IMO 2020 0.50%S

Last IMO MEPC before 2020
The transition has started !
How are your preparations

Timothy Wilson

5 and 6 June 2019

Lloyd's Register

Transition Timeline to 0.50% fuels – How are you doing?

01/2020

Risk

- Fuel quality
- Compatibility
- System Design
- Equipment adaptability
- Operating procedures
- Supplier selection (QMS)
- Human Element

Preparatio

Fuel management

- Fuel quality and availability
- Storage and handling
- Treatment and best practice
- Training - crew competence

Ship assessment

- Tank arrangement
- Scenario planning
- Equipment adaptability and flexibility
- Changes/modifications

People

- Stakeholder engagement
- Training and awareness

Transition

Ship implementation

- SIP development
- SIP review
- Vessel trials
- Demonstrating best practice

Class

- System changes
- Structural modifications
- Statutory compliance

Complianc

Fuel testing

- Testing
- Analytical support
- Mixing guidance
- Contamination investigations
- Regular inspection and advice

Operation

- Fuel management audits
- Supplier selection
- Non-availability (FONAR)
- Non- compliant fuel response

Class

- Class notations
- In-life maintenance and survey
- Rule and regulatory compliance

Proactive Management apply: PLAN DO CHECK ACT

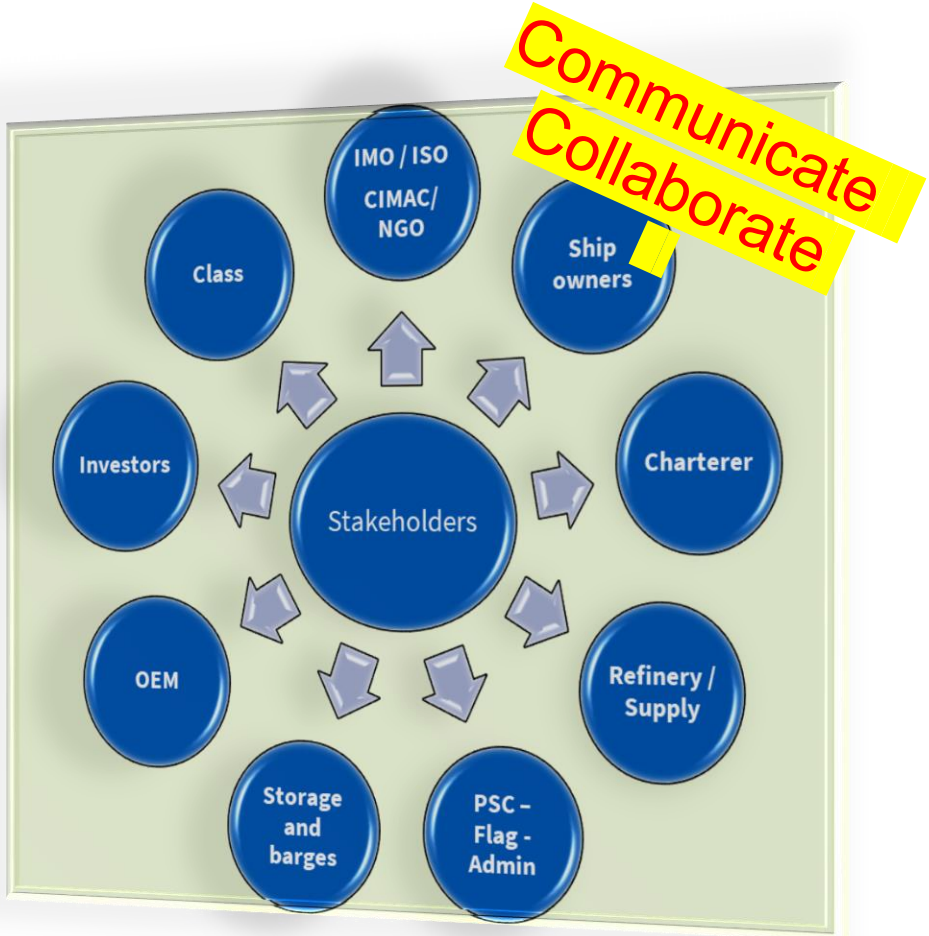
Consultancy and fuel testing

Class and statutory services

Where are you?

Consequences - ‘a change of mindset on bunkers’

- Sulphur to limit – compliance
- Fuel variability/ quality
- Segregation – compatibility
- Adaptability of ship design
- Supply chain integrity/QMS
- Bunker availability scenarios
- **Price over quality?**
- Commercial implications
- Uniformity of enforcement
- Proactive Fuel management
- Crew awareness / training



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MEPC 74 is over and decisions for 2020 are made?

IMO aimed for a uniform and consistent implementation -

Revision to MARPOL Annex VI

- Fuel ban
- Sulphur verification
- Marpol onboard an in use samples
- Sample points
- definitons

?

Fuel Quality safety

- Suppliers role
- Ship role - management
- Charterer/ purchaser role
- Ship design
- Crew understanding

Fuel availability

- Supply infrastructure readiness
- Supply implementation plan
- Correct CLO BN

Enforcement consistency

- Detention
- Penalties
- Application of guidelines

MEPC 74 is over and decisions for 2020 are made?

IMO aimed for a uniform and consistent implementation -

Non compliant bunkers on board

- FONAR
- Off spec supply
- Transition remaining (1 March Ban)

Adaptability to change

- Ship design
- System arrangements
- Crew awareness/ ownership

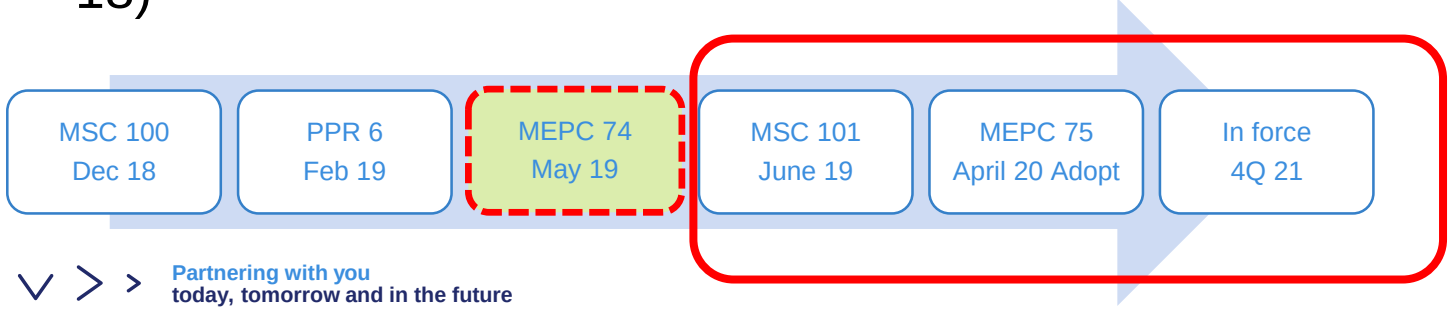
EGCS emission failure

- Short term
- Accidental

Cover the ship's approach to handling all the above in SIP?
Charterer/Purchaser agree in SIP approach?
Terms and conditions for transition and post 01 Jan 2020?

Key Amendments to MARPOL Annex VI

1. Ban on the carriage of non-compliant fuel as a fuel – adopted MEPC 73 (01 March 2020)
2. Reg 2 Defining: sulphur content of fuel oil; Low-flash point fuel: "MARPOL delivered sample", "in-use sample" and "on board sample".
3. Reg 14 on "in-use" and on "board sampling and testing"
4. Reg 14 – in use sampling point – fitted or designated for representative samples
5. Appendix I - 'fuel oil sampling point' to be stated as being fitted on IAPP Cert.
6. Appendix VI fuel verification procedure for Annex VI fuel oil samples (Reg 14 and 18)



MARPOL ‘as delivered’ and ‘On-board’ and In-use samples’

Table 1: Summary of Part 1 [MARPOL] [delivered] fuel oil sample Procedure

On the basis of Appendix V test method		
Applicable limit % m/m: V	Result 2.5.1: X ≤ V	Result 2.5.2: V < X
0.10	Met the requirement	Not met requirement
0.50		
	Result "X" reported to 2 decimal places	

‘As delivered’

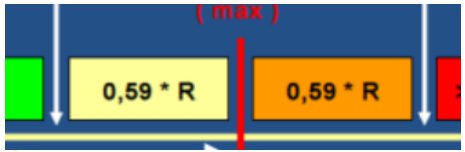
The final results obtained from this verification procedure shall be evaluated by the competent authority

Two decimal places

‘On-board’ and in-use’

Table 2: Summary of in-use or on board fuel oil sample procedure[13]

On the basis of the test method referred to in regulation 2.51 of this Annex				
Applicable limit %m/m: V	Test margin value: W	Result 4.5.1: Z≤ V	Result 4.5.2: V<Z ≤ W	Result 4.5.3: Z > W
0.10	0.11	Met the requirement	Met the requirement	Not met the requirement
0.50	0.53			
		Result 'Z' reported to 2 decimal places		



4.6 The final results obtained from this verification procedure shall be evaluated by the competent authority.

2020 Guidelines - MEPC Circulars

- Ship Implementation Plan recommendation – (MEPC.1 CIRC/878)
- Best Practices for Fuel oil Suppliers (MEPC.1/CIRC 875/Add.1)
- Best Practices for Fuel oil purchasers (MEPC.1 CIRC/875)
- Early reporting by Parties to IMO of 2020 compliant fuel availability (MEPC CIRC/880)
- On board sampling for the verification of the sulphur content (MEPC.1 CIRC.864/Rev.1)

