Bunker Fuel Quality 2020….
The Story So Far

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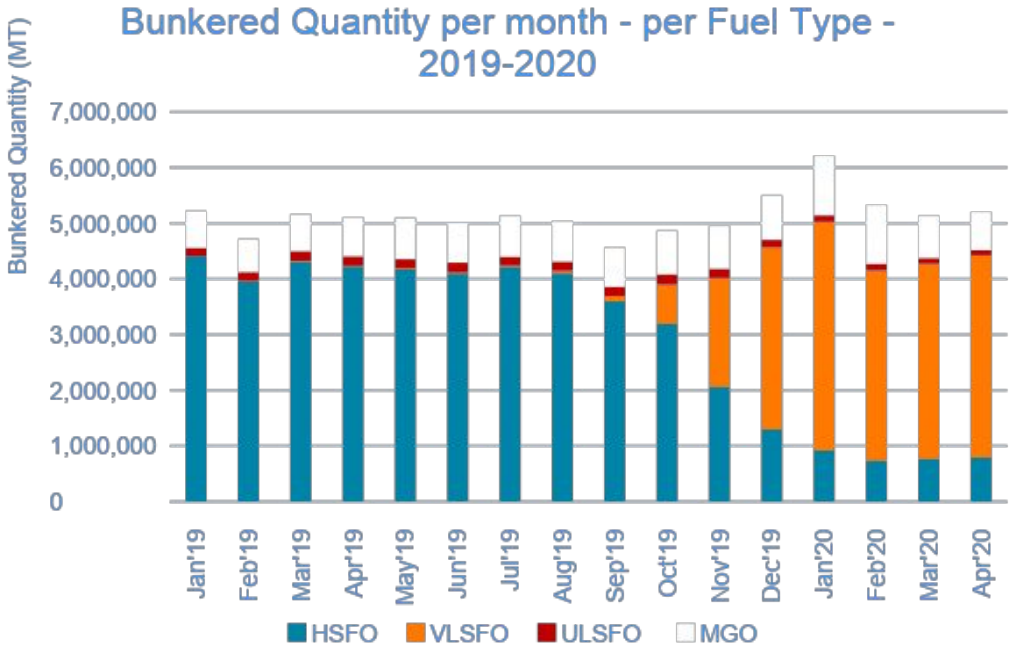
Bunkered Quantities Tested by VPS

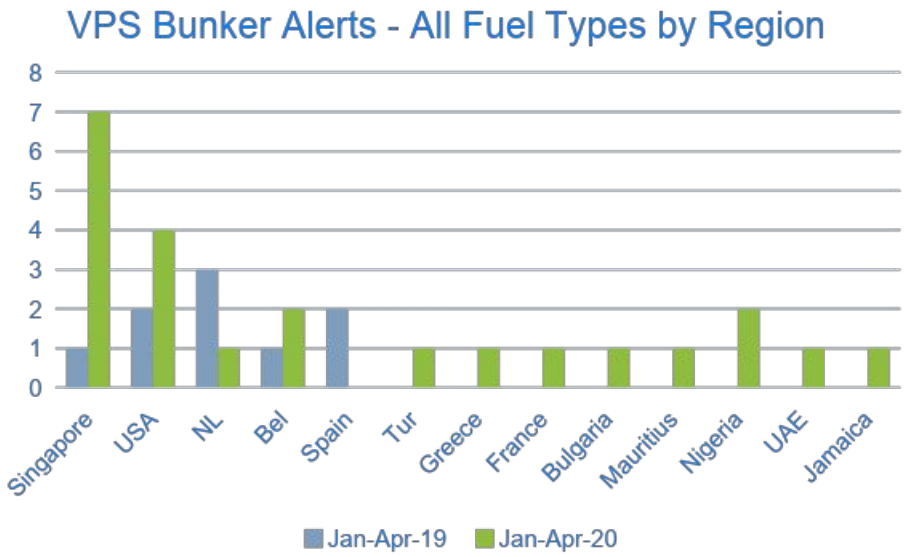
- Jan-Apr 2020: VLSFO most popular fuel choice in fuel supply mix.
- Bunkered Fuel tested by VPS:
  - VLSFO – 67%
  - MGO – 16%
  - HFO – 15%
  - ULSFO – 2%
- COVID-19 slowed all fuel demand Mar-20
- VLSFO demand Jan-66% to Apr-70%
- Fall in fuel prices has not affected % of HFO demand in 2020 YTD.
- Has falling fuel prices affected EGCS (scrubber) uptake?



