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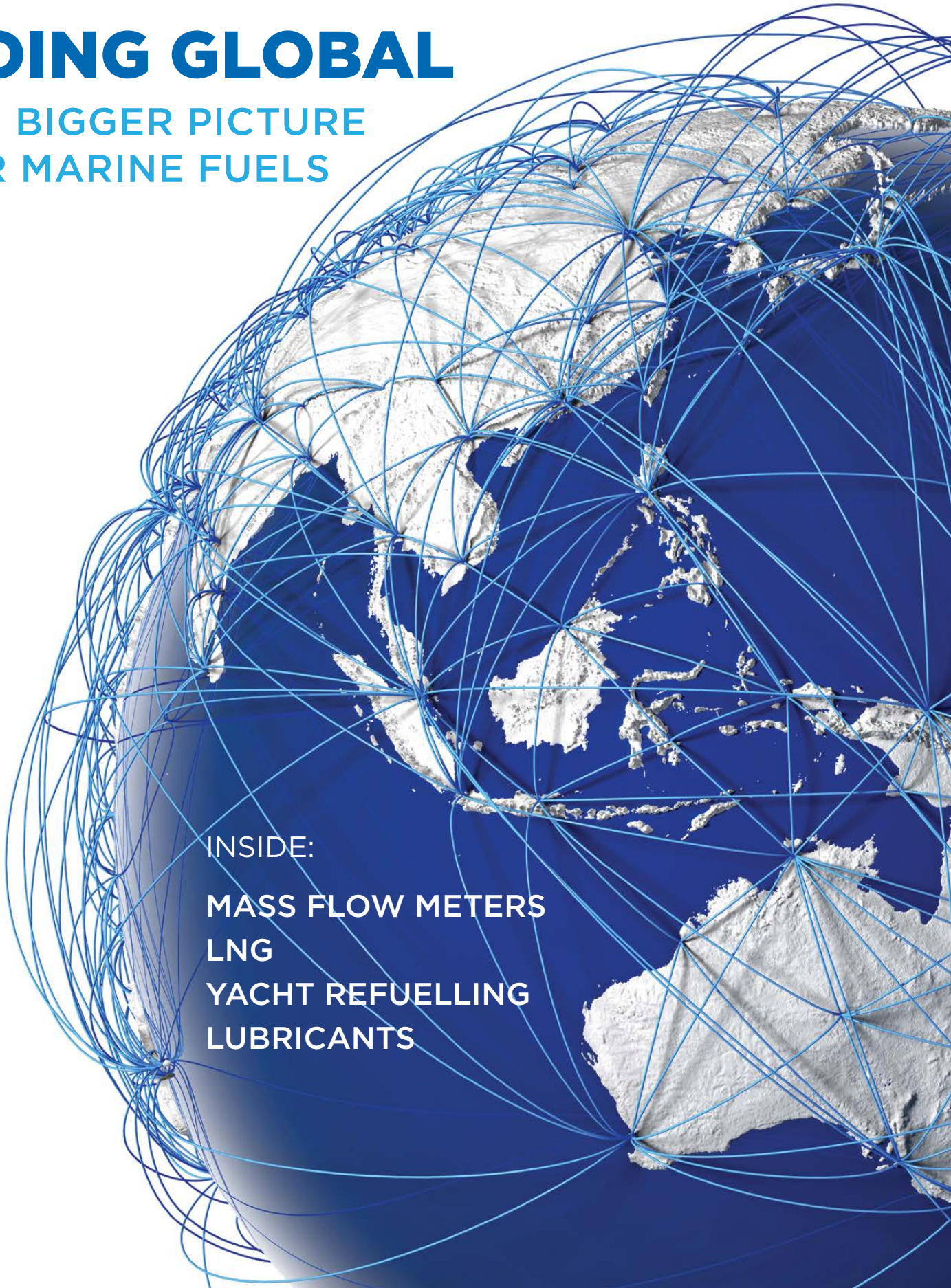
BUNKERSPOT