2020 Guidelines - MEPC 74 Circulars coming

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- Best practice for Member State/Coastal State (MEPC.1/Circ.883)
- EGCS - actions in the event that the EGCS fails (MEPC.1/Circ. 884)
- For PSC on contingency measures for addressing non-compliant fuel oil (MEPC.1/Circ.882)
- Notification on early application of the verification procedures for MARPOL Annex VI fuel oil samples (regulation 18.8.2 and 14.8) (MEPC.1/Circ.881)

Resolutions from MEPC 74

- RESOLUTION MEPC.320(74) – 2019 guidelines for consistent implementation of the 0.50% Sulphur limit under MARPOL Annex VI

- RESOLUTION MEPC.321(74) – 2019 guidelines for port state control under MAROPL Annex VI Chapter 3

- Matters Relating to Fuel SAFETY Reg 18 passed to MSC100 and MSC next meeting June

Safety Implications of 0.50% Sulphur fuels

Potential safety implications – expressed at IMO MEPC

- stability of fuel supplied ;
- cold flow properties;
- flash point;
- ignition quality;
- cat fines.
- **Annex VI Reg 18.3 - IMO**
- **Clause 5 - ISO**
- ***Compatibility***

'Most safety issues are actually on board management issues '

MEPC 73 (October 2018) requested MSC 100 (December 2018) to consider the safety implications associated with the use of low Sulphur fuel oil,

agreed to include in its biennial agenda an output on

ON the agenda MSC 101 – this week

"Development of further measures to enhance the safety of ships relating to the use of fuel oil", with a target completion year of 2021;

bunker supplier licensing scheme agreed at MEPC 74 should be voluntary at this time;

FONAR - IMO Guidance for Reg 18.2

Resolutions: MEPC.320(74) and PSC Guide MEPC 321(74)

Procedures in SIP - SMS?

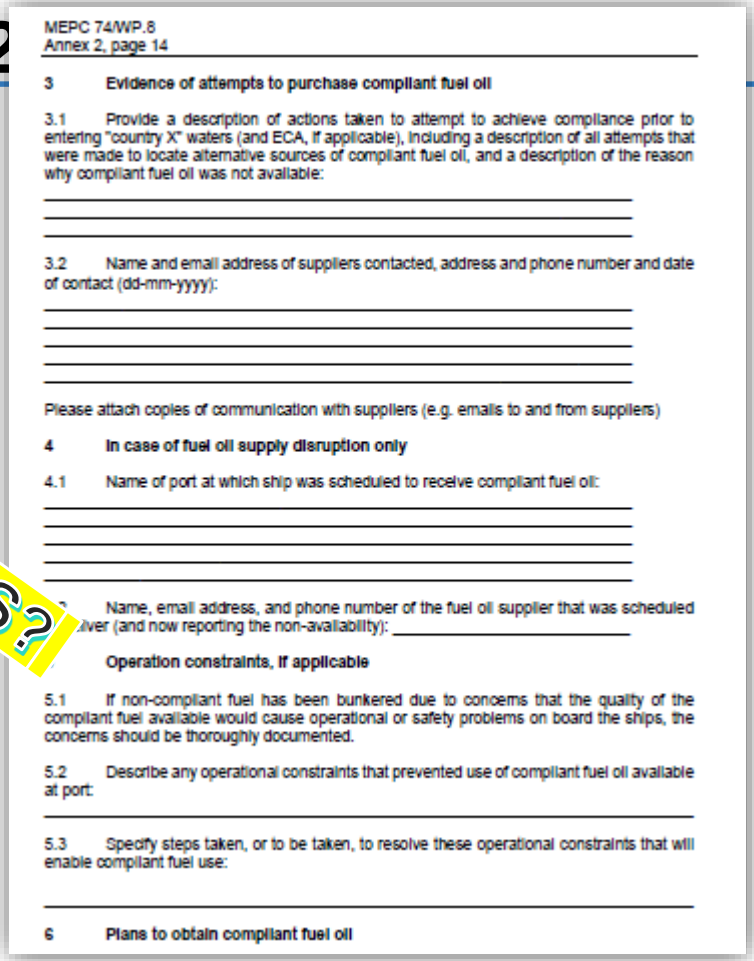
Record of Actions and Efforts:

- All efforts to obtain compliant fuel ……
- Operation constraints, if applicable
- Voyage planning to obtain compliant fuel
- Submit FONAR once compliant fuel is identified as not available ……

- Port State will determine appropriate action….

- FONAR to be sent to the flag Administration and to the competent authorities in the relevant port(s) of destination pursuant to regulation 18.2.4 of MARPOL Annex VI.

- *Ship should not be required to deviate from its intended voyage or unduly delay the voyage'*



MEPC 74/WP.8
Annex 2, page 14

3 Evidence of attempts to purchase compliant fuel oil

3.1 Provide a description of actions taken to attempt to achieve compliance prior to entering "country X" waters (and ECA, if applicable), including a description of all attempts that were made to locate alternative sources of compliant fuel oil, and a description of the reason why compliant fuel oil was not available:

3.2 Name and email address of suppliers contacted, address and phone number and date of contact (dd-mm-yyyy):

Please attach copies of communication with suppliers (e.g. emails to and from suppliers)

4 In case of fuel oil supply disruption only

4.1 Name of port at which ship was scheduled to receive compliant fuel oil:

Name, email address, and phone number of the fuel oil supplier that was scheduled liver (and now reporting the non-availability):

Operation constraints, if applicable

5.1 If non-compliant fuel has been bunkered due to concerns that the quality of the compliant fuel available would cause operational or safety problems on board the ships, the concerns should be thoroughly documented.

5.2 Describe any operational constraints that prevented use of compliant fuel oil available at port:

5.3 Specify steps taken, or to be taken, to resolve these operational constraints that will enable compliant fuel use:

6 Plans to obtain compliant fuel oil

MARPOL Annex VI- Reg. 18 .2.1 .1 ; 2.1.2 ; 2.2

Addressing Contingency Measure for Non-Compliant fuel on board

- PSC Guide MEPC 321(74)

1. **New bunker BDN states < 0.50 – independent test result shows limit has not been met**
2. The ship is compliant based on BDN legal document until proven otherwise.
3. **Ship to advise Flag and port State** (be transparent) that the limit from the analysis indicates the fuel may have not met requirement - ship is investigating further **or wait for confirmation with supplier**
4. PS and flag State will most likely wait on final ship assessment – following commercial deliberations with the supplier
5. BDN remains valid

Following a FONAR bunker HSFO remaining

- Transparency with authorities
- De-bunker
- Manage according to method acceptable by competent authority
- After used/discharged – possibility to clean tanks or flush with lower Sulphur fuel
- Competent authority discretion

Procedures in SIP - SMS?

Check with flag their preferred approach - SMS?

EGCS - recommended actions if it fails (MEPC.1/Circ. 884)

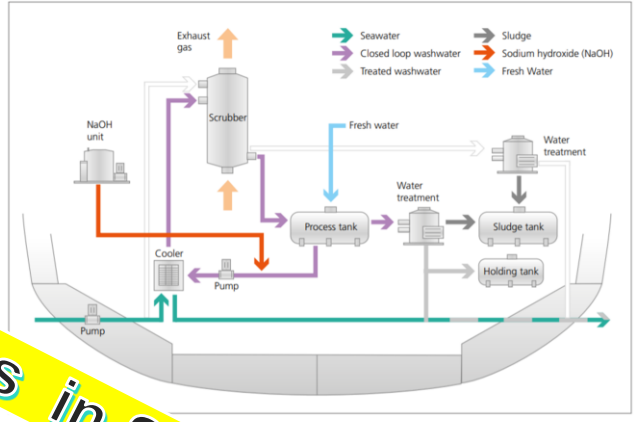
Crew must understand the severity of an EGCS failure

- Alarm/Alert - Action must be taken immediately
- Identify and remedy malfunction
- ETM check list on process and diagnosis?
- Logged in EGCS record book

- Short term emission SO2/CO2 emission exceedance = max one hour –

- IF EGCS malfunction cannot be rectified – accidental breakdown

- Switch to compliant or means to repair or obtain compliant fuel with flag and port States



Procedures in SIP - SMS?

Suggested Prep. ACTION: ... our an FMEA – check spares and maintenance schedules – ... pumps etc. – additional compliant fuel tank (0.10% DM?) ?

*Malfunctions lasting more than one hour or repetitive malfunctions Should be reported to the flag and port Administrations with explanation of steps being taken… **flag and port State's…will determine appropri action***

Enforcement by Country for Non-Compliance

Sample of potential fines?

