9 March 2021

IUMI Policy Agenda

7. Fuels

Brief description

Machinery damage is by far the most frequent cause of loss in marine insurance, and the numbers are likely to increase with the introduction of low-sulphur limits. Historically, 40% of all hull claims by number are machinery damage making up 30% of the costs.

Low-sulphur fuels
The MARPOL regulation limiting sulphur oxide emissions from ships with a global cap of 0.5% became mandatory on 1 January 2020.

Prior to this date, concerns had been raised in relation to fuel stability, differences in composition and blending from supplier to supplier and port to port, lower flashpoints than the minimum required by international safety regulations, inadequate safety margins for catalytic fines and ignition delays stemming from inferior combustibility. The Maritime Safety Committee agreed in December 2018 to include in its biennial agenda an output on “Development of further measures to enhance the safety of ships relating to the use of fuel oil”. With a strong focus on safety issues related to flashpoint requirements, MSC 101 endorsed in June 2019 an action plan for the development of these measures in view of finalizing at MSC 104 in 2021.

Guidance is offered by amongst others ISO, classification societies, the International Council on Combustion Engines (CIMAC) and industry associations. In August 2019, a Joint Industry Group published a Guidance on the supply and use of 0.50%-sulphur marine fuel. The guidance is supported by IUMI as one of the project sponsors. The publication provides guidance for stakeholders across the marine fuels and shipping industries, from fuel blenders and suppliers to end users. It presents the specific safety and operational issues relating to the supply and use of max. 0.50%-sulphur fuels, an overview of fuel quality principles, and the controls that should be put in place to ensure that safety issues are identified, prevented and/or mitigated. It addresses issues such as fuel compatibility, fuel stability, and fuel handling and storage, and contains a comprehensive review of existing operational factors that can affect safety.

To get a better understanding of the quality of the new fuels and possible safety implications following the implementation of the IMO 2020 sulphur regulation, BIMCO, ICS, INTERCARGO and INTERTANKO conducted a survey on fuel quality and safety among shore-based personnel in the period February – May 2020. Of the respondents, 14% had not experienced any off-spec or operational quality issues, while 62% had to some extent experienced increased sludge deposits. The report concludes that the transition to the 0.5% sulphur limit has not been without problems, and as fuel oil

properties are fluctuating, quality and safety problems will continue to be a challenge for the global shipping industry.

Cat fines

The most typical and well-known contaminant that can destroy an engine in a short time is cat fines. Cat fines are an inevitable by-product of refining and consist of small particles of metal that are deliberately introduced to 'crack' the fuel. Unless removed by purification, cat fines will become embedded in engine parts and cause serious and rapid engine damage. Filtration of fuel has been a requirement on board for many years, but crews are now noticeably less experienced and less reliable in operating the systems. Cat fines due to inadequate tank cleaning and sediments in tank bottoms is also a more common issue since the introduction of IMO 2020.

Vessel operators and crew often have no idea about the purity of the fuel they use, nor is there any obligation to find out before using it. Often, the purifiers installed are inefficient and cannot cope. Cases are known where filters have been removed. A discrepancy exists between ISO standards for cat fine content[1] and the content recommended and anticipated by engine manufacturers in engine design. Engines need fuel with a concentration of cat fines at no more than 15ppm, but fuel is produced and sold at 60ppm and more. Effective filtration, purification and fuel management is required. There is clearly a need for more crew training and somebody to verify that the equipment and systems installed actually remove the cat fines on their way to the engine.

According to the fuel testing agency DNV Petroleum Services, the bunker fuel industry in the U.S. has seen a rise in metals content as a result of regulations to reduce the level of sulphur in bunker fuel. Low sulphur fuels are less lubricating, and this combined with the introduction of increased amounts of abrasive materials, causes damage. Once cat fines become embedded in engine parts, they cannot be removed. Until fairly recently, such losses have simply been described as engine damage or crew negligence and the real cause not identified. It is only now that definite attributable losses are being reported.

Claims due to cat fines have been identified in the range of USD 300,000 to USD 1.5 million, mostly in low speed engines. Wear is very rapid; for example, if liners are replaced, they could be worn out again in three days. In a technical paper presented at the CIMAC Congress in 2013, cat fines were found in 84% of all the cylinder liner high wear cases investigated. In a more recent study[2] that was published after the new IMO 2020 sulphur regulation took effect, 31% of the respondents answered they had experienced operational issues caused by increased wear and tear of cylinder liners, piston rings or other components due to increased amounts of cat fines in the fuel oil.

