BRITANNIA LOSS PREVENTION

B!NSIGHT

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ALTERNATIVE FUELS - METHANOL

THE MARITIME INDUSTRY ENCOUNTERS UNPRECEDENTED CHALLENGES AS IT STRIVES FOR DECARBONISATION AND THE ATTAINMENT OF NET-ZERO EMISSIONS.

Decarbonising shipping is not only an environmental imperative but an emerging area of innovation, reflecting the industry's shift towards alternative fuels.

WAVES GROUP

OUR PARTNER FOR THIS ISSUE

Waves Group is a leading, independent maritime and offshore consultancy with a global presence. We provide essential advice, analysis, and data to support clients in the shipping and offshore energy sectors, enhancing operational confidence and certainty in outcomes.

Our 24/7 worldwide response team assists clients in both planned projects and unforeseen circumstances. With a solid track record built on years of operational experience, we offer practical advice backed by detailed technical analysis and data, reducing uncertainty and solving problems effectively.

Our team of experts, including Master Mariners, Marine Engineers, Naval Architects, and Maritime Civil Engineers, offers specialised expertise in areas such as fires, marine salvage, offshore energy, cranes, alternative fuels and maritime data acquisition and analysis. From project inception to completion and beyond, we support clients in marine casualties, disputes, port operations, offshore energy infrastructure construction and decommissioning.

With offices located in London, Southampton, Singapore, Houston, and Rotterdam, we ensure swift and efficient support for projects worldwide.

LIQUEFIED NATURAL GAS (LNG) IS CURRENTLY TAKING THE LEAD AS A TRANSITIONAL FUEL; HOWEVER, SEVERAL POTENTIAL ZERO-EMISSION FUELS SUCH AS **METHANOL** AND **HYDROGEN** ARE ALSO ON THE RISE. IT IS UNCERTAIN WHICH FUEL WILL BE THE PREFERRED CHOICE OF THE FUTURE, AND IT IS LIKELY THAT A VARIETY OF ALTERNATIVE FUELS WILL BE REQUIRED TO MEET FUTURE DEMAND.

As part of their decision making, shipowners need to perform due diligence which includes a thorough risk identification and assessment when choosing an alternative fuel. As part of this assessment, several stakeholders will need to be consulted, for example the engine maker, fuel supplier, classification society, hull & machinery insurers and the ship's flag state.

CONSIDERATIONS THAT SHOULD BE TAKEN INTO ACCOUNT INCLUDE:

1. **SUITABILITY AND IMPACT ON THE ONBOARD ENGINES**
   The engine maker should be consulted to determine whether the onboard engines are suitable for consuming the selected alternative fuel or whether the engine will require any retrofitting.

2. **FUEL MANAGEMENT**
   Handling alternative fuel onboard is likely to present different operational hazards compared to fossil fuels. Therefore, it is essential to train the crew properly in handling these new fuels.

3. **HEALTH, SAFETY AND ENVIRONMENT (HSE)**
   While the alternative fuels may have their obvious environmental benefits, they may come with some increased safety risks. Therefore, any alternative fuel should be accompanied by a thorough assessment of its HSE risks, and this should form the basis of the onboard safety measures for handling the fuel.

4. **QUALITY**
   With the current lack of international standardisation, a clear and detailed bunker specification needs to be developed by the shipowner to ensure suitable fuel is delivered.

Britannia's Loss Prevention department has collaborated with Waves Group to provide practical advice on the widely discussed alternative fuels: Biofuels, Liquefied Natural Gas, Methanol, Ammonia, and Hydrogen. The examination for each of these alternative fuel types will focus on good practices in storage, handling, bunkering, safety and emergency response.

This guidance will focus on methanol, a fuel that has been safely transported on chemical tankers for many years. The push to decarbonise the maritime industry has elevated methanol's status as a readily available, low-carbon fuel, with the first commercial methanol-fuelled vessels already operational. Regarding legal framework, methanol as a fuel will fall under the guidance of the International Code of Safety for Ships using Gas or other Low-flashpoint Fuels (IGF) code and MSC.1/Circ.1621, specifically addressing bunkering, storage, and onboard handling.

STORAGE

METHANOL STAYS IN LIQUID FORM AT AN AMBIENT TEMPERATURE AND PRESSURE AND IS THEREFORE EASIER TO STORE THAN THE ALTERNATIVE CRYOGENIC FUELS SUCH AS LNG, AMMONIA OR HYDROGEN.

With a boiling point of 65 °C, there is minimal concern around vapour pressure control during storage in fuel tanks. However, due to its low flash point, maintaining an inert atmosphere in the fuel tanks is imperative during normal operations.

As inert gas will also be used on the safety and purging systems for the methanol consumers, it may be most effective to consider fitting a nitrogen production and storage system to achieve the requirements for inert gas.

Otherwise, permanently maintaining inert gas onboard is essential to cover at least one voyage from port to port, accounting for the anticipated maximum fuel consumption and trip length. Additionally, sufficient inert gas must be available to maintain the fuel tanks in an inert condition for a minimum of two weeks in harbour with minimum port fuel consumption.

A cofferdam must shield integral fuel tanks, excluding areas bound by the shell plating below the lowest possible waterline, along with other fuel tanks housing methanol and fuel treatment preparation spaces.

Independent fuel tanks can be located on an open deck or within a fuel storage hold space. If located on an open deck, a drip tray will be required for containment of leakage. A water spray system for emergency cooling should also be fitted. Independent tanks must be securely fixed to the ships structure, able to resist any expected external forces.

Portable fuel tanks may be used, ensuring they meet independent tank requirements while incorporating additional specifications for integration into the ship's control and monitoring systems. Additionally, an approved method for connecting to the ship's fuel piping systems, such as through a flexible hose must be provided.