GOING GLOBAL

THE BIGGER PICTURE FOR MARINE FUELS



INSIDE:

MASS FLOW METERS
LNG
YACHT REFUELLING
LUBRICANTS

'An alarming quantity (17.2%) of all samples submitted from the US and ports around the Gulf of Mexico showed wear scar results above 520 µm - with 7% being classed as off spec based on a single test result (>580 µm)'

Double take

Michael Green of Intertek ShipCare and Michael Banning of Innospec review the findings of a follow-up study on the use of distillate fuel grades and lubricity issues – and also provide some insights into the uptake of recent revisions of ISO 8217

In July 2010, the release of the revised ISO 8217 marine fuel specification saw a significant overhaul of the previous 2005 version and introduced a range of new testing requirements for both residual and distillate fuel grades.

The ISO 8217 specification is specifically designed such that it is reviewed and amended in order to keep pace with the developments in the bunker industry and reflect changes in the type of fuels available to shipowners and operators.

The 2010 and subsequent 2012 revisions of ISO 8217 were very forward thinking in that many of the changes were designed to reflect the expected increased use of distillate fuels to comply with imminent legislative change.

As greater demands were placed on the supply chain to offer more low sulphur distillate fuel, concerns grew in relation to the prospect of poorer quality product being offered to owners and operators, as a result of more intensive refinery treatment processes being used to reduce the sulphur content of fuels.

In looking to examine the impact of the new test requirements in relation to lower sulphur fuels, a joint venture between Intertek ShipCare and Innospec was established to look at the relationship between the sulphur content of distillate fuels

and the inherent lubricating properties.

The initial study was carried out between 2010 and 2012 and showed a number of key points for consideration. In all, a total of 182 distillate fuel samples from ports across the globe were examined and the survey showed that approximately 4.4% of all tested samples failed the 520 µm wear scar limit as stipulated in the ISO 8217:2010 standard.

Conclusions drawn from this study suggested that the 0.05% (500 ppm) sulphur limit at which the lubricity test is mandated could be deemed to be somewhat questionable, based on the fact that several samples with significantly higher sulphur contents tested at or near the limit. Although the study did not find any out and out failures of fuels with above 0.05% sulphur, it is known from automotive fuel experience that such a situation can arise in extreme cases.

To reduce the sulphur content of distillate fuels, refineries employ a technique known as hydroprocessing. This process is extremely effective, but has a negative impact on boundary lubrication, or lubricity. With boundary lubrication naturally occurring polar species prevent metal to metal contact by the formation of a mono-molecular layer. In hydro processed fuels, many of these polar species are removed. Fuel pumps rely on the fuel for lubrication, but there are two distinct regimes of lubrication to consider, hydrodynamic lubrication and boundary lubrication.

Hydrodynamic lubrication relates to the oil film created between the moving components. This area of lubrication is directly dependant on the viscosity of the fuel and is one of the reasons OEMs recommend a minimum viscosity of 2 centiStoke (cSt) when operating on distillate fuel. If the viscosity is too low the oil film can become insufficient and seizure can occur.

Lubricity is of equal importance, but is somewhat different and relates to the boundary lubrication rather than hydrodynamic. Where boundary lubrication really plays a part is within fuel pumps where the clearance between the plunger and barrel is extremely small and can decrease further when the components reach operational temperature.

