



Key Challenges in Marine Fuel Management

IBIA FORUM

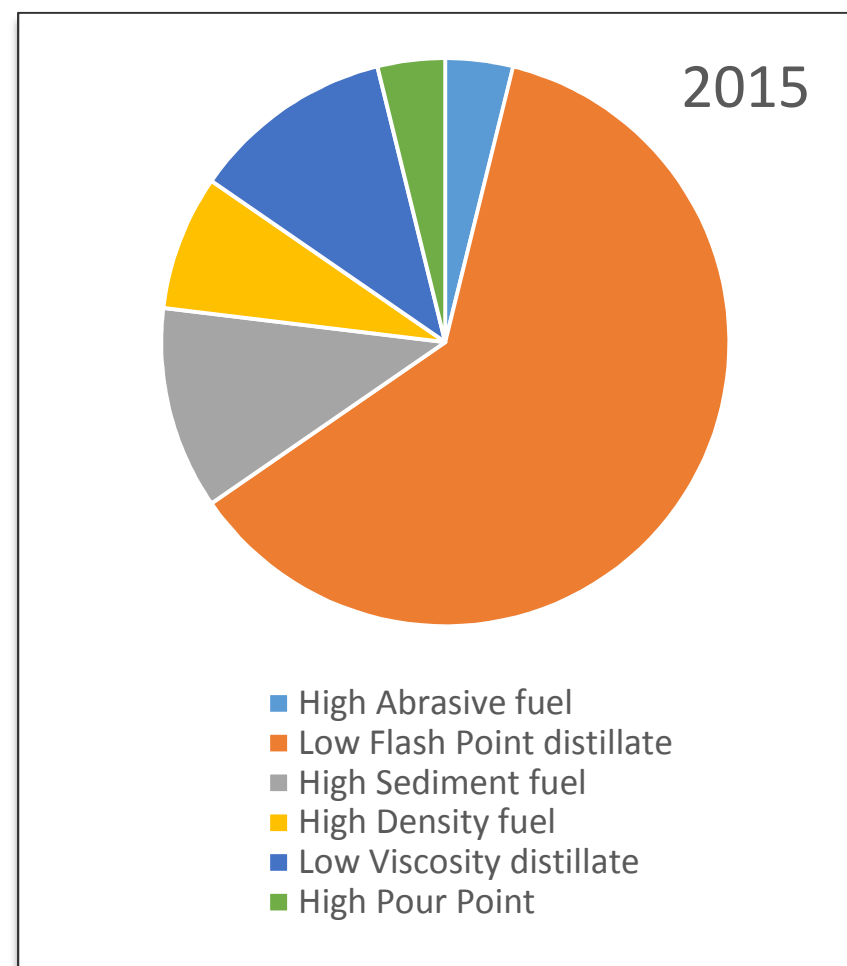
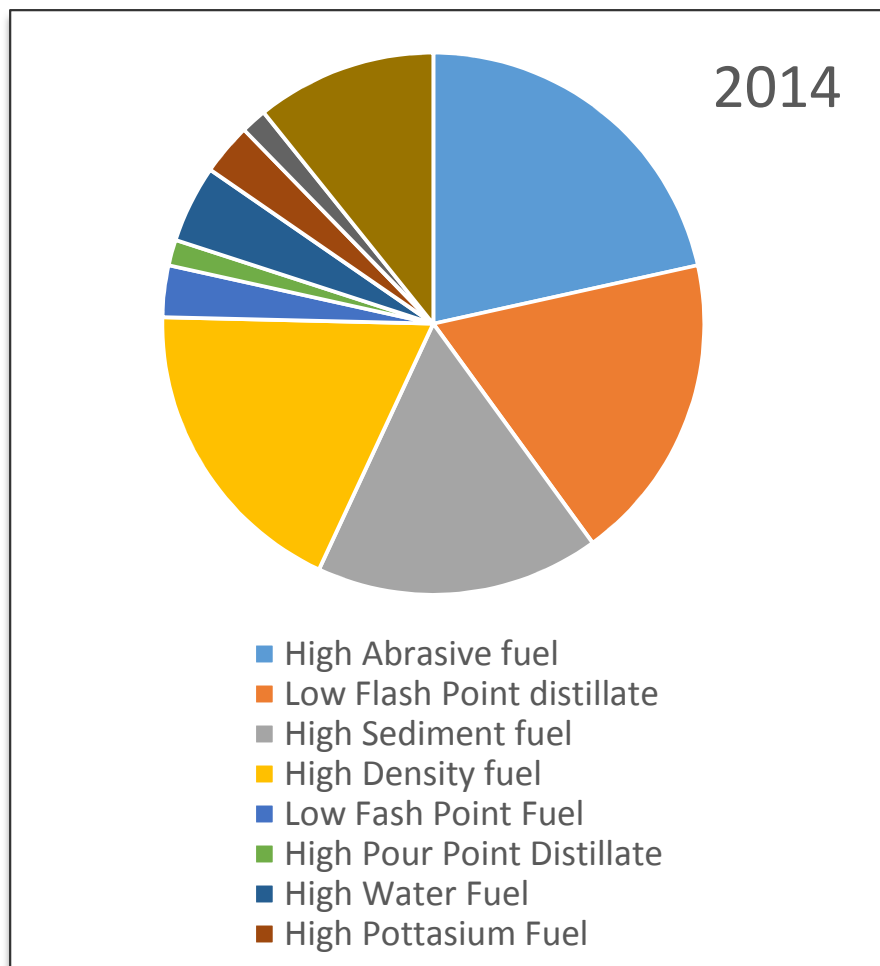
25th November 2015, Singapore