PENALTIES FOR NON-COMPLIANCE TO SO_x REGULATIONS IN SELECTED COUNTRIES WITHING SECAs

Country	Maximum financial penalty
Belgium	Eur 6 million
Canada	CAD 25,000
Denmark	No maximum
Finland	Eur 800,000
France	Eur 200,000
Germany	Eur 22,000
Latvia	Eur 2,900
Lithuania	Eur 14,481
Netherlands	Eur 81,000 + gains
Norway	No maximum
Sweden	SEK 10 million
UK	GBP 3 million
USA	USD 25,000/d

Source: Trident Alliance

- Non – Compliance could lead to detention
- Includes the HSFO carriage ban

- Capability to impose penalties uncertain
- Laws can be unclear
- Globally enforcement resources uncertain
- Most shipping enter 93 signatory states

ISO 8217 + PAS 23263

- At MEPC 70, IMO asked ISO to review 0.50% fuel quality – updated MEPC 74 on status
- No new 0.50% tables

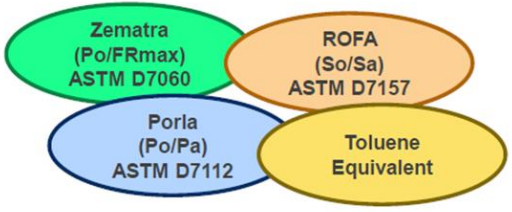
- PAS will provide general considerations applicable to 0.50% fuels in particular flash point, viscosity, cold flow properties, ignition characteristics, catfines, and stability, composition and deletarious material

- ISO WG through CONCAWE - study to establish consistent stability/compatbility informaton for new formulations

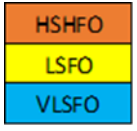
  - 48 fuel oils tested: 7 ULSFO (S ≤ 0,10 %); 4 LSFO (S between 0,50 and 1.00%), 11 HSFO; 26 VLSFO (S ≤ 0,50 %)

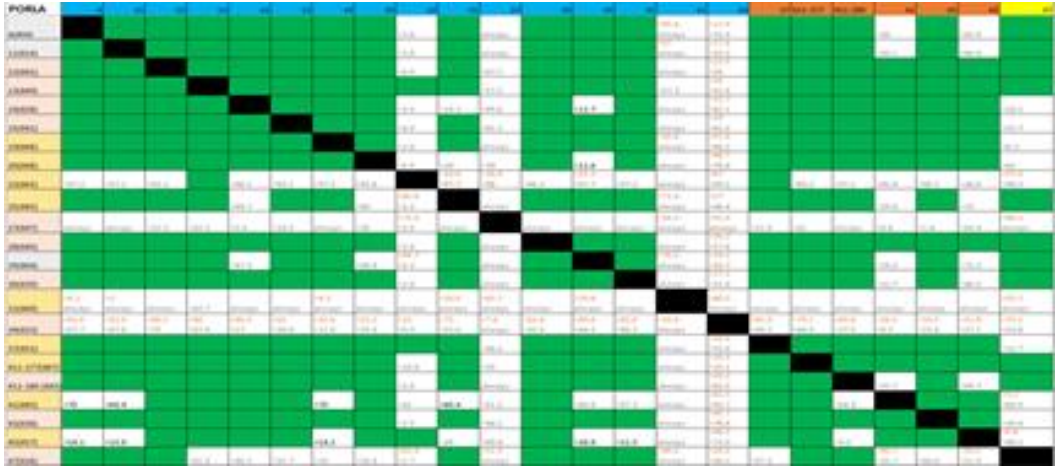
Considerations of Study on critical properties

- A fuel shall have sufficient reserve stability
- TSA ~ TSP: still valid for future fuels ?
- Impact of waxy product streams (ASTMD4740)
- in the blend on TSA, TSP, TSE and spot test
  - Routine tests may incorrectly indicate fuels to be unstable or incompatible, which however remains on the preferred side of caution.
- Work in progress - how does the predicted compatibility compares to the individual fuels characteristics such as :
  - Density, pour point , CCAI , Viscosity
  - Also considered cold flow viscosity stability flash pt



COMPATABLITY BETWEEN FUELS
Green computable white at 10% at least





Study Summary

- Risk of fuel incompatibility best be mitigated by segregation of fuels
- Crew awareness of received fuel quality/properties becomes more important
- Compatibility can, at present, only be determined between two identified components
- Spot Test ASTM D 4740 can be used but understanding waxy fuels may give a ‘false negative’ but this is on the safe side. Practice of using 4740 on board can be continued. - Lab Test TSP on shore may be needed
- **Supplier should be able to provide compositional information that may help to evaluate the potential risk for incompatibility, before delivery (Viscosity Density Cold flow properties.. And any other guidance…**
- PAS 23263 aims to provide mean(s) to obtain guidance on fuel compatibility- may involve additional testing

OCIMF IPIECA JIP submission MEPC 73/5/17

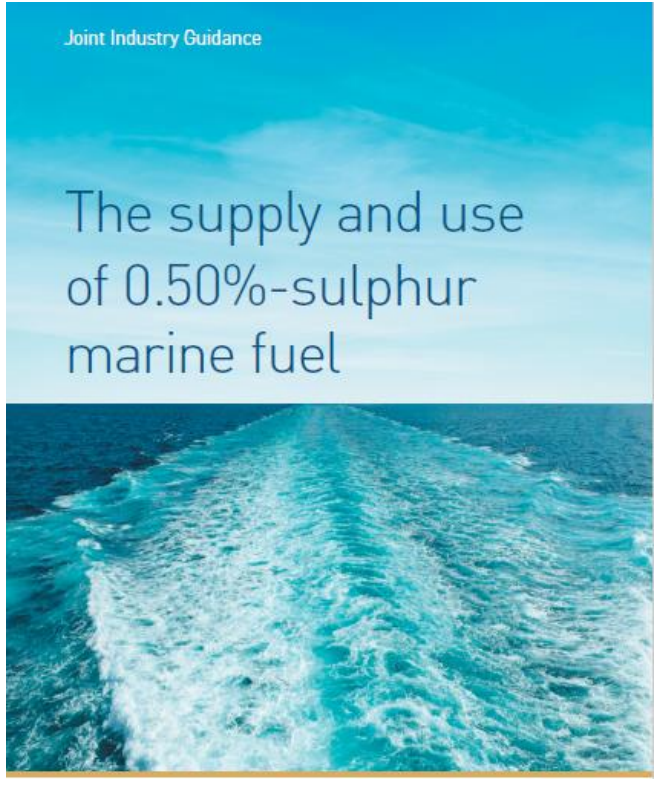
'Joint industry guidance on potential safety and operational issues related to the supply and use of 0.50% max Sulphur fuels '

Expectations and responsibilities on fuel suppliers and users

Guidance on fuel characteristics and properties:

Guidance on the supply of existing and new 0.50% max.

Guidance on the storage, handling and usage of existing and new 0.50% max. Sulphur fuels:



Defining Marine Fuel Quality RESOLUTION MEPC.320(74)

International Organization Standardizati

INTERNATIONAL MARITIME ORGANIZATION

.General Requirements

- **Typically ISO 8217 Clause 5**
- **5.2** The fuel shall be free from any material at a concentration that causes the fuel to be unacceptable **++…….**

Ship specific

- **technical** limits/ constraints
- agreed between buyer and seller -
- such as:
- ISO 8217 – Table 1 + 2 + PAS 23263

Statutory

- **SOLAS – Flash Point**
- **MARPOL ANNEX VI Reg. 14 , 18 Sulphur - Safety**
- **Regional or Local Sulphur**
- **Directive (EU) 2016/802**
- **China – CARB – +++……..**

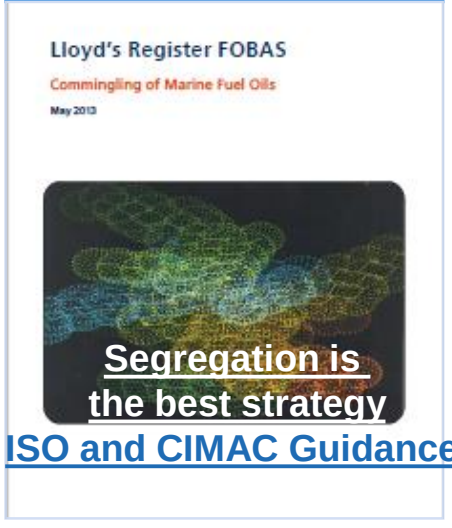
Fuel Quality – Statutory – Ship Specific – General Requirements