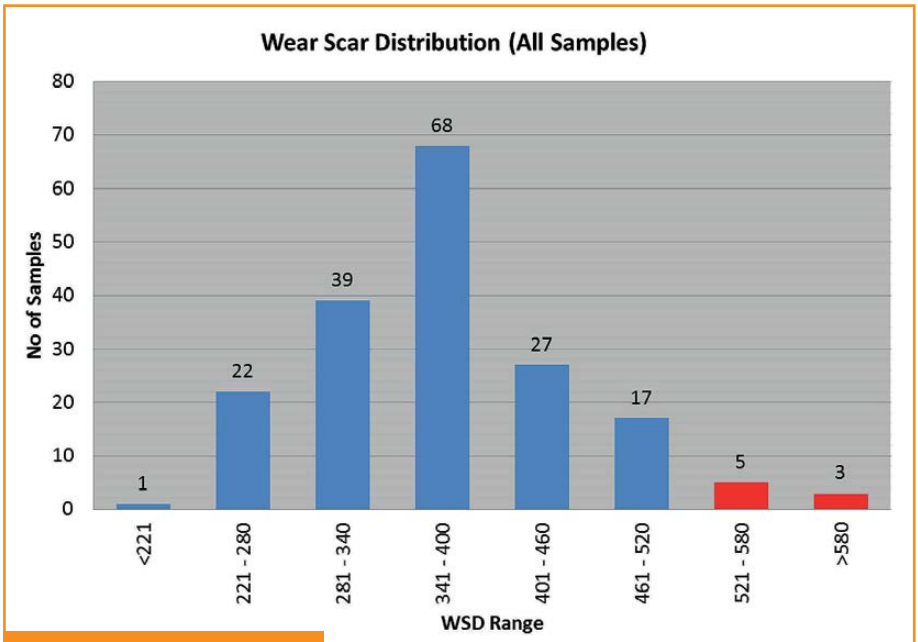
When there is insufficient boundary lubrication within fuel injection equipment, excessive and accelerated wear can be expected and premature failures may occur. Failures such as this can be extremely costly, not only in financial terms, but also in terms of safety and lost time. Lubricity improvers (LI) can mitigate this issue and work by providing the necessary lubrication that has been eliminated from the fuel due to the hydroprocessing at the refinery. This means that a low-sulphur marine gasoil (LSMGO) with poor lubricity can be used without issue; typically LIs are suitable for splash blending and can be dosed at various locations to suit the vessel requirements.

It was also noted during the initial study that in most cases fuel was being purchased in accordance with ISO 8217:2005, rather than the 2010 specification, in which case the lubricity test would not be conducted at all and, as such, reduced lubricating properties of the fuel may not be perceived as a risk.

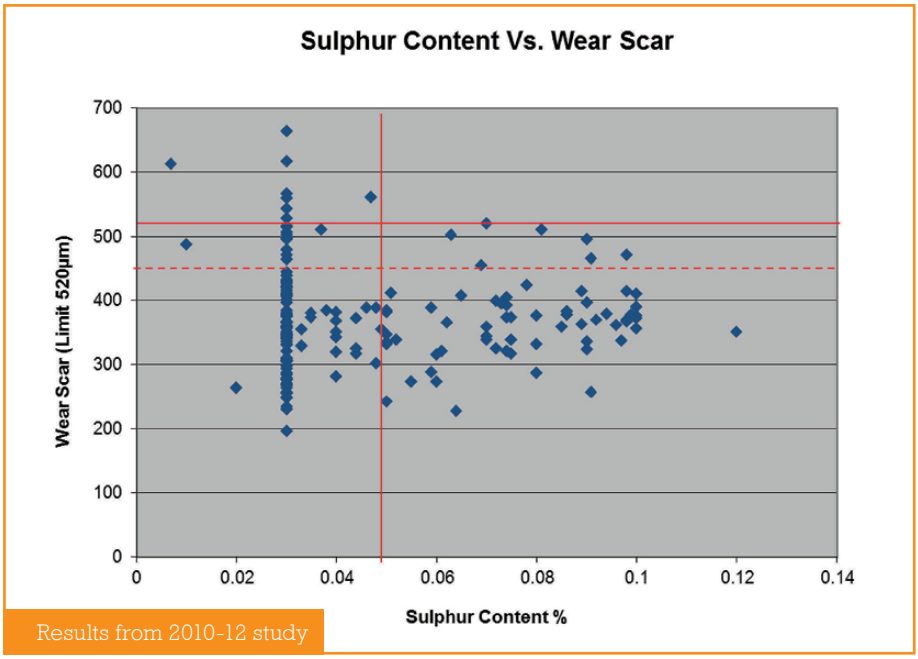
At the time of the study, extensive usage of low sulphur gasoils for sustained periods was still relatively low, but the build to 1 January 2015 and the introduction of the 0.1% sulphur limit in emission control areas (ECAs) would see buying patterns move away from the traditional reliance on residual product and questions would need to be asked as to whether the situation regarding sulphur and lubricity would also change significantly.