Contributory changes which would help:

- Sampling and testing of fuel before use
- Improved fuel handling on board

[1] HFO with a cat fines content of up to 60ppm is compliant with the ISO 8217:2010 fuel standard
[2] BIMCO, ICS, INTERCARGO, INTERTANKO: 2020 Fuel Oil Quality and Safety Survey, 19 August 2020

- Improve the quality of bunkers
- Alter the ISO standard
- Charter/bunkering contracts should specify fuel less than 60ppm
- Regular cleaning of filters, frequent drainage
- Clean the settling and service tanks during dry dock
- Check centrifuge capacity on specifications for new buildings
- Ensuring optimized fuel system treatment
- Introducing a new fuel cleaning system layout
- Automatic control of the cleaning flow rate
- Intensified monitoring of the fuel treatment efficiency

IUMI raised the need of more class involvement to ensure that vessels can safely operate on the new fuels required in the future with IACS in January 2011, and attended a meeting with the Machinery Panel in September 2013 to present the insurance industry's concerns. Following this meeting, the IACS Machinery Panel decided to review the members' current requirements on facilities provided for handling the fuel on board to establish a common baseline. The IACS Recommendation for petroleum fuel treatment systems for marine diesel engines was subsequently published in July 2017.

Fuel contamination

Contaminated supplies of biodiesel fuel that were first reported in the US Gulf region in February 2018 have since persisted on an unprecedented scale and may have affected as many as 1,000 vessels.

This contamination has led to a range of technical problems, including blocked fuel filters, fuel pump seizures an even loss of main engine power. The cost of an engine damage could be up to USD 800,000 for an individual vessel. The loss of engine power may lead to serious incidents such as collisions and groundings.

Testing to ISO8217 levels will not necessarily show if the fuel is contaminated or not, as the suitability of biofuels requires gas chromatography and specialised equipment in a laboratory to determine any contamination. This test will generally take 7 to 10 days, and there are today not enough laboratories to perform the necessary testing. Consequently, vessels are forced to sail with fuel in separate tanks and rely on the ability of the crew and equipment to make the fuel fit for use.

IUMI believes that the current system with the end-user taking all the risk is unacceptable. Rather than the end user, refineries should be compelled to do the testing and confirm the delivery of non-contaminated fuels. In parallel, the ISO review of low-sulphur fuels should also include an amendment of the ISO8217 to deal with biofuels.

A joint MEPC-MSC circular addressing the delivery of compliant fuel oil by suppliers was approved by MEPC 74 and MSC 101 in May and June 2019, respectively. The Circular recommends that Member States take appropriate action to ensure that fuel oil suppliers under their jurisdiction deliver compliant fuel.

In December 2018, BIMCO published a Marine Fuel Sulphur Content Clause for Time Charter Parties. The Clause states that charterers are obliged to provide fuel that complies with MARPOL requirements, and also use suppliers and bunker barge operators who comply with the same. Shipowners remain responsible for the fuel management.

Relevant authority / organisations and documents

- **IMO – MEPC & MSC**
  - MARPOL Regulation 14 & Annex VI: "Prevention of Air Pollution from Ships, allowing for special (SOx) Emission Control Areas".
  - MSC93/INF.8: Safety implications arising from the supply of "Out of Specification" Marine Fuels, submitted by ICS and IPTA, 13 March 2014.
  - MEPC70/INF.12: Study on fuel oil quality, submitted by INTERTANKO, 22 July 2016.
  - PPR4/20/3: Justification and scope for a new output on effective implementation of the 0.50% m/m global sulphur limit, submitted by BIMCO, CLIA, ICS, INTERCARGO, INTERTANKO, IPTA and WSC, 25 November 2016.
  - MEPC71/5/3: Report of the correspondence Group on Fuel oil quality, submitted by the United States, 31 March 2017.
  - ISWG-AP1/2/12: Safety implications associated with 2020 fuels and their respective challenges, submitted by Liberia, Marshall Islands, ICS, BIMCO, INTERTANKO, INTERCARGO and WSC, 15 May 2018.
  - MEPC 73/5/17: Joint industry guidance on potential safety and operational issues related to the supply and use of 0.50% maximum sulphur fuels, submitted by ISO, OCIMF, IPIECA, IMarEST, RINA and IBIA, 31 August 2018.
  - MSC100/8/1: Effective implementation of existing provisions for fuel quality and safety in IMO conventions, submitted by Liberia, ICS, INTERTANKO, IPTA and INTERFERRY, 28 September 2018.
  - MSC100/8/2: Safety implications and respective challenges associated with 2020 compliant fuels, submitted by Bahamas, Liberia, Marshall Islands, Panama, BIMCO, INTERCARGO and INTERTANKO, 28 September 2018.
  - MEPC.1/Circ.875: Guidance on best practice for fuel oil purchasers/users for assuring the quality of fuel oil used on board ships, 26 April 2018.
  - MEPC.1/Circ.875/Add.1: Guidance on best practice for fuel oil suppliers assuring the quality of fuel oil delivered to ships, 9 November 2018.
  - MEPC.1/Circ.878: Guidance on the development of a ship implementation plan for the consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI, 9 November 2018.