Fuel stability and flash point

Supplier

Fuel compatibility

Ship



ISO and CIMAC Guidance

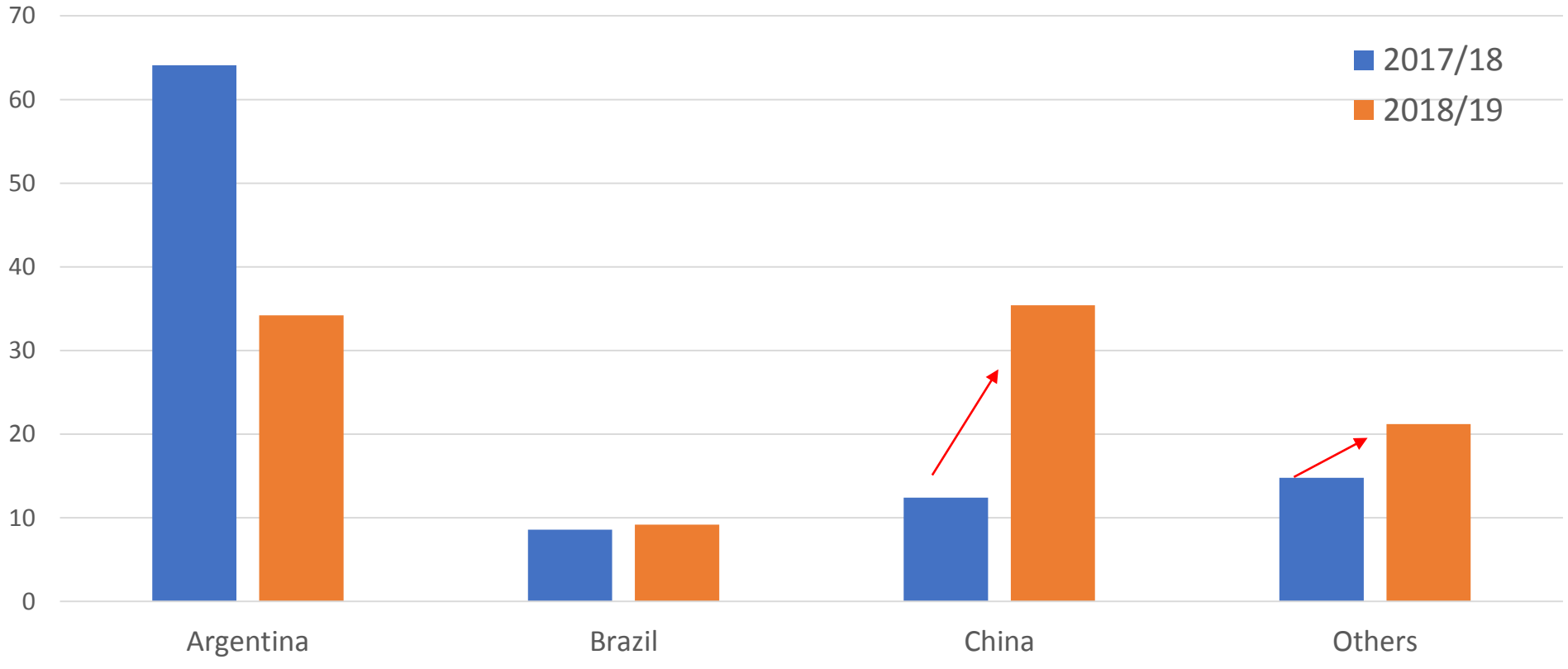
Cold flow properties

Viscosity and Density variablity

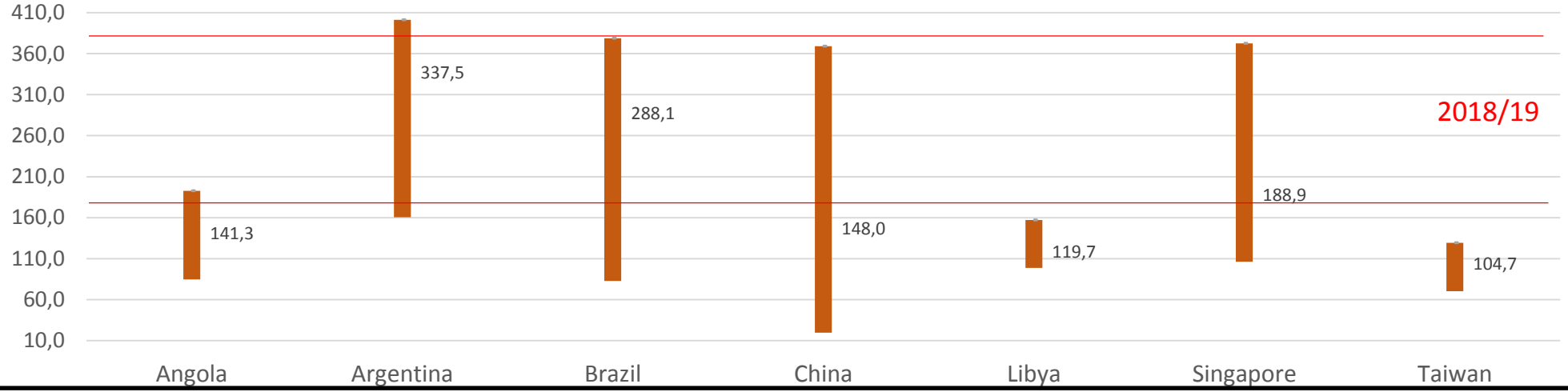
"With care in SUPPLIER blending + pro-active fuel management these risks can be mitigated

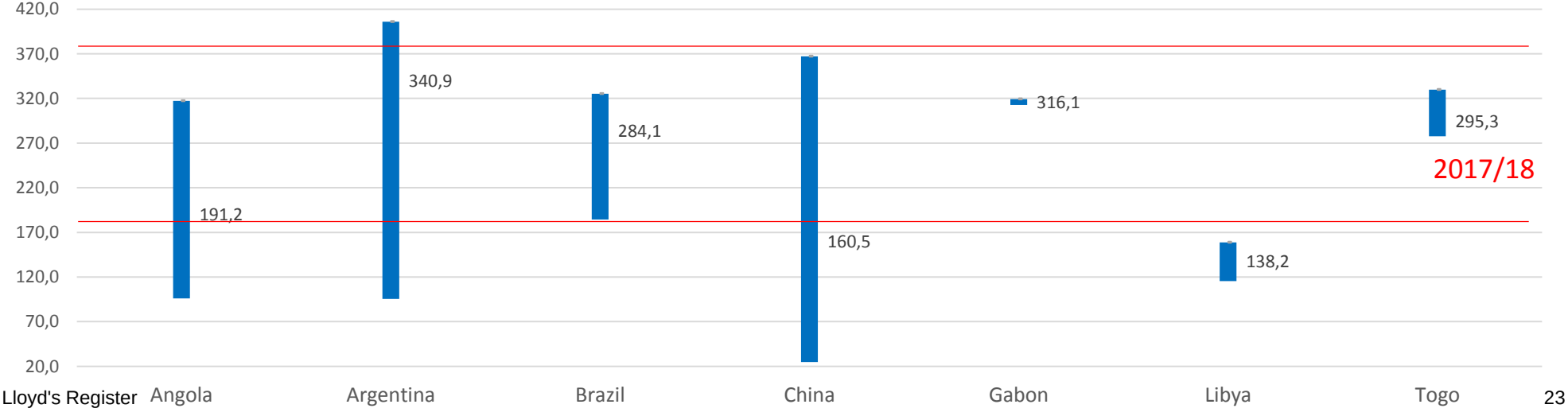
We do it with today's blended fuels "