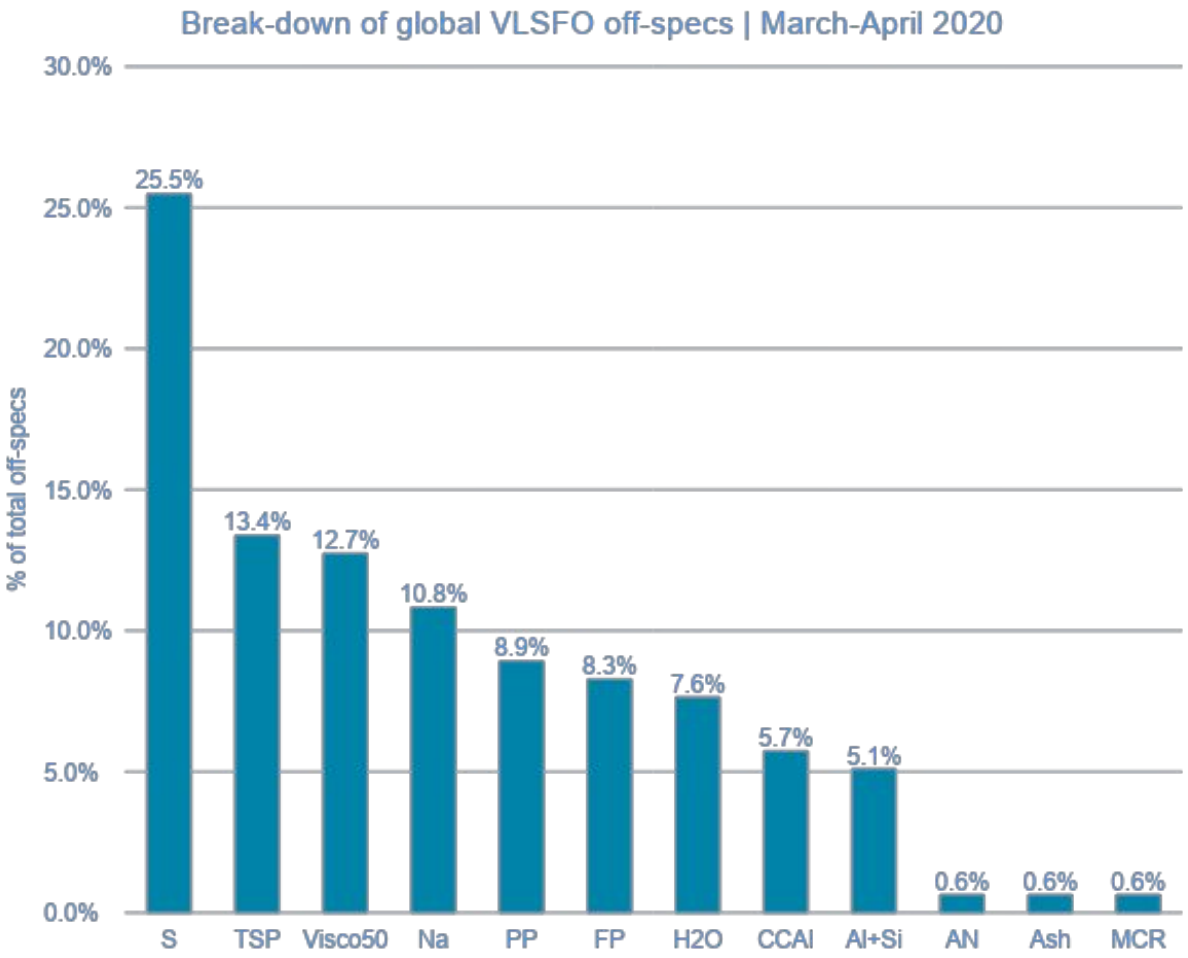
Fuel Quality (VPS Bunker Alerts)

