic Incentives forecasted	• Limited experience within the industry • Uncertain availability • Potential unknown technical issues • Abrasive engine wear, engine damage/failure • Compatibility • Stability • Growing competition using same type of fuel within same market

SOx Scrubber	
Pros	Cons
• Can use regular HSFO • Viable for retrofit • Particles reduction as well as SOx • Attractive for certain ship types • Fuel efficiency • Potential premium charter rates • Advances in future technology expected • Large commitment from leader container line may increase allowed lifetime by authorities.	• Initial investment (USD 2 to 10m) • 3% approx. increase in fuel consumption • Requires chemicals (closed loop) • Requires management coordination with ship's power management system • Requires constant monitoring • May turn out as only a temporary solution • Further/stricter IMO regulations • Multiple compliance issues due to wrong operation

LNG	
Pros	Cons
• Good environmental performance • Comply with NOx Tier III requirements • Positive impact on EEDI • Growth in Emission Control	• Higher investment cost (USD 3 to 30m) • Expensive to retrofit • Volatility in LNG prices • Requires extra space

Areas (ECAs) • Established LNG supply chain • Increasingly seen as the main alternative • Government support increasing • The regulatory difficulties • Safety concerns addressed • Public (customer) perception	• Some engine types require additional systems to reach NOx Tier III • The current bunker price environment • Limited availability of LNG for use as marine fuel • Securing finance (weak shipping markets) • Residual value concern

Other Alternatives	
Pros	Cons
• Available for most engine configurations • Stricter regulations regarding bunker fuels • Reduction in fossil fuel dependency • Strong potential of biofuels • New engine technologies may open a marine market for alternative fuels	• Unknown fuel cost • Limited experience within the industry • Uncertain availability, especially in port facilities • Potential increased wear and tear • Cylinder failures • Over lubrication • Ship operators would have to adapt to new fuels in the fuel mix • Slow/delayed biofuel development

6.2 Compliance Methods Summary

Given the multiple alternative methods discussed above, with their specific arguments in favour or against them, shipowners and ship operators should assess every alternative for compliance in detail and address the added costing aspects for compliance with the 2020 IMO regulation. The installation of scrubber systems to the ship or alternative fuel efficiency systems will certainly derive in initial costly investments in excess of millions of dollars, depending of the complexity of the technology chosen.

Further analysis in terms of fuel availability on their specific trading routes also needs to be completed, along with the immediate evaluation of charter party agreements, to ideally make sure the allowable grade of compliant fuels is always maintained. Another aspect to evaluate in this regard is the negotiation of satisfactory indemnity provisions in case fuels are identified as non-complaint, or any other associated unlawful behaviour of the voyage related to the 0.50% cap regulation.

Lastly, when assessing and comparing compliance methods available, shipowners and ship operators equally need to think about a comprehensive fuel management plant that includes: fuel oil system modifications, tank cleaning, fuel oil capacity and segregation capabilities, procurement of compliant fuels and further investment in training for the technical crew offshore. IMO's MEPC.1/Circ. 878 from the 9th November 2018, provides guidance in the development of a ship implementation plan. *(GUIDANCE IN THE DEVELOPMENT OF A SHIP IMPLEMENTATION PLAN FOR THE CONSISTENT IMPLEMENTATION OF THE 0.50% SULPHUR LIMIT UNDER MARPOL ANNEX VI).*

After specifying in Chapter 3 the Existing Sulphur Oxides Regulations and the 2020 low Sulphur Cap requirement (MARPOL Annex VI) Regulation; and comparing the different available compliance methods in this Chapter, a better understanding of the difficulties that shipowners and ship operators are facing are clearer. At the end of the day, the decision for the best compliance method will be subject not only on payback time, but also on other factors such as GHG emissions, environmental profiling, and long term value creation potential within each business profile and specific strategy, "*there is no "one size fits all" approach to IMO 2020"* (Ship & Bunker - 2018).

Chapter 7 Decision Making Considerations

In overall, the decision in terms of compliance alternatives for each ship within the maritime industry will depend not only on the engine size, but also on fuel tank capacities, since this is one of the most important cost aspects for LNG to cite one example.
The actual operating cost profile of each ship, including time spent in ECAs or areas with some kind of scrubber restrictions, will also have effects in the decision making process.
Fuel prices uncertainty can play an important role in the outcome of each decision. For large ships with higher fuel intake, investing in a scrubber can be seen as profitable even for low spreads of the HSFO compliant fuel pricing.

For smaller ships, LNG can be more attractive, especially when a long term planning is being considered.

Apart from these basic conceptual costing factors, there are other aspects that may influence the final decision and should be discussed more in detail.

7.1 Approach of industry leaders towards the new regulation

One of the factors to be taken into account and important to highlight is the decision in terms of compliance already made by the leading shipping companies, it is important to highlight that the competitiveness of the shipowners and ship operators will be subject on the ability to choose the best possible compliance alternative option, and also their investment potential.

In this regards and as of June, 2019, the major shipping companies across the globe have already announce their specifics into what alternative compliance method will be used from January the 1st next year. The specifics and the rationale from major

players within the industry are used for smaller companies as a decision path to follow in a lot of cases.