Percentage distribution of 0.50% RM samples

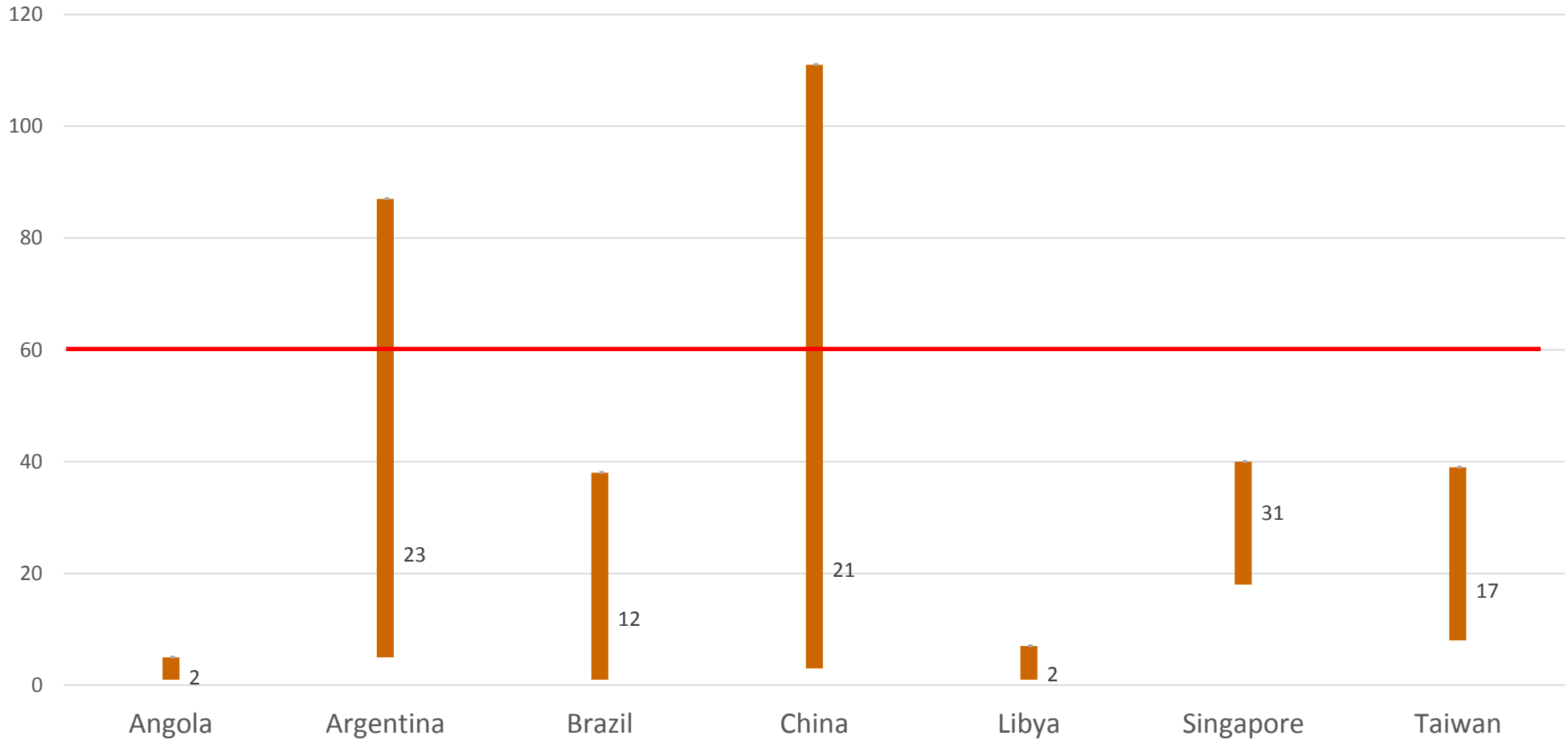


Viscosity distribution @50 Deg C

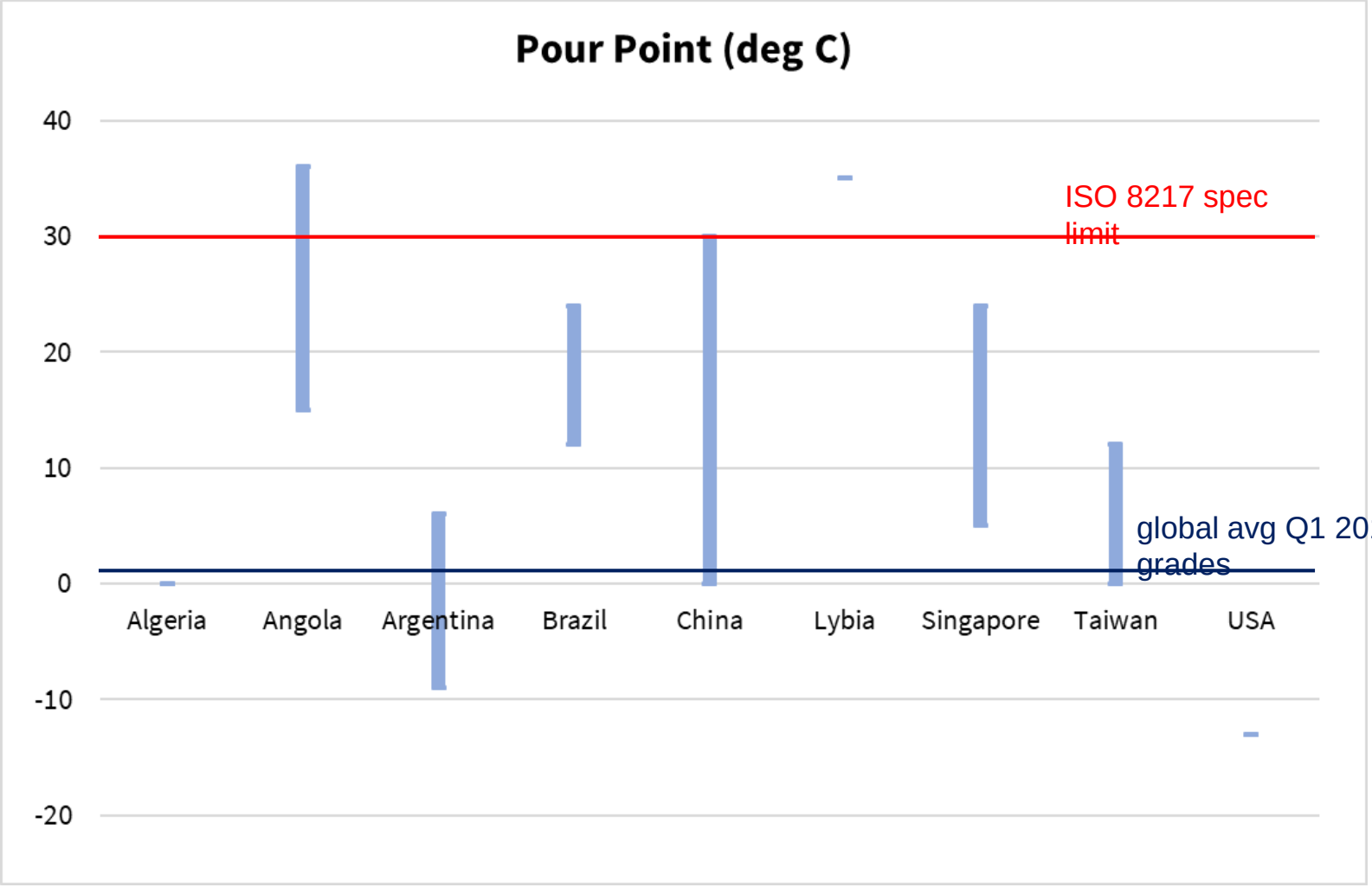




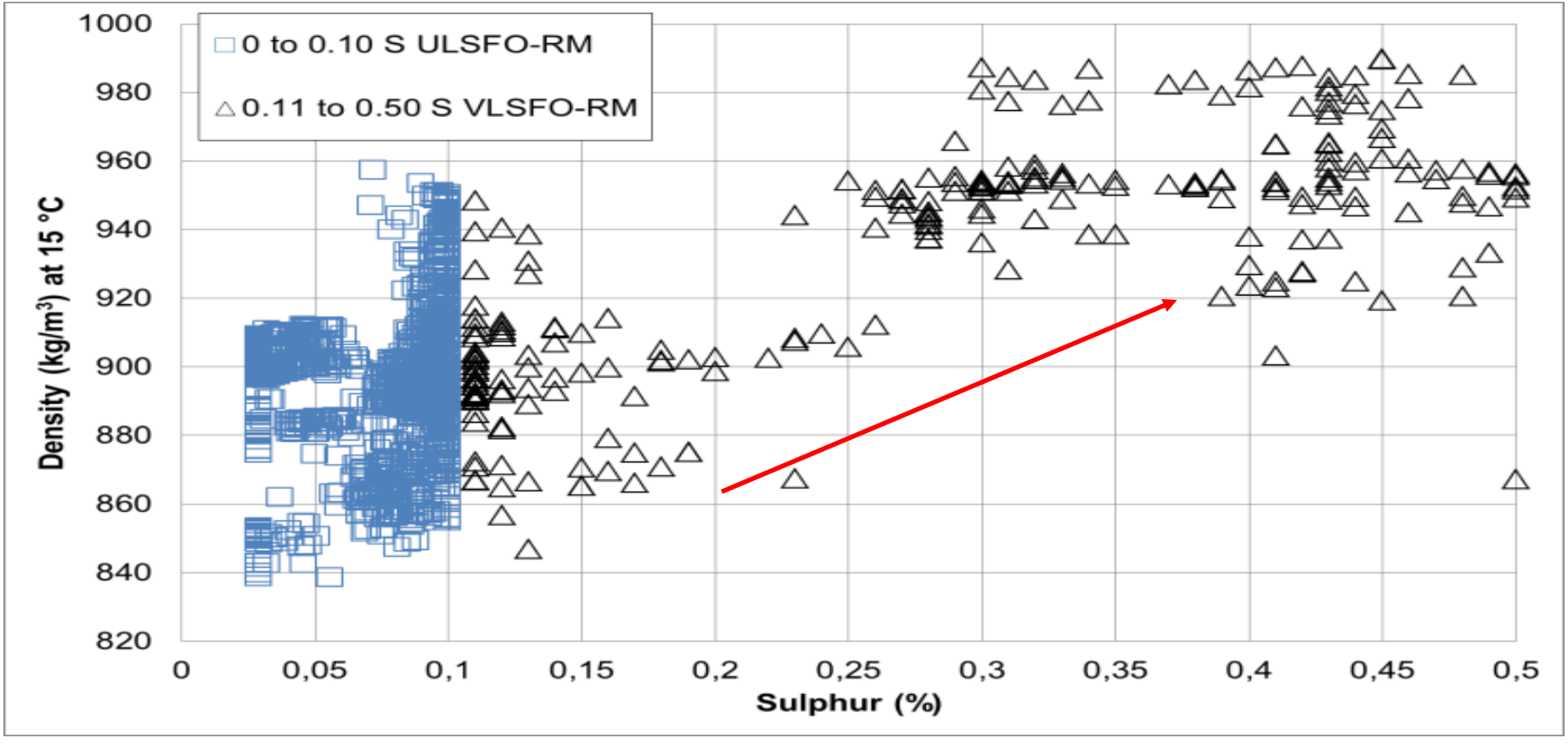
Al+Si (ppm) 2018/19



FOBAS 2019 0.50% residual fuels



2018 0.50 data 2017 – 2018 Density / Sulphur



Recent ISO 8217 RMG 380 max 0.50%mass – order spec

Density @ 15 Degrees	0.9466	0.8939	0.9599	0.9723	0.925
Kinematic Viscocity @ 50 degrees	371.3	40.55	317.5	362.5	6.8
Sulphur	0.405	0.228	0.4	0.45	0.22
Water by Distillation	0.1	0.05	0.3	0.05	0.35
Pour Point	+3	+24	-12	-6	-9
Flash Point	>100	112	73	>110	>70
Micro Carbon Residue	6.67	2.4	8.87	3.61	0.16
Total Sediment Potential	0.04	0.05	0.03	0.02	0.06
Ash	0.012	0.016	0.035	0.013	0.01
Vanadium	11	<1	5	1	1
Sodium	7	n/a	72	18	3
Aluminium + Silicon	15	20	45	<15	9
Aluminium	7	n/a	n/a	n/a	3
Silicon	<10	n/a	n/a	n/a	6
Zinc	<1	n/a	3	1	1
Phosphorus	2	n/a	1	5	1
Calcium	5	n/a	6	3	1
CCAI	807.8	n/a	823	834	852
Total Acid Number	0.09	n/a	n/a	1.89	
Hydrogen Sulfide	<0.60	n/a	<1	1	