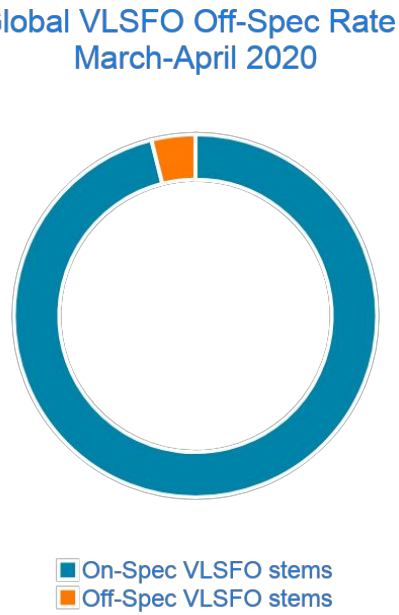
- Jan-Apr 2019 v Jan-Apr 2020
  - 9 Bunker Alerts v 23 Bunker Alerts
  - 2020 Quality issues MGO/HFO/VLSFO
- 2020 Bunker Alert Parameters:
  - MGO – Flash Point (6), Viscosity (2)
  - HFO – Flash Point (3), Density (3), Catfines (1), Sediment (1), Potassium (1)
  - VLSFO – Sediment (4), Flash Point (1), Potassium (1)
- VPS Bunker Alerts by Region:

	Jan-Apr-19	Jan-Apr-20
MGO	5	8
HFO	2	9
VLSFO	-	6
ULSFO	2	0



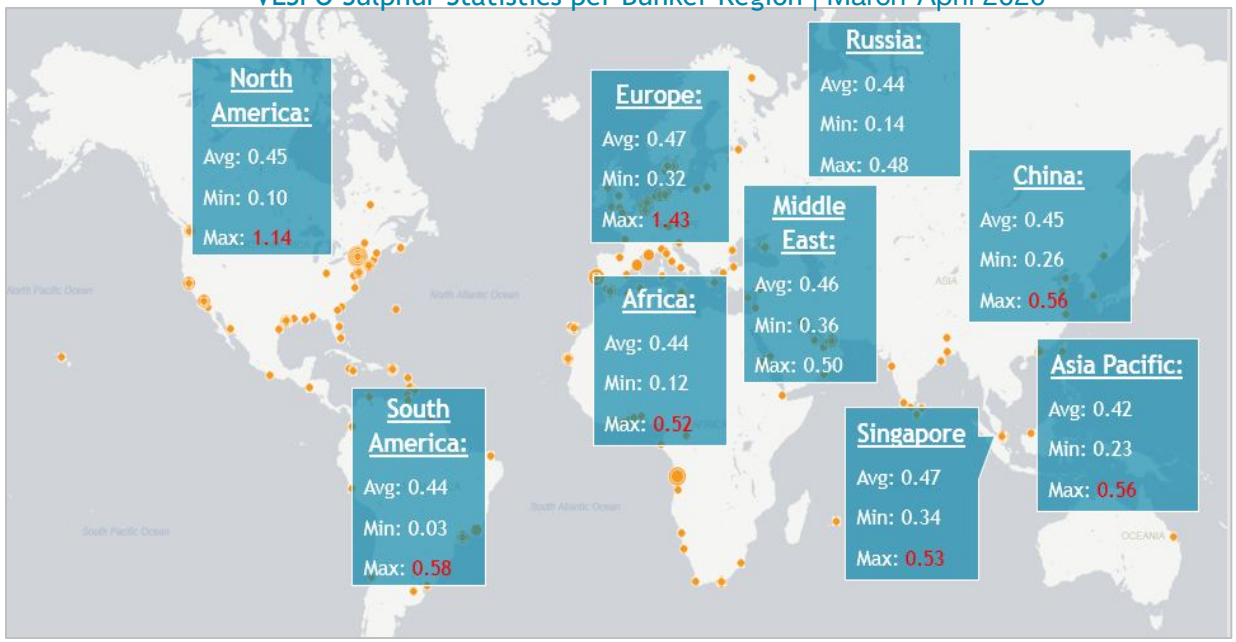
VLSFO Off-Specification by Test Parameter