Capt. Rahul Choudhuri

Managing Director - Asia, ME & Africa

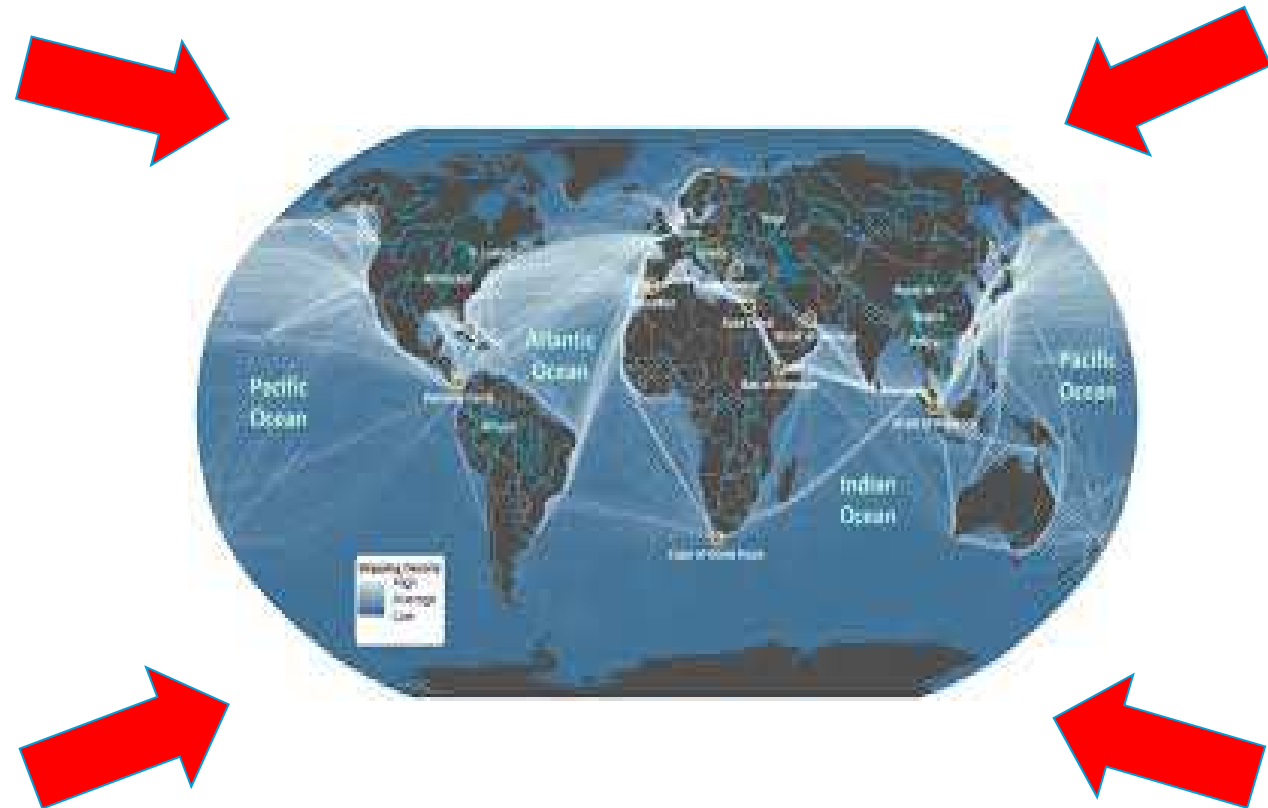


Bunker Alerts - fuel trends to watch



Bunker Alerts - countries affected in 2015

- ARA
- Cyprus
- France
- Greece
- Italy
- Korea
- Morocco
- Norway
- Panama
- Singapore
- Spain
- Russia
- Turkey
- UAE
- UK
- USA





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Engine failure likely caused by poor separator efficiency

Veritas Petroleum Services(VPS) recently performed investigative analysis on fuel samples from a tanker with engine failure at sea. The vessel had drifted at sea for 10 hours before it was towed to the nearest port for repair. Upon dismantling the engine, a majority of the piston rings were found broken and a liner crack was detected on one of the cylinder units.