FOBAS 2019 0.50% residual fuels

Test	Units	Min	Ave	Max
DEN15	kg/l	0.9055	0.9539	0.9885
KV50	cSt	38.4	224.0	388.9
ASH	% m/m	0.000	0.023	0.064
Sulphur	% m/m	0.11	0.40	0.63
Water	% V/V	0.05	0.15	0.65
Pour Point	oC	-7	10	36
Micro Carbon Residue	% m/m	0.00	7.83	14.42
Flash Point	oC	62.0	69.9	70.0
Net Specific Energy	Mj/kg	40.86	41.51	42.26
Gross Specific Energy	Mj/kg	43.22	43.97	44.87
Total Sediment	% m/m	0.00	0.02	0.10
CCAI	N/A	787	822	858
Silicon + Aluminium	mg/kg	1	17	50
Calcium	mg/kg	1	25	133
Vanadium	mg/kg	1	4	20
Sodium	mg/kg	1	8	46
Iron	mg/kg	1	17	42
Lead	mg/kg	1	1	3
Nickel	mg/kg	1	13	36
Phosphorus	mg/kg	1	2	8
Zinc	mg/kg	1	1	4
Total Acid Number	mg/kg	0.00	0.46	0.86

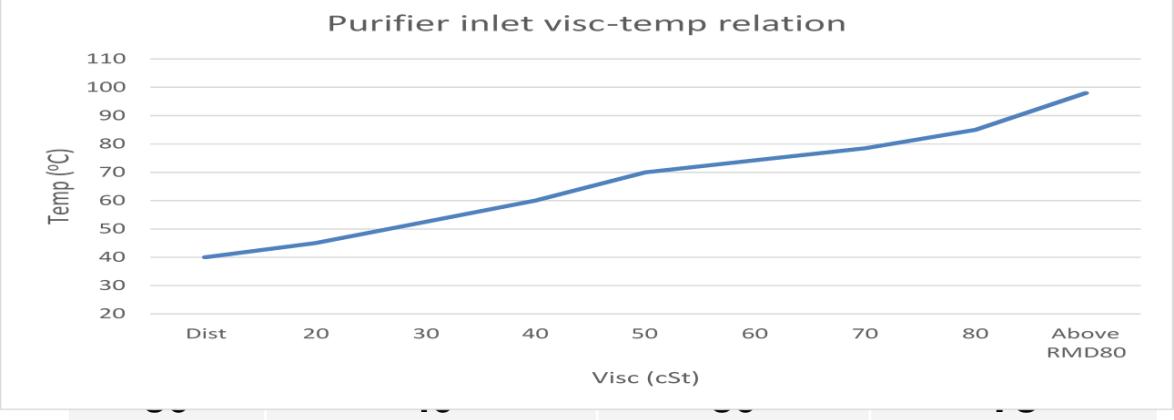
Minimum / maximum on board fuel temperatures – Case Study

TEST	METHOD	UNIT	RESULT
Density at 15°C	ASTM D4052 -18	g/ml	0.8602
Flash Point PMCC	ASTM D93-18 A	°C	96.0
Pour Point Upper	ASTM D97-17b	°C	+27
Total Sulphur by X-Ray	ASTM D4294-16e1	%(m/m)	0.094
Viscosity Kinematic at 50°C	ASTM D445-18	mm^2/s	7.118
Total Sediments by Hot Filtration Existent	ASTM D4870-18	%(m/m)	0.02

Min Temp: **37 deg C**

Inj V of 10 to 15 cSt: **37 to 24 deg C**

Cooling as well as heating of RM fuels may be required to achieve injection viscosity



BDN example – attention to viscosit

中石化中海船舶燃料供应有限公司
CHINA SHIPPING & SINOPEC SUPPLIERS CO.,LTD.

供 油 凭 证（正本）
BUNKER DELIVERY RECEIPT(ORIGINAL) No.SH- 0000253

Delivered to MV: [redacted]
Owner/Operator:
Delivery Port & Berth: 外一期
Pumping Started: 23:50

IMO NO. [redacted]
Delivery barge: HUA YA RAN GONG 16
Delivery Date: 2019-04-10
Pumping Stopped: 03:00

Product Characteristics	LS380 燃料油 IFO	柴油 MGO	其它 OTHERS
Density at 15 °C, kg/m³	911.4		
Viscosity at 50°C, mm²/s	80.1		
Sulfur Content, mass%	0.42		
Water Content, volume%	0.25		
Flash Point, °C	75.0		

Know what you are loading

中石化中海船舶燃料供应有限公司
CHINA SHIPPING & SINOPEC SUPPLIERS CO.,LTD.

供 油 凭 证（正本）
BUNKER DELIVERY RECEIPT(ORIGINAL) No.SH- 0000253

Delivered to MV: [redacted]
Owner/Operator:
Delivery Port & Berth: 外一期
Pumping Started: 23:50

IMO NO. [redacted]
Delivery barge: HUA YA RAN GONG 16
Delivery Date: 2019-04-10
Pumping Stopped: 03:00

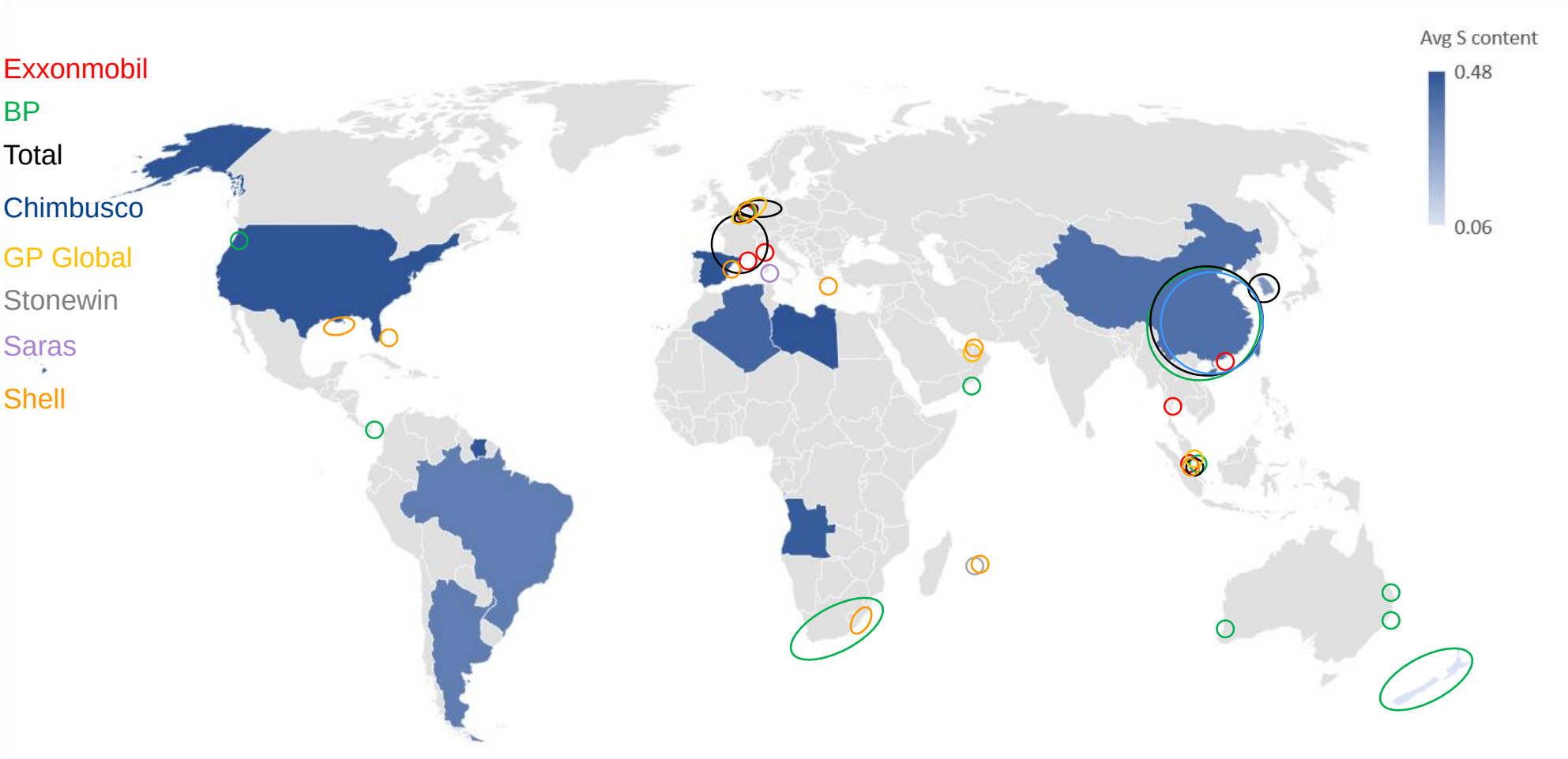
Product Characteristics	LS380 燃料油 IFO	柴油 MGO	其它 OTHERS
Density at 15 °C, kg/m³	911.4		
Viscosity at 50°C, mm²/s	80.1		
Sulfur Content, mass%	0.42		
Water Content, volume%	0.25		
Flash Point, °C	75.0		

Oil Temperature, °C	40		
Sample Seal No.	6930937 / 6930939 / 6930938 / 6930940	2676901 / 2676903 / 2676902 / 2676904 / 2676905	
Supplied Quantity:	LS380 燃料油 IFO	MGO	OTHERS
Gross Volume Liters:	447558		
Net Volume Liters:	447558		
Volume Correction Factor:	0.9847		
Net Metric Tons:	399.680		

MARSHALL ISLANDS

Lloyd's Register

VLSFO availability in 2019 (LR FOBAS data)