If we fast forward to 2015 and the actual implementation of the 0.10% sulphur limit, what has changed?

In looking at developments since the start of 2015 it is clear that the bunkering industry has undergone a significant change. However, some things have not moved on so quickly; the limited uptake of ISO 8217:2012 standard being a key issue.



Results from 2010-12 study



Results from 2010-12 study

In order to ascertain the actual impact of the wider use of low sulphur distillate for sustained periods, a second, follow-up study was commissioned to see if anything had changed.

The scope of the second project was somewhat different to the first, in that a greater number of samples were readily available for examination. This, coupled with a narrowing of focus regarding the regional diversity of the samples analysed, gave a more accurate representation of what was actually happening in the industry.

Similarly, the test data examined in the second study was more in line with the ISO 8217 test requirement for the lubricity test – based on the determination of a sulphur content of less than 0.05% m/m (500 ppm).

An examination of the data reveals that a weighted regional average of 7.3% of samples tested showed a wear scar greater than the 520 µm limit. Some 2.8% were deemed to be true off specs (outside of the 95% confidence interval – greater than 580 µm – based on a single test result).

In looking at this data in greater detail, an alarming quantity (17.2%) of all samples submitted from the United States and ports around the Gulf of Mexico showed wear scar results above 520 µm – with 7% being classed as off spec based on a single test result (>580 µm).

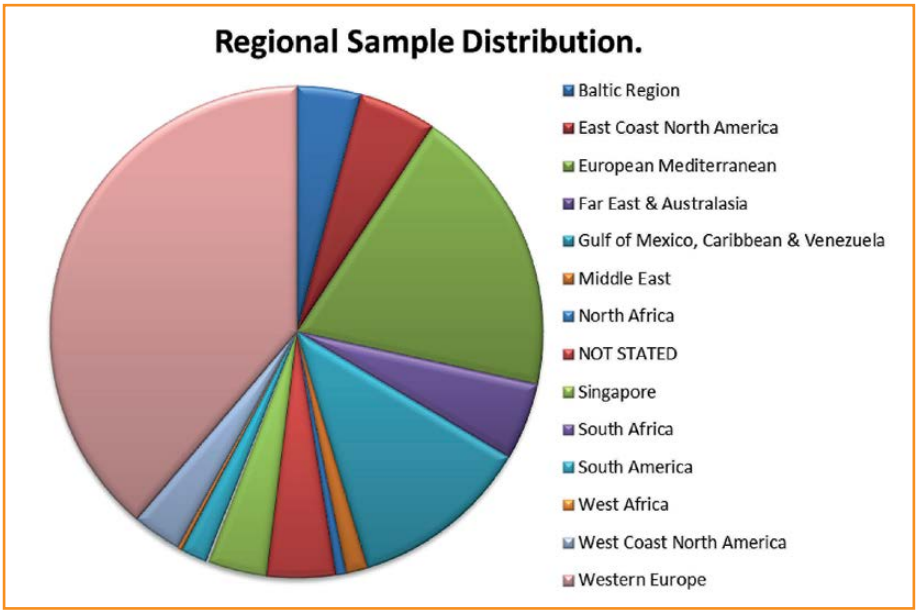
Taking this into consideration, it is clear that the landscape has indeed changed since 2012, which is only to be expected given that the sulphur regulations have now been enforced. One thing that hasn't changed is still the relatively low uptake of the 2012 version of the ISO 8217 standard. However, despite this the number of owners and operators choosing to protect their ships by using a lubricity improver has increased significantly, which confirms that lubricity issues and their potential impact on costly engine components are being taken seriously