Cat fines (Al+Si) is the prime suspect for such damage but in this case, the fuel used was within spec and had 39 mg/kg Al+Si. Five system samples were then forwarded to VPS for further investigation. Basic analysis was carried out on all these samples and additionally Fuel Ignition & Combustion Analysis, Gas Chromatography-Mass Spectrometry (GC-MS) and Cat fines Size Distribution screening were performed. The ignition and combustion characteristics of the fuel tested were good and no chemical contaminant was detected by the GC-MS analysis.

Fuel System Check analysis however showed that the reduction of the cat fines by the separators was only 32% when an efficiency of at least 70% would be expected, leaving behind 31 mg/kg Al+Si after the separators. The before engine sample had 32 mg/kg Al+Si and the sizes ranged from 5 µm to 45 µm. There was no settling of Al+Si in the service tank or even if there was any settling, that was perhaps offset by previous accumulation. The 32 mg/kg cat fines at the engine inlet is much higher than engine manufacturers' recommendation of less than 15 mg/kg, and can be deemed primarily responsible for wear of the rings and liners and for causing subsequent damage.

Besides the repair and off-hire costs arising from such an incident, grounding a tanker off a coast could also expose ship owners and operators to liabilities related to the environment and human safety.

VPS recommends the following best practices as a preventive measure:

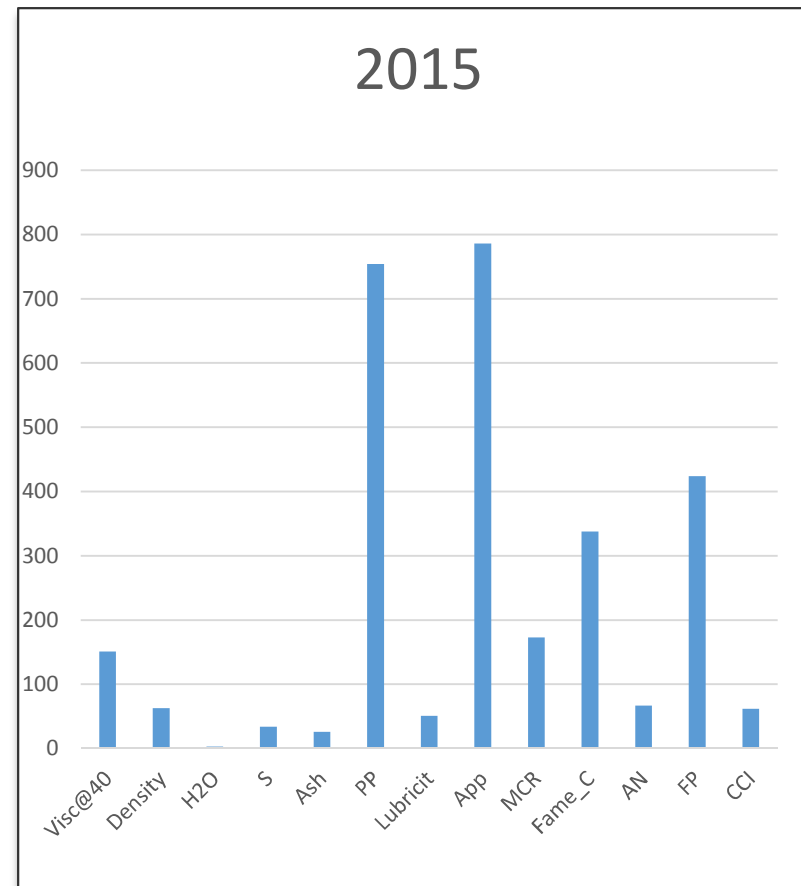
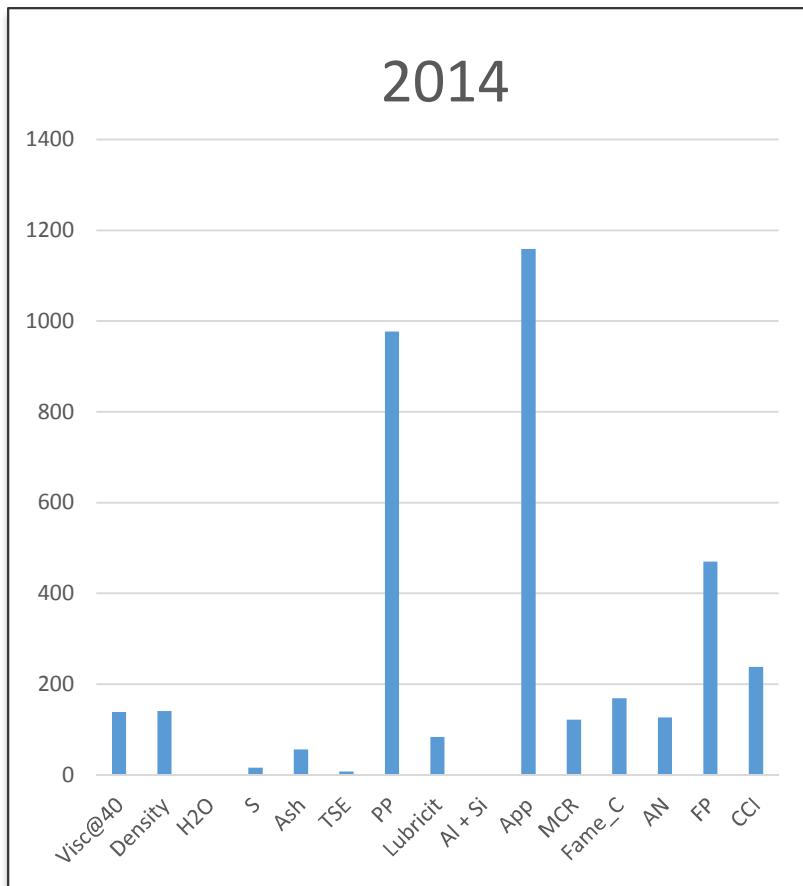
- 1) Send a sample for Fuel System Check whenever cat fines is elevated (> 40mg/kg) or every three months, whichever is earlier. This will ensure that the separators are working in optimum condition and cat fines have sufficiently reduced at the engine inlet.
- 2) Analyze before and after separator samples during major servicing of separators. This ensures efficiency is not compromised and the outcome can also be used to benchmark the engineer's competence.
- 3) Analyze settling and service tanks' drain samples every six months to check for cat fines accumulation and clean the tanks if necessary.
- 4) Purchase fuel as per the ISO 8217:2012 specification, which limits the cat fines to a maximum of 60 mg/kg in bunker fuel and verify its quality before use.