- MEPC.1/Circ.880: Reporting of availability of compliant fuel oils in accordance with regulation 18.1 of MARPOL Annex VI, 9 November 2018.
- MSC100/WP.11: Report of the Drafting Group on Fuel Oil Safety Matters, 5 December 2018.
- MSC101/8: Method of work for evaluating the need for further measures to enhance the safety of ships relating to the use of fuel oil, submitted by IACS, 29 March 2019.
- MSC101/8/2: Development of further measures to enhance the safety of ships relating to the use of fuel oil, submitted by ICS, INTERTANKO, INTERCARGO and IPTA, 16 April 2019.
- Resolution MEPC.320(74): 2019 Guidelines for consistent implementation of the 0.50% sulphur limit under MARPOL Annex VI.
- MEPC.1/Circ. 881: Guidance for port state control on contingency measures for addressing non-compliant fuel oil, 21 May 2019.
- MEPC.1/Circ. 884: Guidance for best practice for member state/coastal state, 21 May 2019.
- MEPC.1/Circ.864/Rev.1: 2019 Guidelines for on board sampling for the verification of the sulphur content of the fuel oil used on board ships, 21 May 2019.
- CCC6/INF.6: FSA study on the use of low-flashpoint oil fuels, submitted by the EC and Member States, 10 June 2019.
- MSC101/WP.10: Development of further measures to enhance the safety of ships relating to the use of fuel oil, Report of the Working Group, 11 June 2019.
- MSC-MEPC.5/Circ.15: Delivery of compliant fuel oil by suppliers, 24 June 2019.
- MEPC75/5/2: Bunker Supplier Licensing Schemes, submitted by ICS, BIMCO, INTERTANKO and WSC, 27 December 2019.
- MSC102/6: Development of further measures to enhance the safety of ships relating to the use of fuel oil, report of the Correspondence Group, 18 February 2020.
- MSC102/INF.19: Lessons learned from the mechanical incident caused by non-compliant fuel oil that contains deleterious chemicals, submitted by China, 10 March 2020.
- MSC102/6/2: Comments on document 102/6, submitted by the Cook Islands and ICS, 24 March 2020.
- MEPC76/5: Review of 2020 marine fuels quality, submitted by ISO, 29 January 2021.

- **EU**
  - Sulphur Directive 1999/32/EC with amendments.
- **CIMAC**
  - Congress 2013, Paper no. 51: “Onboard fuel oil cleaning, the ever-neglected process How to restrain cat-fine damages in two-stroke marine engines”. Paper presented by experts from MAN Diesel and