Evidence!! The importance of fuel testing – Know your fuel

Analysis results are meaningless if the sample is NOT representative and the supporting documentation not complete

- **Witness the MARPOL ++ sample**

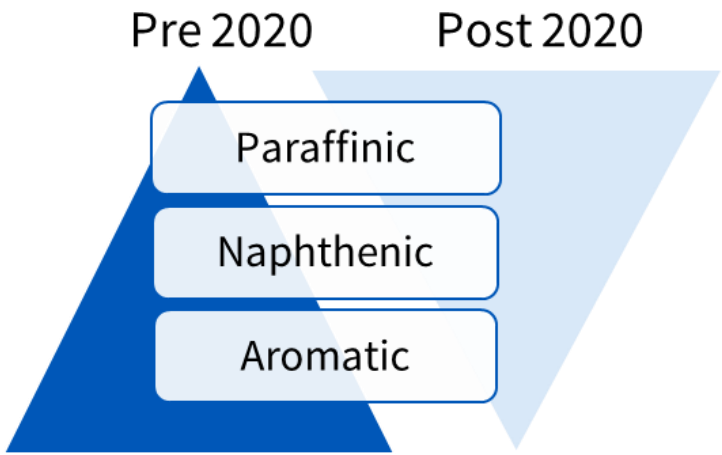
Vs

'The quality of EVIDENCE collected will determine the success of any investigation in support of a claim'

samples should only be considered representative <u>if witnessed, by the receiving vessel's crew and the physical supplier</u>

Stability and compatibility

Stability	• Resistance of a single fuel oil to break down and form insoluble sticky sludge deposit
Compatibility	• The ability of two or more fuels when mixed to form a stable and homogenous product.
Incompatibility	• Inability of two or more blend components to co-exist together without breaking down and precipitating sludge
Two or more stable fuels, if incompatible	• **when mixed together will form an unstable product.**

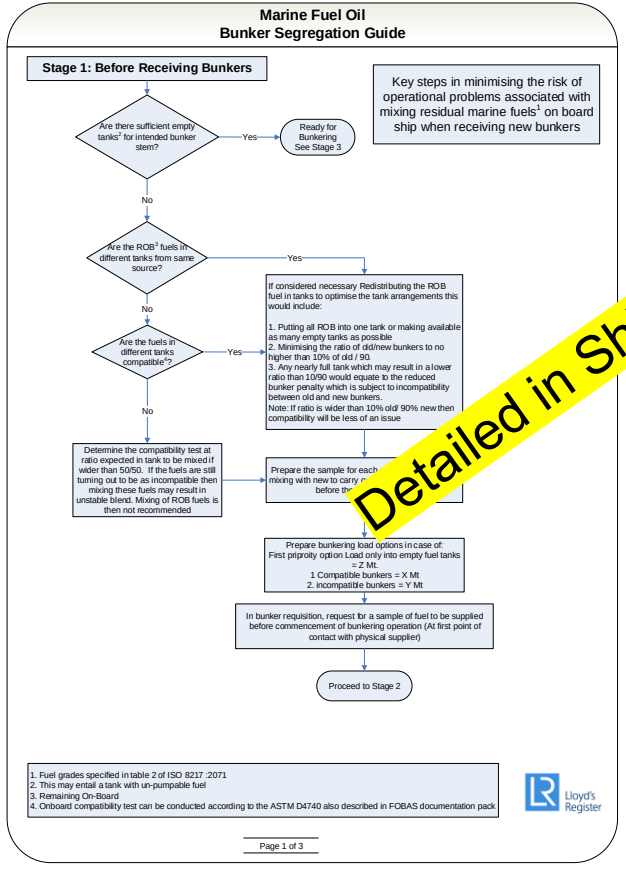


- **<u>TSP – is the definitive test</u>**
- Ask supplier for fuel core fuel characteristics – COQ n advance of delivery ?
- Bunkers segregation: best means to mitigate Check compatibility – worse case