Regards,

Jeroen de Vos
Service Director
Technical & Advisory



Distillate off-specs - a changing landscape



Cold flow issue - Filter clogging 1



Bunker Port: Off Skaw
Pour Point = $< -9^{\circ}\text{C}$
CP = not tested
CFPP = not tested

Cold flow issue - Filter clogging 2



Grade - LSMGO
Pour Point = 6 °C
CP = 11 °C
CFPP = 8 °C



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Paraffin wax formation in distillates

BIMCO recently issued a [warning on wax formation](#) in low sulphur marine gas oil. It was brought to BIMCO's attention that while adhering to ISO 8217 specifications, a DMA 0.1% sulphur fuel had a cloud point of 32°C, which is the temperature at which paraffin starts to form. However, the cloud point metric is not part of the ISO 8217 specifications.

For distillate fuels the cold flow properties consist of three Parameters - pour point (PP), cloud point (CP) and cold filter plugging point (CFPP). Pour point is defined as the lowest temperature at which a fuel will continue to flow before it turns solid. CP is the temperature at which cloudy wax particles can be seen. CFPP is a lab method indicating the temperature at which a reference filter is blocked under specified conditions.

Suppliers only focus on the PP in order to meet specifications because neither CP nor CFPP is limited in ISO8217. Knowing only the PP of a distillate fuel is not enough to evaluate the cold flow properties of a distillate fuel as there is no correlation between PP and/or CP and CFPP. The PP and/or the CFPP can be suppressed by cold flow improvers whereas the CP cannot be changed by the use of additives.

Fuel purchasers are therefore strongly advised to carefully consider seasons and operational patterns, as well as specify the required cold flow properties (through CP and CFPP) when ordering new fuels and distillates. The crew should also know the CP and CFPP of the products onboard in order to take precautions against filter blockages and prevent the problem described by BIMCO.