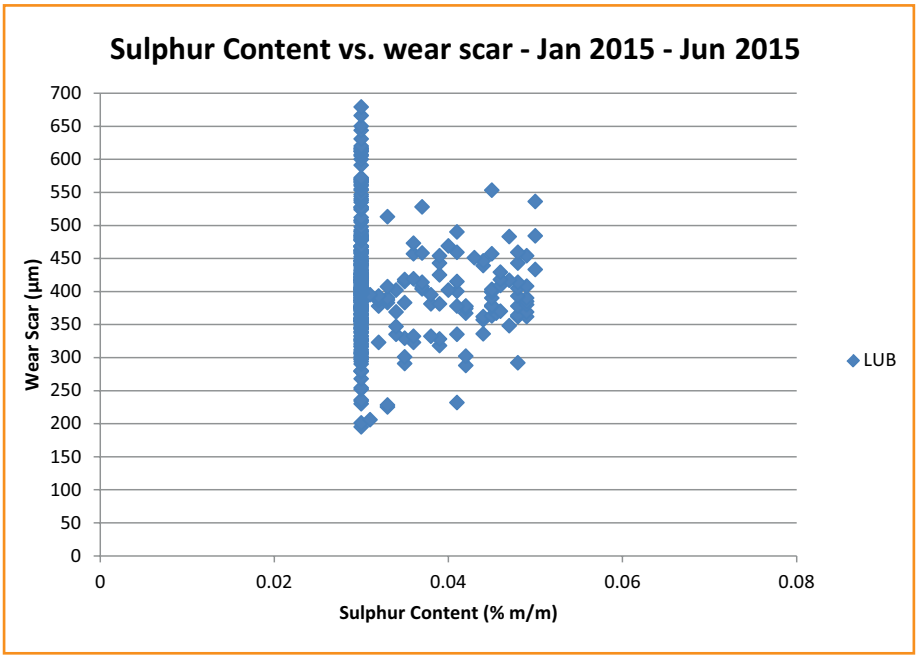
Another significant point that needs to be considered is the role played by the 'new' ultra low sulphur fuel oils (ULSFO)

The introduction of these fuels has certainly gone some way to reducing the overall quantity of LSMGO in use, which could suggest that pressures on the whole supply chain have been lessened and, as a result, the anticipated problems with distillate fuels have been minimised.

The uptake of these fuel types has risen steadily in the last 18 months but the overall market share is still relatively low (accounting for around 8% of all samples). The question is, therefore, have they played such a big role in limiting the problems noted?

Since 1 January 2015, problems due to the long term use of LSMGO are now coming to light, and several cases have been noted where reduced lubricating properties of the fuels used appear to have played





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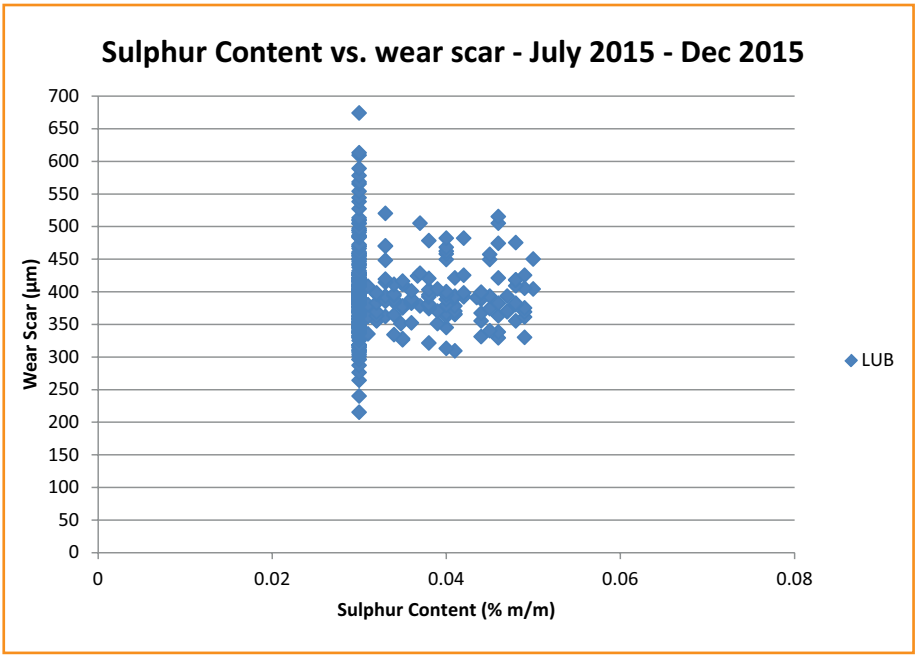

