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PUBLISHED 1Q 2020

IMO 2020 Marine Fuel Oils: So Far So Good?

What are the Underlying Risks?

March 26, 2020

Effective from 1st January, 2020, the International Maritime Organization (IMO) reduced the maximum allowable sulphur content in marine fuel oil from 3.5 to 0.5% by mass, on a global basis, to reduce pollution arising from the emission of sulphur oxides (SOx) from ships.

In efforts to avoid the risk of non-compliance with the more stringent sulphur requirements, ship owners and operators adopted widespread measures before implementation to carry out tank cleaning and other associated processes to remove residues of higher sulphur fuel from their ships' systems on board.

Now that the 0.5% sulphur regulations have entered into force, fuel manufacturers and suppliers will tend to rely more heavily on blends of feedstocks and fuels that have had a relatively short history of use in marine applications. Whilst the use of such blended fuels will allow ship owners and operators to meet the sulphur content requirements, unstable fuel blends are more likely. Such blends can foul exposed surfaces with wax or asphaltene buildups and ultimately impair engine and machinery performance; in extreme cases this can result in loss of power, effectively immobilising a ship and placing it in peril. To date, such situations have not been prevalent; however, accumulation of deposits can occur over weeks, months, or even years and may well be exacerbated over time by the greater diversity of the 0.5% sulphur blended fuels received on board and the propensity for compatibility issues. Such incompatibilities can arise, for example, when a heavy asphaltenic fuel is blended with a lighter aliphatic fuels.

The tank cleaning and related processes adopted by ship owners and operators before 2020 are likely to have reduced initial problems encountered soon after the 0.5% sulphur regulations came into effect. However, it seems less likely that such widespread diligence in cleanliness will be enacted on an ongoing basis. This will increase the risk of shipboard problems developing over time.

With a vessel in operation, even the most diligent ship owners and operators may not be immediately alerted to the risk of machinery issues until an incident occurs. Ship owners and operators can help reduce the risk of such incidents, which may have serious and costly consequences, by approaching the new blended marine fuel oils with continual caution.

How Deposit Buildup Can Go Unrecognised

Traditionally, so-called "bad" batches of fuel tend to be associated with immediate and costly consequences. In contrast, blended fuels can accumulate wax and asphaltene deposits at a relatively slow rate, as slowly as 1 mm every few months. In operational conditions, such gradual effects may be initially compensated for by the inbuilt reserve capacity of a ship's systems, with no immediate deterioration evident in vessel performance. Over time, gradual degradation and performance reductions are far less likely to be acted on, as opposed to sudden and dramatic step changes within a ship's plant, which would be expected to cause immediate alert.

Because of the diversity of the blended fuels now available, problems may develop, or be exacerbated, when changing over to a different stream, due to

compatibility issues, resulting in greater deposit formation. This may occur between two fuels that each individually meet required specifications.

These are examples of why a continual cautionary approach is now necessary for the new 0.5% Sulphur content blended fuels.

Why Additives Do Not Provide the Complete Solution

Additive suppliers are actively promoting the sale of fuel additives to remediate wax and asphaltene buildup in blended fuels and publicising their products by showcasing successful results achieved.

Whilst fuel additives can be of benefit and are generally formulated to fight crystallisation and the deposition of long-chain wax molecules and agglomeration of asphaltenes, the opposite can occur if an additive is not well matched to both the fuel itself and the deposited materials. Oil producers have teams of engineers and scientists dedicated to selecting, designing, and producing specific batches of additives for their oils. As most ship owners and operators understandably lack these resources, and rely on the expertise of the additive manufacturers, a cautionary approach is again encouraged, especially when purchasing any off-the-shelf additive packages for fuel tanks.

The Potential for Disputes

Statutory requirements for marine fuel oils are set out by IMO in their regulations for the prevention of air pollution from ships. Whilst, from 1st January, 2020, there is a very prescriptive requirement for the maximum sulphur content of marine fuels, there are also a number of other requirements that may be considered as more subjective, including that the fuel oil shall not include any added substance or chemical waste that jeopardizes the safety of ships or adversely affects the performance of machinery. Unfortunately, global industry standards are not presently available for definitively testing the potential of marine fuels to cause wax and asphaltene buildup, or indeed for testing the compatibility of fuel additives.

These new and different fuel stability and compatibility issues have been brought to the fore because of the shift to 0.5% sulphur fuels and the lack of industry standardised testing for a number of the relevant potential problems that the fuels may cause.

There are numerous and varied stakeholders within the marine fuel supply chain, including refiners and oil producers, fuel traders, suppliers and brokers and, with regard to a vessel itself, ship owners, operators, managers, charterers, and cargo interests, all backed by a multitude of insurers. At all stages, and for all parties, the timely provision of accurate technical pro-active advice can often prove invaluable in avoiding potential fuel issues and the possibility of subsequent disputes. If an incident should occur, then such advice can assist in effective mitigation to the benefit of all parties, whilst ensuring that relevant evidence is identified as necessary, as may be subsequently required. Ultimately, if a dispute should occur between parties then their ability to deal with this properly and efficiently may pivot on timely and accurate technical advice, to allow appropriate decisions to be made in an informed manner.

Regarding IMO 2020 fuels, if matters involving wax and asphaltene buildup arise, all parties can benefit from independent technical advice from knowledgeable experts who can scientifically investigate the root cause of the problem and advise on the best course of mitigation.

Exponent's Expertise

Exponent's multi-disciplinary, in-house, knowledge, experience, and expertise can add value at all levels of the supply chain and all stages of the marine fuel lifecycle. Exponent has a team of petroleum chemists and engineers and mechanical and marine engineers who can provide timely knowledge-based, scientifically supported, pragmatic advice and can comment with authority on all relevant fuel aspects, proactive and reactive, including advanced testing and assessment techniques, relevant to IMO 2020 fuel issues such as stability, compatibility, use of additives, regulatory compliance, and physical problems that may be encountered.

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