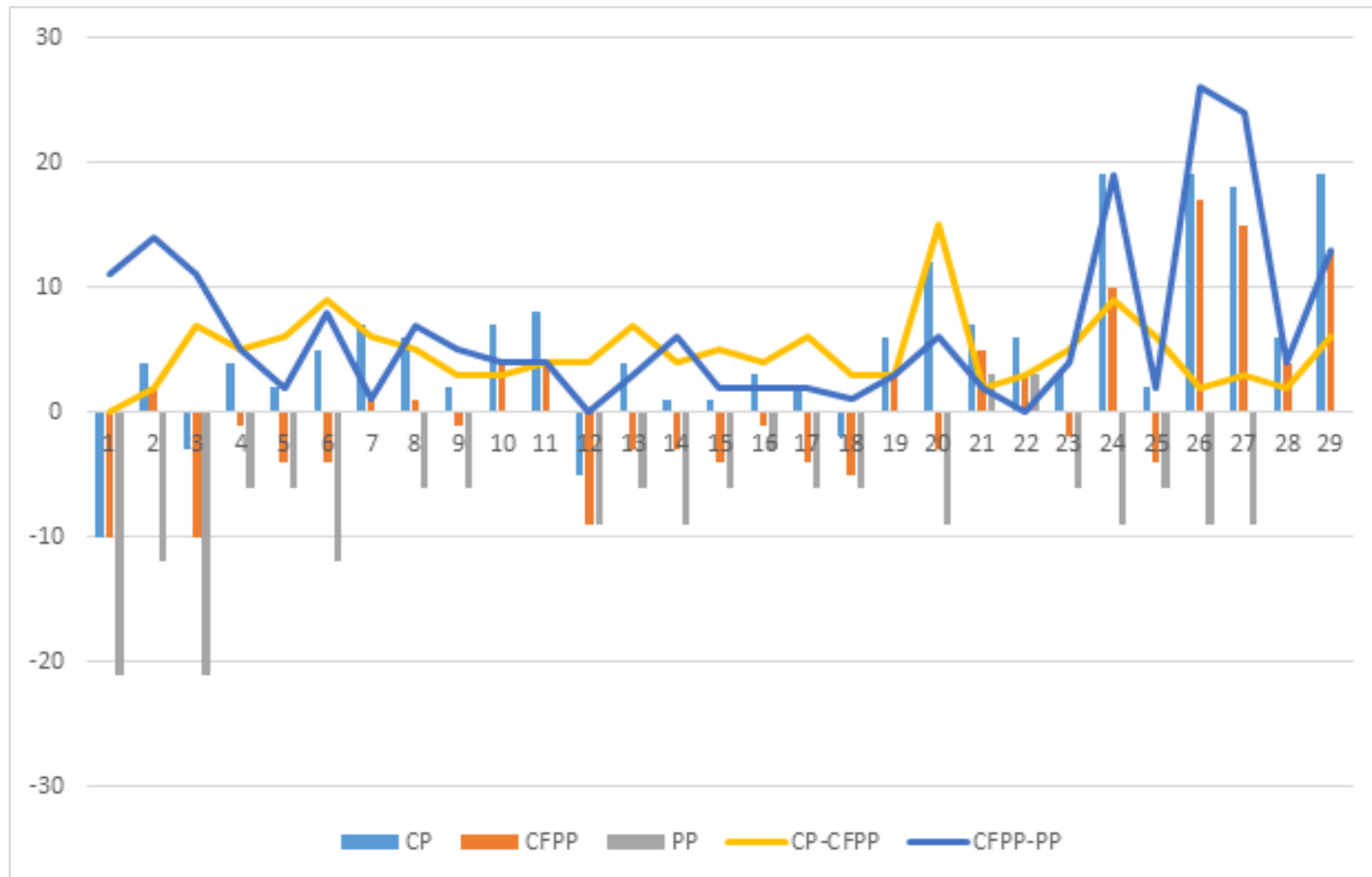
Your Customer Service Manager or nearest VPS Office would be happy to assist should you require any clarification.

Thank you.