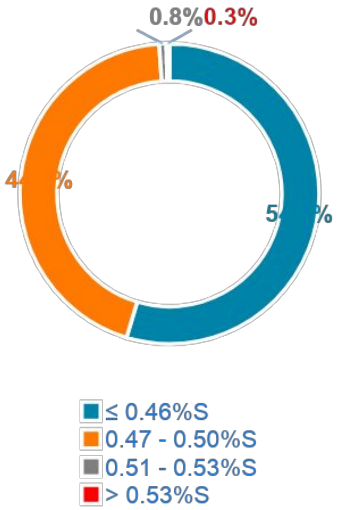


VLSFO Sulphur Content

VLSFO Sulphur Statistics per Bunker Region | March-April 2020

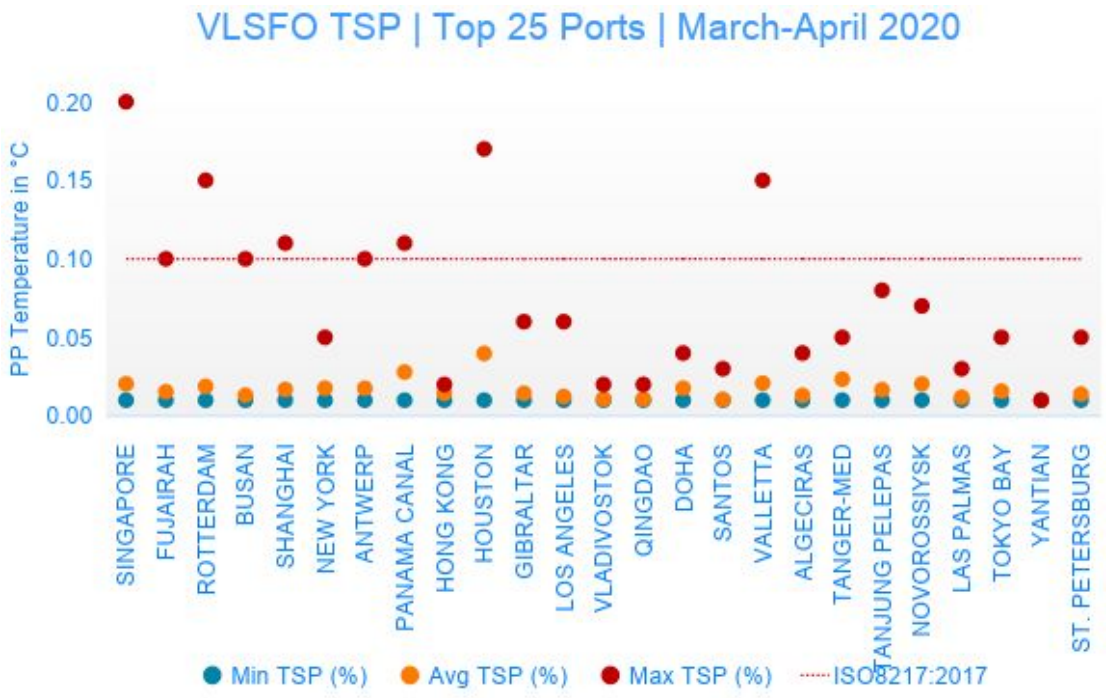


VLSFO Sulphur Compliance | March-April 2020



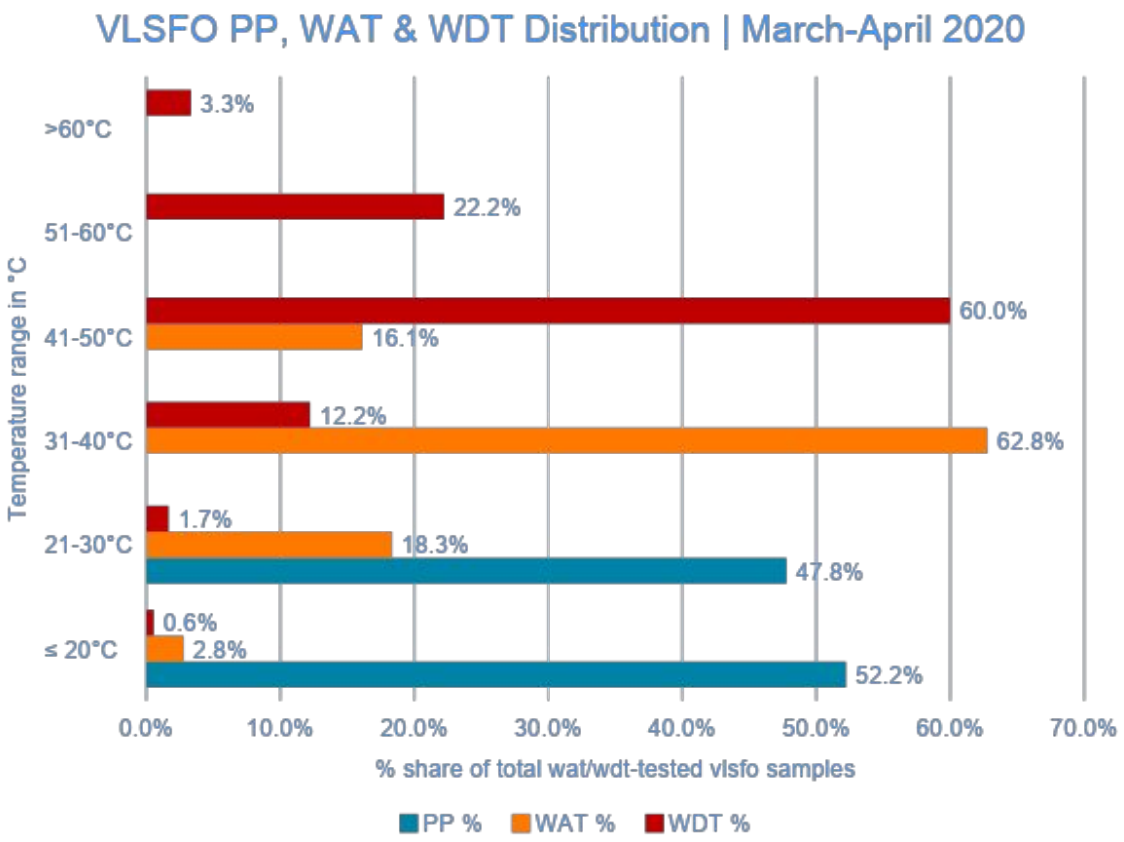
VLSFO Fuel Stability

- Average TSP values across all regions are <0.01-0.03%
- Many stability-related issues without TSP being off-spec.
- TSP accounts for 13.4% of Off-specs
- Past few months- VLSFOs tested as stable when bunkered, become unstable a few weeks after bunkering.
- Fuels flocculate, become unusable, indicating the shorter shelf life of some VLSFOs.