Turbo (Denmark), DNV Petroleum Services (Singapore), NanoNord (Denmark), Alfa Laval Tumba (Sweden).
    - Position Paper 6/2015: New 0.1% sulphur marine (ECA) fuels, June 2015.
    - WG7 Fuels: Guideline - Cold flow properties of marine fuel oils, January 2015.
    - WG7 Fuels: Fuel quality Guide - Ignition and combustion, 2011.
    - WG7 Fuels: 2018 marine fuel incidents, November 2018.
    - WG7 Fuels: Guideline – Marine fuel handling in connection to stability and compatibility, November 2019.
    - Position Paper 01/2020: Zero carbon energy sources for shipping (ISWG-GHG7/5/1, submitted by EUROMOT, 5 February 2020)
        - White Paper 1: Production pathways for hydrogen with a zero carbon footprint
        - White paper 2: Zero and net zero carbon fuel options
- **UK P&I Club** Risk Focus: Loss of power
- **Joint Hull Committee** information pack: Marine engine damage due to catalytic fines in fuel, joint paper with Braemar (The Salvage Association), 26 September 2013
- **U.S.**
    - Environmental Protection Agency (EPA): North American Emission Control Area: http://www.epa.gov/otaq/oceanvessels.htm#north-american
    - Coast Guard: Safety Alert 10-18: U.S. Gulf Coast bunker contamination, 8 June 2018.
- **Wärtsila** Fuel Oil Requirements (Heavy Fuel Oil).
- **MAN:** Service Letter SL2014-593/DOJA, December 2014.
- **Gard** Loss Prevention Circular No. 01-14: Prevention of engine damage due to catalytic fines, February 2014.
- **IACS Machinery Panel:** No. 151 Recommendation for petroleum fuel treatment systems for marine diesel engines, July 2017.
- **ISO:**
    - 8217:2017 – Specifications of marine fuels, 21 March 2017.
    - ISO/PAS 23263:2019: Petroleum products – Fuels (class F) – Considerations for fuel suppliers and users regarding marine fuel quality in view of the implementation of maximum 0.5% sulfur in 2020, September 2019.
- **U.S. Coast Guard:**
    - Safety Alert 13-15: Ultra Low Sulphur Fuel Oil & Compliance with MARPOL Requirements, 19 November 2015.
- **IUMI:** Position Paper on Catalytic Fines and Engine Damage, 8 March 2016 (https://iumi.com/opinions/position-papers).
- **INTERTANKO** Critical review: Contaminated Bunkers damage hundreds of ships. Do authorities really care?, 10 August 2018.

- **International Chamber of Shipping:** Provisional guidance to shipping companies and crews on preparing for Compliance with the 2020 'Global Sulphur Cap', September 2018.
- **BIMCO:**
  - 2020 Marine sulphur content clause for time charter parties, 10 December 2018.
  - 2020 Fuel transition clause for time charter parties, 10 December 2018.
- **Joint Industry Guidance:** The supply and use of 0.50%-sulphur marine fuel, 20 August 2019.
- **Exhaust Gas Cleaning Systems Association (EGCSA):** Global marine SOx emissions regulation map: https://www.egcsa.com/map-regulations/
- **BIMCO, ICS, INTERCARGO and INTERTANKO:** 2020 Fuel Oil Quality and Safety Survey, 19 August 2020.

Timeline / important dates

- **Sulphur limits:**
  - Californian waters: 0.1% sulphur limit as of 1 August 2012.
  - North American Emission Control Area (ECA): 1.0% sulphur limit as of 1 August 2012.
  - European and North American ECAs: 0.1% sulphur limit as of 1 January 2015.
  - MARPOL – outside ECAs: 0.5% sulphur limit as of 1 January 2020.
  - China:
    - Coastal territorial waters, except coastline Hong Kong, Macao and Taiwan: 0.5% sulphur limit as of 1 January 2019.
    - Inland water ECAs: 0.1% sulphur limit as of 1 January 2020.
    - Regulated waters of Hainan Island: 0.1% sulphur limit as of 1 January 2022.
  - South Korean ECA:
    - Certain ports introduces 0.1% sulphur limit from 1 September 2020.
    - 0.1% sulphur limit when navigation in the ECA area from 1 January 2022.
- IACS letter to IUMI 23 July 2012. IUMI response 19 November 2012.
- Loss Prevention workshop, IUMI conference London, 15-18 September 2013.
- Meeting with IACS Machinery Panel, 3 September 2013.
- IACS Unified Requirement: 2Q 2016.
- MEPC 74: 13 - 17 May 2019.
- Joint industry project of ship owners, bunker suppliers and other interested parties (BIMCO, ICS, OCIMF, IPIECA, Intertanko, Intercargo and others, IUMI is observer) aim to publish a guidance in July/August 2019. Progress was reported to PPR in February 2019.
- MEPC 75: 16-20 November 2020; adoption of guidelines and treatment of MARPOL samples.

- New ISO 8217 standard expected to be published in 2023.

IUMI will:

- Encourage implementation of the new IACS recommendation for petroleum fuel treatment systems for marine diesel engines by all IACS members.
- Increase awareness by presenting available documentation of losses due to cat fines, and warn of the risks involved.
- Monitor developments related to switch-over from heavy fuel to distillates in the ECAs.
- Encourage an amendment of the 60mg/kg limit for cat fines and the inclusion of biofuels in the ISO standard.
- Support a review by MSC of the safety aspects of implementing the 0.5% sulphur limit with effect from 2020.
- Suggest that refineries are compelled to test and confirm the delivery of non-contaminated fuels.