Best regards,
Eirik Andreassen
Chief Executive Officer



Distillate Sample - Comparison of PP, CFPP & CP

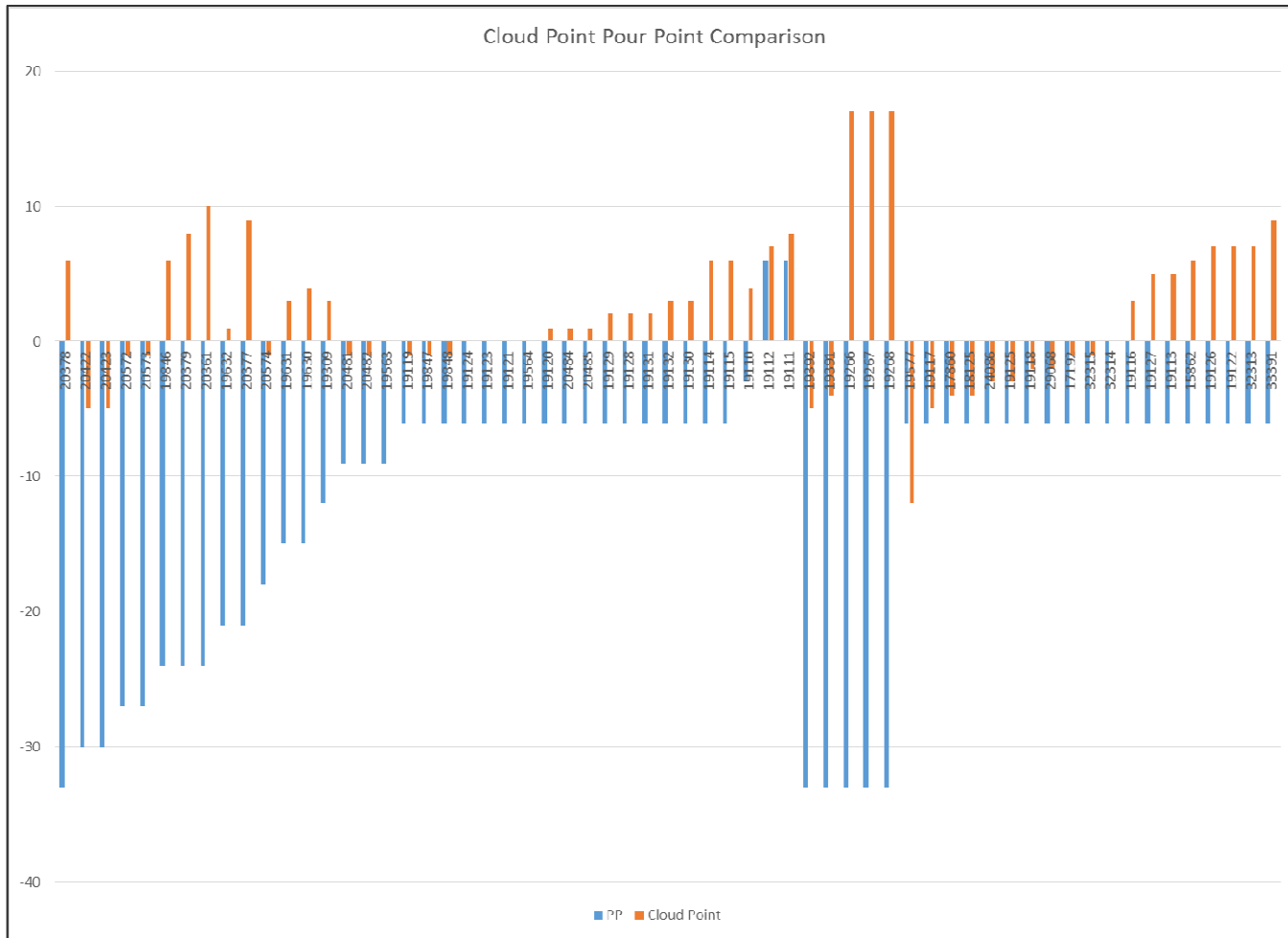


Emergency Equipment Fuel

- Operational impact can be critical
- Life Boats and Emergency Generators can fail when needed most



Emergency Equipment - CP & PP



Resistance to use better fuel specification

- Pickup rate for ISO 8217:2012 still low with ship operators
 - AMEA = 23%
 - EUROPE = 42%
 - USA = 15%



Key changes in ISO 2012 Distillate spec

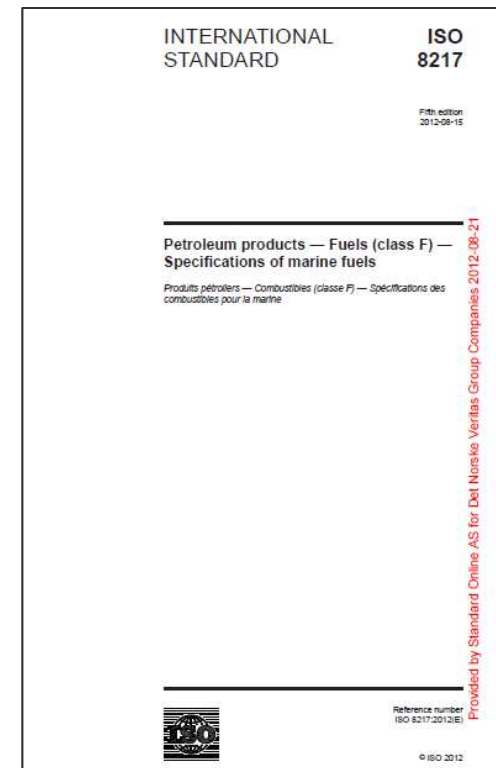
	ISO 2012	ISO 2005
Viscosity, min	2.00 cst	1.50 cst
ULO	Ca + Zn or P	Ca+ Zn+ P
Acid Number, mg KOH/g	0.5	X
H ₂ S, mg/kg	2.00	X
Lubricity	520 μm	X
New Grade	DMZ	X