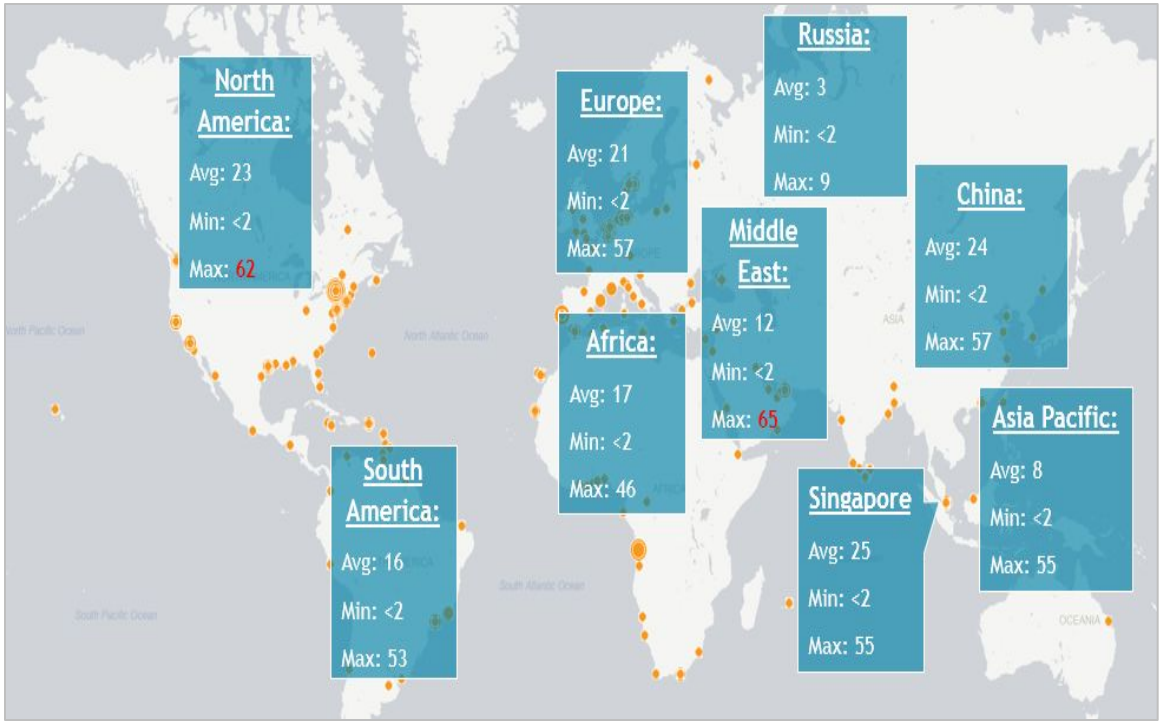


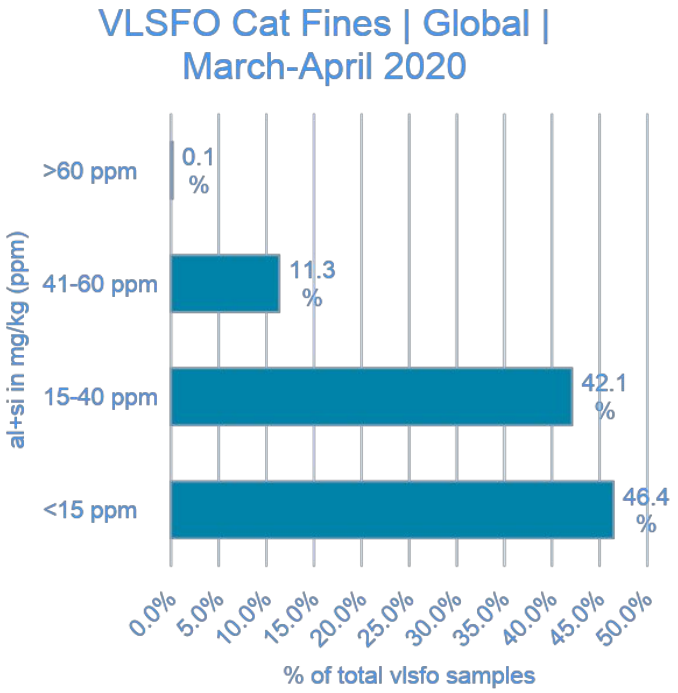
VLSFO Cold Flow Properties (PP/WAT/WDT Analysis)

- On average WAT is 22°C>PP
- On average WDT is 11°C>WAT
- Majority of VLSFO, PP < 30°C
- WAT & WDT values remain much higher than the PP
- >75% of VLSFO samples have WAT > 30°C
- >85% of VLSFO samples have WDT > 40°C.
- Elevated WAT/WDT could result in wax formation unless the purifiers' separation temperatures are maintained above the WAT.



VLSFO - CatFines





Liner Wear & Engine Damage

- Over 40 vessels with broken piston rings, damaged cylinder liners & hard deposits
- All burnt on-spec VLSFOs
- All used BN40 lubricating oil
- 2-stroke engines most susceptible
- Numerous fuel & lubricant suppliers, various engine manufacturers
- Cause: Reserve BN of CLO not being utilised to neutralise acids from fuel combustion due to lower sulphur.
- Result: Hard Calcium deposits on the piston crown, causing liner wear, scuffing & broken piston rings.
- When BN is reduced, detergency reduces and the oil film is lost, when BN increases, detergency improves and oil film is retained but the deposit formation starts.

Summary

- Apr-20 VLSFOs - 70% of all bunkered fuel tested by VPS
- Fall in fuel prices - not caused increase in MGO use, or decrease in HFO use.
- A significant increase in Bunker Alerts in 2020 YTD v 2019 for MGO/HFO/VLSFO
- 3.9% of all VLSFOs tested exceed the test specification for a least one parameter
- VLSFO Sulphur levels have improved over 5 months. 1.1% VLSFOS >0.50%S
- Stability of VLSFOs is the key concern. Reduced shelf-life
- Cold-flow Properties a further concern. PP <30°c, WAT 22°c>PP, WDT 11°c> WAT
- Catfine levels have significantly improved over time. 0.1% VLSFOs>60ppm
- Lubricating Oil BN key consideration with VLSFOs. SDA and fuel testing important
- 50yrs of HFO/MGO use….5 months of VLSFO use……We are all still learning !!

Thank you for your attention!

YOUR FUEL MANAGEMENT PARTNER

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