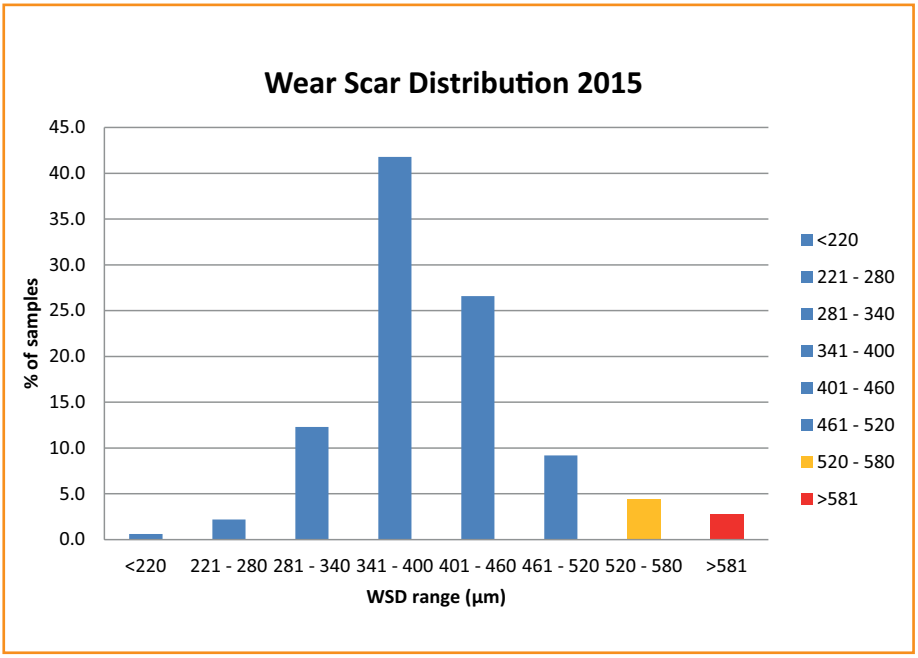

a role where problems were seen onboard.

This is highlighted particularly well by a case study from the end of 2015 where six vessels, operated by different owners/managers, showed significant damage to fuel injection equipment.

All six vessels had taken parcels of fuel on a regular basis from US Gulf Coast ports and had complained of fuel injection equipment showing excessive wear patterns. Examination of the fuels in use at the time showed no problems, but further investigation of their bunkering patterns showed a correlation in regard to the MGO parcels being picked up. Analysis of the MGO fuels being used showed wear scar results to be very close to or just over the 520 µm limit. Further discussions with the different vessel owners/operators confirmed that virtually none were stipulating the ISO 8217: 2010/2012 fuel standard when purchasing fuel and, as such, the additional tests (including lubricity) were not being conducted.

However, the most telling factor was revealed in discussions with one of these owners, who confirmed that the only vessel in their fleet (currently being managed by a third party) which had problems, was the one which didn't use lubricity improver or conduct routine lubricity testing..

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