Key changes in ISO 2012 HFO spec

	ISO 2012	ISO 2005
Al+Si, mg/kg	25~60	80
Ash, %m/m	0.040 ~0.150	0.10~0.15
Vanadium, mg/kg	50~450	150~600
MCR, %m/m	2.50~20.00	10~22
ULO	Ca + Zn or P	Ca+ Zn+ P
Sodium, mg/kg	50~100	X
Acid Number, mg KOH/g	2.5	X
CCAI	850~870	X
H2S, mg/kg	2.00	X
New Grades	RMA10, RMG180 & RMK500	X

Value of switching to ISO 8217:2012

- Better fuel quality
- Improves safety levels in shipboard operation
- Clarifies statutory requirement for Sulphur level
- Reduces engine damage
- Improves fuel management
- IN SUMMARY - A BETTER FUEL FOR YOUR ENGINE



Hybrid Fuels



Hybrid Fuels



- Ignition & Combustion Quality - Good
- Viscosity - Need not to worry about internal leakage
- Al+Si content - can easily reduce to maker's spec
- Energy Value - OK
- Lubricity property - no issue
- Cheaper than LSMGO



Issues with Hybrid fuels

Compatibility

Pour point

Availability??

The image shows the text '24/7' in a bold, blue, 3D sans-serif font. The numbers are rendered with depth and perspective, casting soft shadows on the white surface below them. The slash is also rendered in a 3D style, appearing as a vertical bar between the numbers.

Transfer difficulty during bunkering - PP issue



Bunker Port: Rotterdam

Grade – RMD80

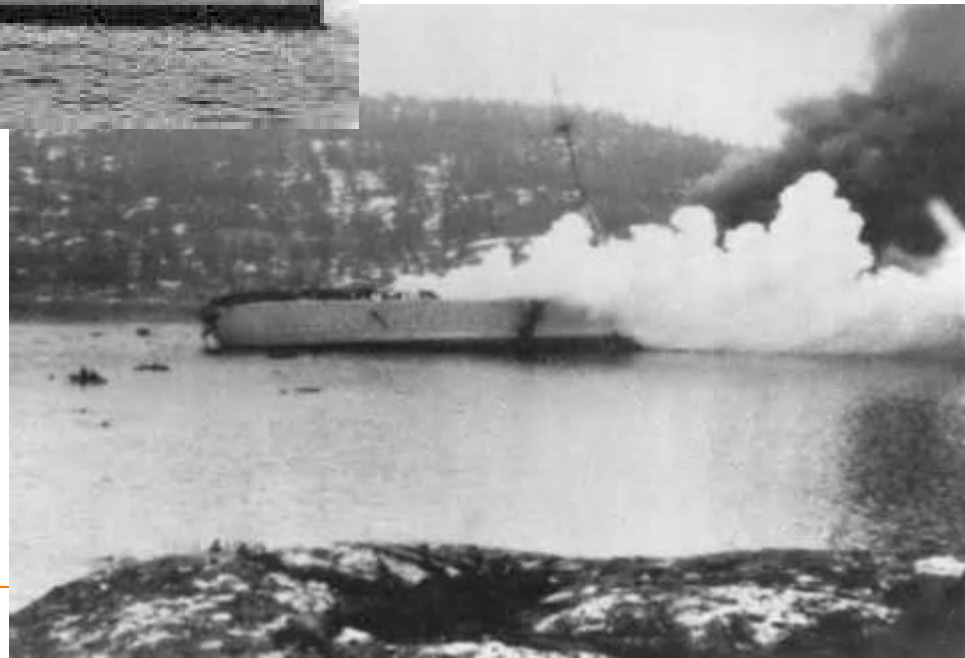
Outside temp 9°C but the fuel PP is 30°C

Hybrid fuel feedback - Asian Customer

- Using hybrid ULSFO fuel since Jan 2015
- Trading Asia -Europe & Asia - USA
- Mainly from SK @ Busan and occasionally from Shell @ Rotterdam
- No problems experienced
- Cost savings

Density Kg/m ³	Viscosity cSt	MCR %m/m	Al+Si Mg/Kg	PP °C	CCAI	Energy MJ/Kg
906~941	19 to 62	1.5~ 4.7	2~ 30	3 to 30	792~844	41.8~42.5