Pressure and vacuum relief valves should be fitted to each fuel tank, directing the venting to a safe location on an open deck.

BUNKERING

BUNKERING METHANOL TO THE SHIP'S PERMANENT TANKS, GIVEN ITS LIQUID STATE AT AMBIENT TEMPERATURE, FOLLOWS A PROCESS SIMILAR TO CONVENTIONAL FUEL BUNKERING.

However, as the vessel adheres to the IGF code, the following considerations apply:

1. Plan each bunkering operation individually, collaborating closely with the bunker supplier. This planning includes:
    a) Conducting a combined risk assessment
    b) Performing a compatibility assessment
    c) Developing a joint plan of operations
    d) Creating a separate plan and risk assessment for any simultaneous operations (SIMOPs)
    e) Confirming the methods of communication
2. Install an Emergency Shutdown System (ESD) on the vessel, connecting it to the bunkering sources ESD system during the bunkering operations
3. Test the ESD system after connecting the bunkering hose and before methanol transfer
4. Fit a filter/strainer at the bunkering source to prevent the ingress of foreign objects
5. Purge bunker hoses and lines with nitrogen before starting bunkering, ensuring it is below the Lower Explosion Limit (LEL) of methanol
6. Pressure test the manifold connection with nitrogen before commencing methanol transfer to confirm there are no leaks
7. Agree on maximum transfer rates with the supplier
8. Continuously monitor the fuel tank levels and pressures, considering the tank pressure relief valve capacity
9. Drain and purge bunker hoses and lines upon completing bunkering and before disconnection
10. Constantly monitor the vessel's moorings throughout the transfer operation to avoid a breakout situation
11. Use a dry break-away coupling/self-sealing quick release to stop methanol transfer and safely disconnect bunker hoses in case the vessel and source start moving apart (break out)
12. Ensure portable communication devices in the manifold area adhere to the approved standards.

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Ideally, the bunker station should be located on the open deck. If this is not possible, and the bunker station is partially or fully enclosed, arrange suitable ventilation and gas detection systems.

Note that connecting portable tanks to the fuel supply system is also considered bunkering. Ships with portable tanks should conduct a proper risk assessment and provide the ship's crew with a method statement for safe connection and disconnection.

HANDLING

Ensure that fuel lines within the engine room and up to the consumers have a double skin, with the annular space around the inner pipe equipped with a mechanical ventilation of under- pressure type. This ensures constant evacuation and ventilation to the open air. The annular space should also be monitored for leaks, connecting it to a suitable drainage tank for collection and detection of possible leaks. The outer pipe must be gas and liquid tight. Each consumer should be fitted with its own remotely operated shut-off valve and there should be a fuel master shut- off valve capable of stopping methanol supply to all consumers simultaneously. If dual fuel engines are fitted to the vessel, an automatic changeover system is necessary to switch from methanol to conventional fuel in case of a methanol fuel shut-off. This changeover should be capable of maintaining power and propulsion. Dual fuelled engines will require the use of conventional pilot fuel, which is always in use when the engine is operating on methanol and any loss of the pilot fuel supply will cause the methanol master valve to close. All methanol fuel piping should be provided with arrangements for gas freeing and inerting.

SAFETY

Methanol is a toxic substance and ingestion of a small amount, approximately 10 – 30 millilitres may cause death. Although methanol is totally miscible with water, it retains flammability even at high water concentrations; a 75% water and 25% methanol mixture is considered flammable. Methanol is a chemical solvent, which has important implications for materials selection and firefighting. The molecular weight of methanol is marginally greater than that of air, so in the event of a spill or leak, methanol liquid will pool, and vapour may become trapped in confined spaces and low-lying areas. Methanol is easily dissipated from ventilated locations but will not dissipate easily from non-ventilated locations. Due to its total miscibility with water, the environmental impact of a methanol leak is smaller than that of a conventional hydrocarbon fuel, necessitating appropriate positioning of gas detection systems.

All compartments containing the methanol fuel system must have a fixed fire detection and fire alarm system complying with the Fire Safety System Code (FSS). The engine room and compartments housing the methanol fuel system and its components should be protected by an approved fire extinguishing system, using a medium suitable for alcohol fires.

ESSENTIAL FIRST-AID PROCEDURES, DECONTAMINATION SHOWERS AND EYEWASH STATIONS SHOULD BE LOCATED NEAR THE EXITS FROM SPACES CONTAINING METHANOL PIPING SYSTEMS, FOR EXAMPLE:

- AT BUNKERING STATIONS
- EXITS FROM THE FUEL PREPARATION ROOMS
- IN ENGINE ROOMS
- EXITS FROM TANK CONNECTION SPACES.

EMERGENCY RESPONSE

Methanol burns with a clear flame and without smoke, making it difficult to see in daylight. It will still burn at four parts of water to one part of methanol, alcohol-resistant firefighting foam or dry powder is best suited for methanol fires. Although water can be used, it will require copious amounts to dilute the methanol to a suitable level where it can be extinguished.

While CO2 can be used to extinguish fires in compartments, a greater concentration is required compared to conventional fuel fires.

USE A SUITABLE ALCOHOL RESISTANT FOAM OR DRY POWDER TO EXTINGUISH

USE WATER TO KEEP SURROUNDING AREAS AND CONTAINERS COOL

The emergency response plan should address the following scenarios:

- Fire (pool, jet or gas fuelled)
- Large spill and risk of exposure to personnel (ventilation and isolation of ignition sources in case of gas cloud formation)
- First aid (accidental exposure through inhalation, ingestion, or skin absorption)

FURTHER INFORMATION

For further considerations on risks associated with alternative fuels please see our guidance on decarbonisation.

For further information, please do not hesitate to contact the loss prevention department.