The first industry leader to specify their decision and rationale is Maersk; the Danish shipping company have announced that the compliance method to follow will be the use of low sulphur fuels for their fleet. The decision was taken after concluding the following:

I. Scrubber systems might affect the energy efficiency of the vessel in the long run
II. Scrubber systems are costly
III. Require regular maintenance
IV. Emission reduction is not significant

According to Hand, M, 2018; *"AP Moller Maersk CEO Soren Skou believes that best solution for meeting the International Maritime Organization's (IMO) 0.5% sulphur cap is for refineries to provide low sulphur to shipping.* On the question of LNG he said if Maersk was planning to order newbuilds, which he clarified he they were not, the company would definitely look at LNG as fuel".

This approach shows that at least for Maersk, the best possible approach for the upcoming regulation is to opt for cleaner alternative fuels for the existing fleet and in case of new orders to evaluate zero emission options like LNG.

MSC (Mediterranean Shipping Company) presents a completely different approach in order to comply with the 2020 cap. In this case, the announced alternative is the use of scrubber systems; their decision rationale goes along the lines of:

I. Availability of LSF and distillates from refineries

In regards to CMA CGM, in September, last year, this shipping company announced the following:

CMA CGM has decided:

- *to favor the use of 0.5% fuel oil for its fleet,*
- *and to invest significantly*

- *by using LNG to power some of its future container ships (9 ships on order), notably resulting in a 99% reduction in Sulphur emissions,*
- *by ordering several scrubbers for its ships.*

COSCO Shipping, and according to safety4sea.com, 2019 *"COSCO Shipping Lines has reached to a low sulphur fuel oil (LSFO) supply agreement with Double Rich Limited, which is a subsidiary of China Marine Bunker (Petro China). Double Rich will now supply COSCO with compliant 0.5% fuel, complying with the upcoming IMO 2020 sulphur cap".*

This represents one of the measures taken to comply with the IMO regulation, it is important to also highlight that the shipping company also has been working in the development of scrubber technologies which may be an important alternative to countermeasure availability of low sulphur fuels and also volatility in terms of pricing in the future.

In conclusion, these important shipping companies have resolved to comply by following criteria essential to the specifics of their particular strategies in regards to fleet, investment capability and operation, three important aspects that smaller players should evaluate in detail for themselves.

7.2 Chartered distribution

The contracts between the shipowners and charter parties involved are normally time charter contracts, that grant the charter party to employ the ships for five years or more, the other type is bareboat, in this case the charter party hires the ship with no personnel on board and assumes the role of the shipowner.
For time charter, the charter party give payment for the hire and is responsible for the opex of the voyage, implying that the longer of the agreement the higher is the risk. According to Stopford, 2013, *"in bareboat charter the risk, in regards to the vessel's operation and the shipping market condition in general is born by the charterer altogether"*.

Any accountability present from the ship's operation can be a substantial consideration in the final result of the decision regarding the alternative compliance option chosen.

Shipping companies chartering ships under voyage agreements will discard any potential capital expenditure. Companies operating ships under time charter or bareboat agreements are required to take full accountability for the adherence of the vessels with the IMO regulatory direction, in that case, they might want to invest (scrubber systems/LNG powered ships). The main consideration for this, is the exposition of the charter party to any risks involved obtained from the shipping operations.

7.3 Age and capacity of the fleet

When assessing older vessels, options like scrubber systems or LNG powered ships, are not viable alternatives. The high investments on these types of ships will not be able to be presented and more importantly explained in a rational manner due to the shorter operational life versus ROI.

Having said that, a quick conclusion in terms of compliance would be the use of low sulphur fuels. Therefore, LNG systems are viable compliance alternative for new ships, in terms of a potential capital expenditure, in comparison to other systems or technologies like scrubbers.

7.4 Investment capacity of the shipping company

Lastly, the investment capacity of the shipping company, this consideration is basically simple and straightforward, in one hand a costly installation of a scrubber system plus the ongoing costs of maintenance and repairs or the option of being fuel compliant right from the start, requiring absolutely no installation of extra equipment and space but with a substantial higher cost in bunker costs. That extra cost will be able to be passed on to the charterer in form of a surcharge according to the UNCTAD, 2010 Report.

It is important to mention that the leader shipping companies have communicated their respective alternatives to comply with the IMO 2020 regulation and for this Chapter 7, has been basically developed to provide guidance and also to show the rationale behind their decisions for the smaller indecisive shipowners and ship operators.

Chapter 8 Conclusion

With the global IMO sulphur limit approaching so fast, shipowners and ship operators are preparing to make sure they are fully prepared for the 1st of January, 2020.
The market seems to be settling down, since the time required for a scrubber installation is more than 12 months, and manufacturers and installers of sensors and emissions analyser systems are already working close to full capacity. Local

restrictions in the use of open loop scrubbers could also be contributing to a current decline in scrubber orders.
Approximately 2,500 ships are expected to have scrubbers at the beginning of 2020, this will be to approximately 15% of the marine fuel consumption, requiring the rest of the fleet to rely on compliant fuel available.

In the beginning of 2019, tankers, bulk carriers and container vessels are the market areas with the most scrubber systems requests.

To conclude, the shipping industry is facing multiple options ahead of 2020 with no straight forward solution, if key players like refineries move to significantly restrict the sale of HSFO as they see higher profits by selling products like MGO, vessels fitted with scrubber systems would be left asking if the availability will be there when required.

At the moment is clear that no large investments in terms of production configurations have been made by the well-known production players and this has derived in shipowners and ship operators to adopt a wait and see approach as they consider options for the near future, certainly a dilemma for all parties involved.

All the different alternative options have to assessed and carefully looked at and more importantly the decision will be focused on the best cost effective, operationally suitable and competitive for the future.

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