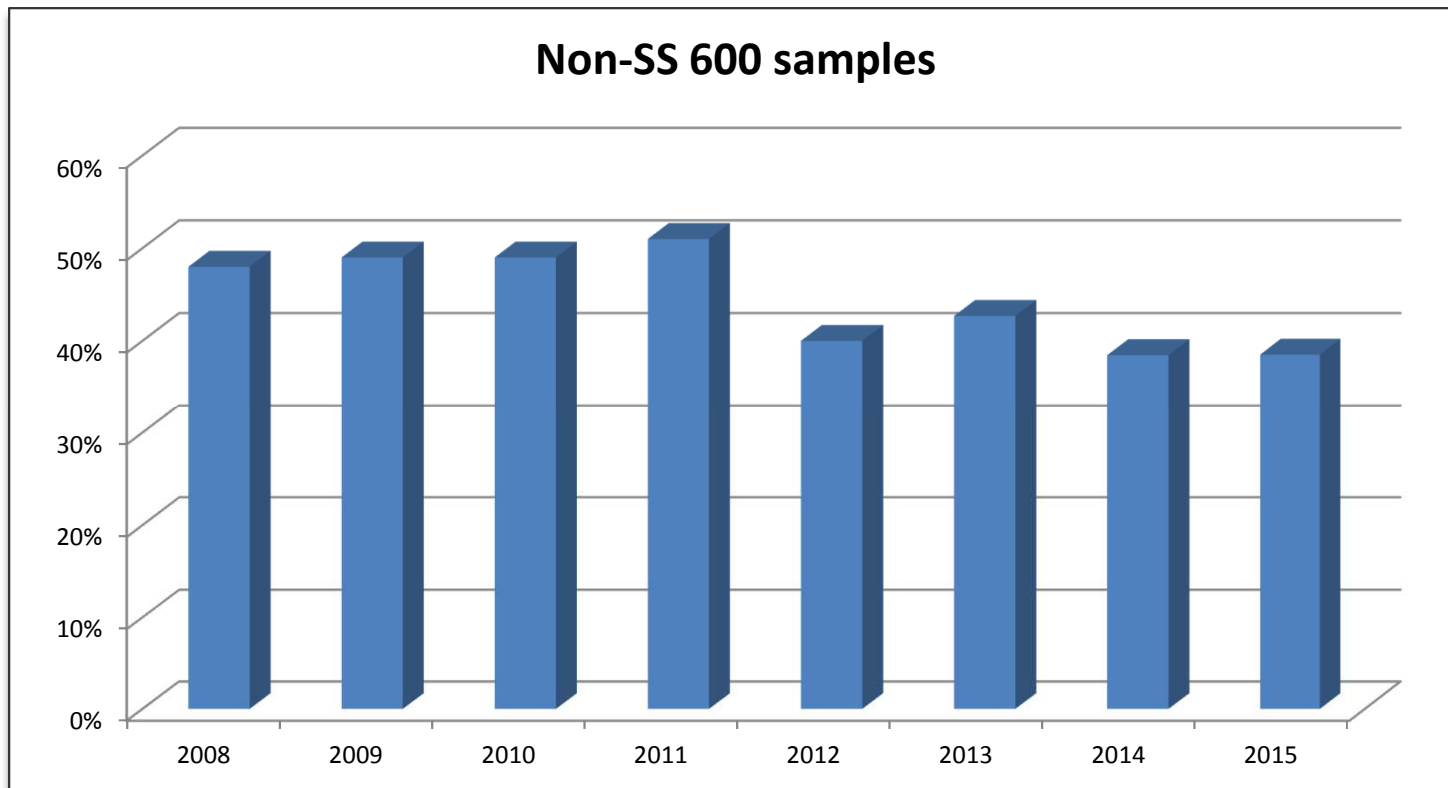
Blucher



Blucher

Density at 15° C, kg/m ³	963
Viscosity, cSt/40° C	17
Scarcity of sample restricted additional analysis.	
A sample of some of the fuel pumped off the wreck during the debunkering operation gave these results:	
Density at 15° C, kg/m ³	907.2
Viscosity, cSt/40°C	7.0
Water %	Less than 0.1
Micro Carbon residue %	2.0
Sulphur %	0.88
Total Sediment Existent %	0.04
Ash %	0.02
Vanadium mg/kg	10
Sodium mg/kg	3
Iron mg/kg	126
Pour Point° C	Below 0
Flash Point° C	Above 70

Sampling compliance & crew training



Summary

- Fuel quality knows no location boundaries & will remain widespread. Don't rule out fuel quality issues with heavy fuels.
- Watch out for distillate quality as this is changing. Put in place systems to monitor CP, CFPP, FP, Lubricity etc. This must include your Emergency Equipment. Be proactive & prepare.
- The bunker industry should take the lead in implementing the new ISO 8217:2012 fuel quality standard more robustly. A positive change process is needed for the greater good.
- Hybrid fuels offers interesting option operationally & financially. But it is prudent to know the quality & ECA compliance.
- Sampling compliance needs improvement, and bunker surveyors play an important role in this implementation.



Thank you

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