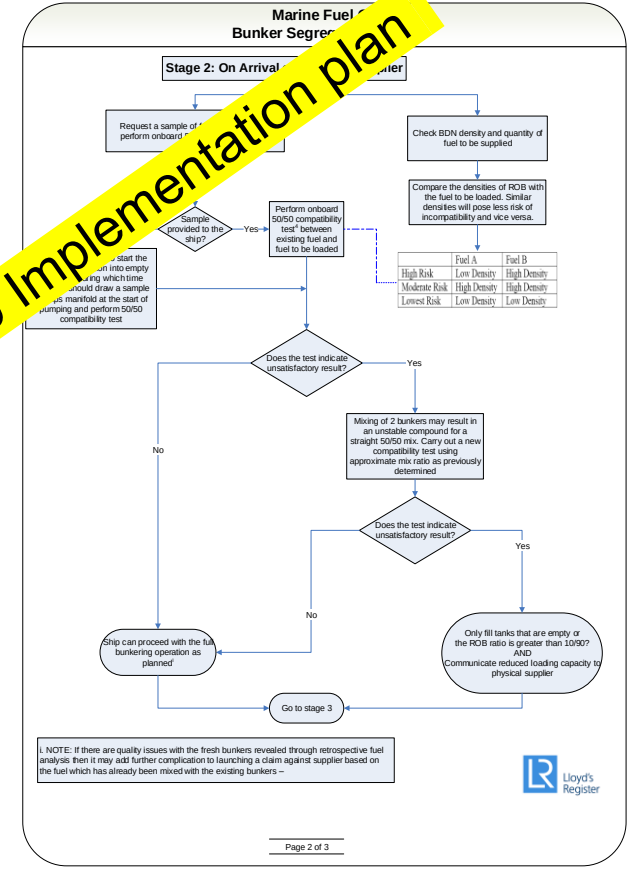
and ratios

Commingling / Segregation Plan : –Stepped approach to managing compatibility

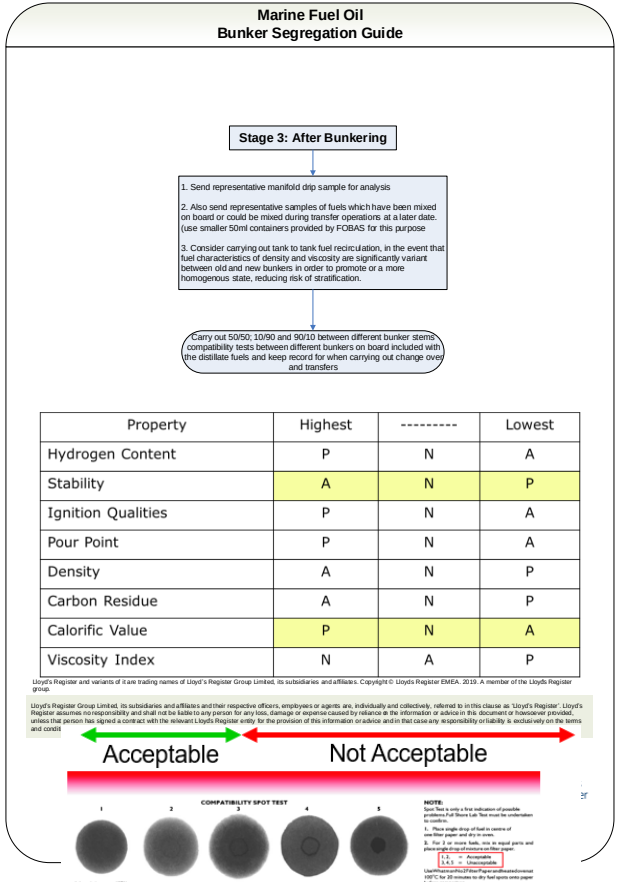
1- Before Bunkering



2- At Bunkering



3- After Bunkering

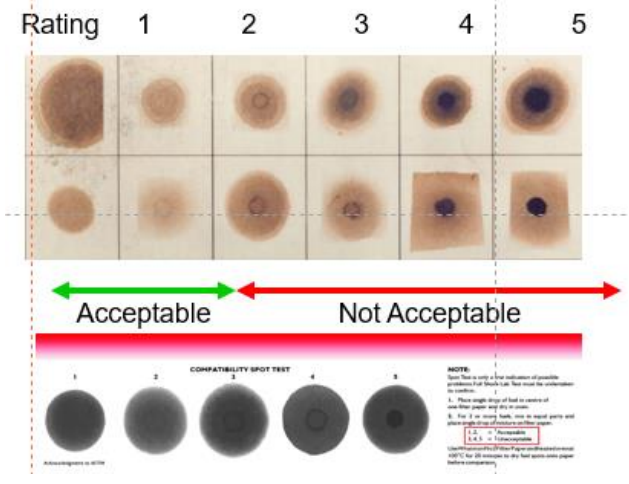


Detailed in Ship Implementation plan

Fuel Stability and Compatibilty Tests

Compatibility Spot Test (On board) ASTM D4740

Indicative only caution needed part of a series of assessments



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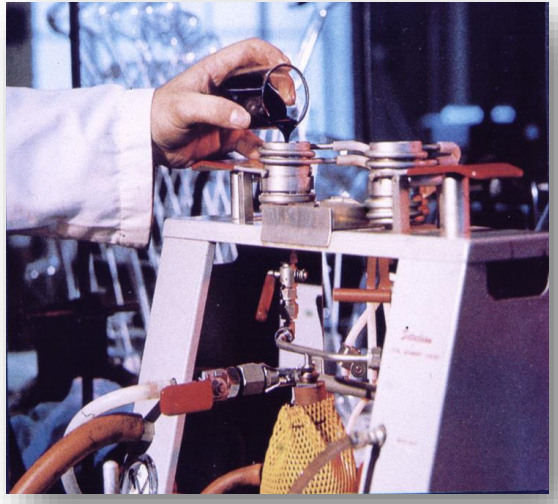
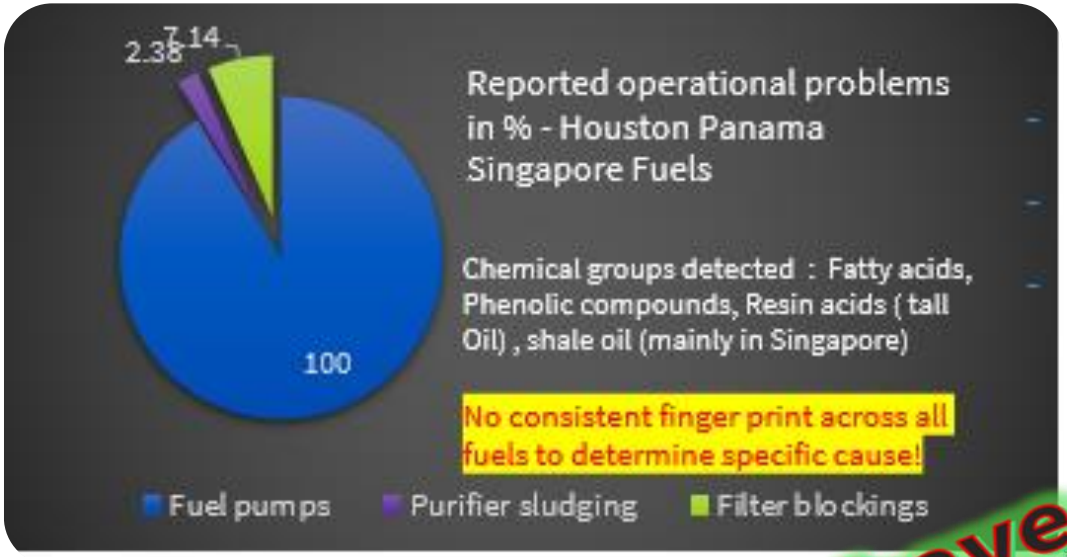


LAB ISO 10307-Part 2A (TSP)

Forward planning – send on board samples ahead for TSP commingle test –

Or at bunker station send samples to lab for TSA/ TSP testing

1 and 2 Q 2018 – unprecedented wake upcall !



- LRGMT FOBAS – Data
- US GULF : 62 cases, 27 confirmed damages
- Panama : 19 cases, 15 confirmed damages
- Singapore : 13 cases , 5 confirmed problematic fuels

Houston we have a problem!

Impacted over 100 ship
Sticking fuel pumps
Loss in power
Flowage

Test Labs flooded with investigations

10 different physical suppliers affected

Numerous barges

Oil Producer and Supplier responsibilities – Take note

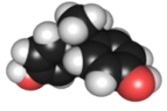
Supplier must meet the ordering specification for most ISO 8217

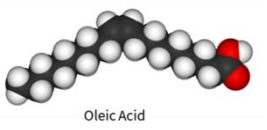
Suppliers must ensure blend stocks are acceptable to ISO 8217 Table 1 + 2 and Clause 5 General requirements – for suppliers to take note

Supplier to provide transparency pre delivery on key operational characteristics – cold flow temperatures, viscosity, density ++ and any more useful information – CoQ++++

Supplier: QMS of oil production and supply – make available to ship / buyer

ISO 8217 Annex B ……..a refinery, fuel terminal or any other supply facility, including supply barges and truck deliveries, should have in place adequate quality assurance and management of change procedures to ensure that the resultant fuel is compliant with the requirements of Clause 5'.





Best Practices for Fuel oil Suppliers MEPC.1/Circ 875/Add.1

Best Practices for fuel oil purchasers MEPC CIRC 875

The Challenge: *To obtain assurance from all parties in the supply chain of blending components and finished fuel oil that undesirable substances have not been added somewhere in the supply chain?*

Users – Owners / Purchasers / Charterers - Voyage forward planning for bunkers –

Which supplier? what rating?

- Registered ?
- Licensed?
- Quality Management System?
- Transfer Procedures?
- QMS on barges?
- Correct documentation?
- Sampling ?
- Reputation?

Reputable supplier? Cost vs risk

IMO Best Practices for Purchasers and Users MEPC.1 /CIRC.875

IMO Best Practices for Suppliers MEPC.1 /CIRC.875 / Add.1

Ships - Purchaser and Charterer responsibility

Ordering	On board Use	Fuel system design
• Specification clarity any constraints • **Selection of Supplier (Annex B)** • What dictates: quality or cost?	• Crew awareness • Proactive management • Know your fuel • Tight Records -evidence chain	• 2020 adaptability • **to the diversity of 0.50 fuels**

Loading plan Objective – "fill empty tanks only"

1. How much bunker do you need for next voyage?
2. When you arrive will you have an empty tank or will it be max 10% - is there any way to get it empty?
3. Is the fuel compatible for bulking up with other fuel onboard to make empty tank?
4. If NOT empty plan min X% ratio mix in tank 10% -
5. Order fuel
6. Receive fuel – Supplier information -
7. Do compatibility spot test check
    1. Consider ratio blends depending on tank contents to be commingled (10:90 ; 90:10 – 20/80, 80/20)
8. Form supplier what parameters given

Partnering with you
today, tomorrow and in the future

Sum up

Ship shore communications on forward bunkering - empty tank fill options critical!

Quality versus price - **integrity of supplier versus cost –**

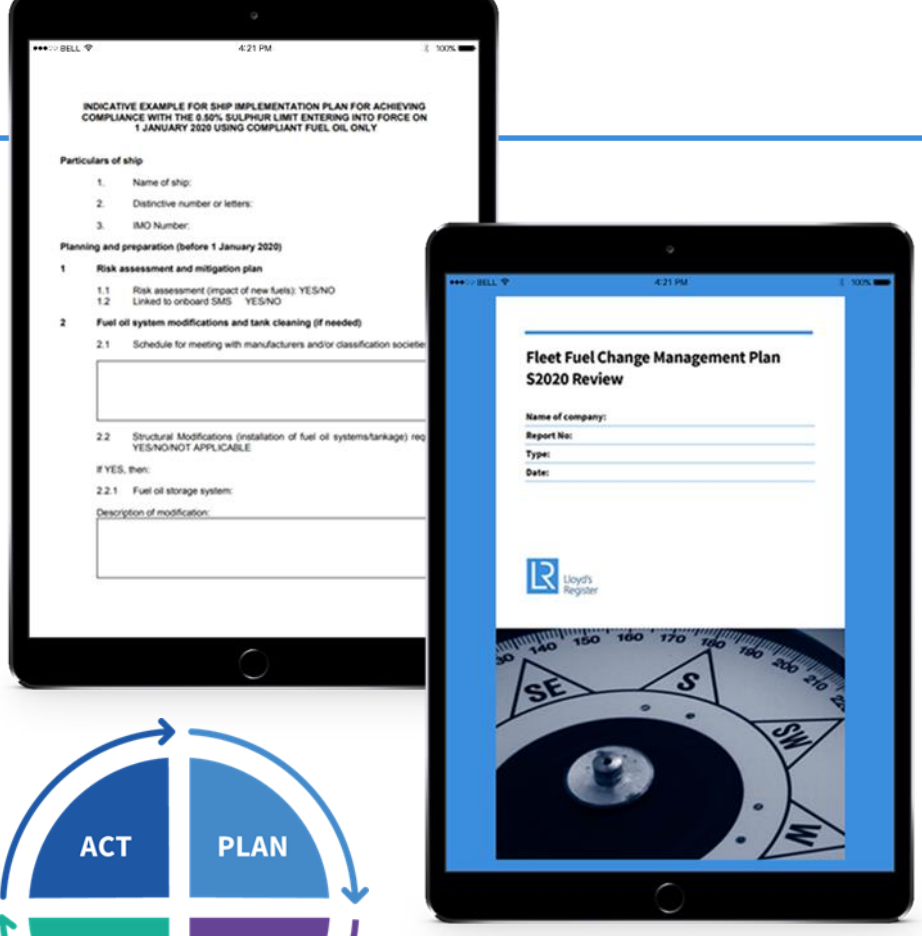
2020 adaptable ship will have a unique competitiveness by being operationally ready, **invest?**

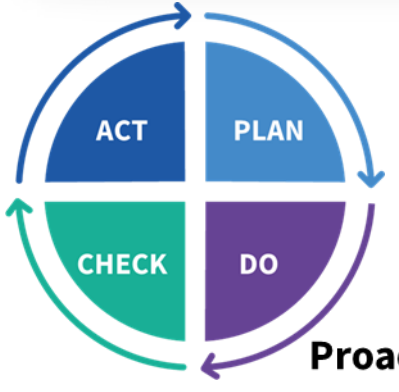
SIP +commingling strategy+ supply transparency –FONAR-NC-Fuel- 2020 adaptability - all stakeholders should buy into.

Crew awareness training is key - understanding significance of Reg.14.1.3 - **LR FOBAS** *offering LR training – how can we help?*

Guidance documents from ISO PAS CIMAC and JIP OCIMF IPIEC along with web/ e- training coming

Comply , report, transparent





Proactive fuel management is KEY to a safe Implementation

Thank you

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Lloyd's Register