

# LNG as fuel



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- LNG bunker fuel is a possible solution to meet the future EU regulations, directed at zero emission fuels.
- LNG bunkering could soon become commercially and economically viable for inland shipping.
- Whilst the same hazards exist for LNG as cargo and LNG as fuel, the risks associated with LNG as a fuel are not the same. Training is essential.

A growing number of operators have asked the club for our opinion on LNG (Liquefied Natural Gas) powered ships. This article outlines some of our considerations.

## Introduction

Compared to road transportation, inland shipping has been considered to have a lower carbon footprint. Since January 2011, EU regulations have required low sulphur fuel for inland shipping, but the next raft of regulations is for emission reductions for nitrous oxides (NO<sub>x</sub>) and particulate matter (PM). As an interim step towards zero emission fuels, LNG has come out as a valuable solution. Coupled with investment for LNG bunkering infrastructure in North Europe, it is becoming more commercially and economically viable and the first LNG inland ships have started operating.

LNG powered ships is not new technology. The LNG tanker fleet has used boil off gas since the 1980's. LNG tankers have a good safety record and are designed and operated within established IMO regulations and recommendations: IGC – Safe Carriage by Sea of Bulk Liquefied Gasses; Resolution MSC 285(86) Interim Guidelines on Safety for Natural Gas-Fuelled Engine Installations in Ships (2009); and the recently accepted draft "International Code for Ships using Gas or other Low Flash-point Fuels" (IGF Code)

## Rules and regulations

For ships operating on the European inland waterways, mostly the ARA (Amsterdam Rotterdam Antwerp) and the river Rhine with adjacent

rivers and canals, IMO regulations don't apply. The relevant rules fall between the EU International Carriage of Dangerous Goods (ADN) and the Central Commission for the Navigation on the Rhine (CCNR) regulations.

These existing rules have many gaps and contradictions for carriage of low-flash point fuel as bunkers instead of cargo. ADN regulations have recently been revised and these new regulations have been formally accepted by the EU. These new regulations cover rules on ship design, operational safety and crew training for ships fuelled by LNG. Next to the ADN standards and guidelines, class societies and ISO have issued standards applicable to, inter alia, the system design and safety issues regarding LNG fuelled ships.

## Technical risks

The technical risks of a LNG fuel ship, (which must have two fuel systems i.e. either a duplicated LNG system or more commonly, dual fuel MDO and LNG), can be 'designed out' by using detailed risk assessments with the aim of achieving inherent safety by controlling the hazards first before introducing mitigation. The ship design cannot be viewed in isolation: service life events such as commissioning, dry-docking and repairs should be considered. The forthcoming rules are risk assessment based rather than prescriptive; thus flag administrations and classification

One of the biggest issues for our underwriters is how to benchmark the risk for LNG fuelled ships as, at time of writing, there are less than 20 ships operating on European inland waterways. With so few ships and systems in operation there is no industry driven preference or commonality.



societies need to be consulted early on in the design process.

From a P&I loss prevention perspective, the key risks are interactions with other ships and shore facilities; interactions with other ship board operations; the storage, handling and transfer of LNG; maintenance of LNG systems; and emergency preparedness for an accidental gas release. In other words, 'the human element'.

#### Bunkering

There are three principle methods for LNG bunkering: direct from shore, from truck and ship-to-ship transfer. Bunker stations and procedures should be designed to protect the ship and crew from hazards. There are several important design considerations for bunkering: safety, vapour management, filling limits, communication and emergency shut-down. When training their crew owners and operators should be aware of the interface between LNG fuelled ships and the bunkers supply link.

#### Training

Even though LNG shipping has good safety records, training and knowledge is essential, as dealing with LNG as bunkers is a task very different from dealing with HFO bunkers or LNG as cargo. Training requirements are mandated by the EU and implemented by Flag administrations alongside any national laws. Compliance with such

requirements is cross-checked by vetting inspectors and class societies.

ADN sets out requirements on crew training, as an owner/manager is required to arrange training based on crew role and responsibilities. Training is type specific as decided by the company training manager. However, until training requirements are fully developed and adopted, the responsibility for providing sufficient training falls to individual owners and operators.

Emergency procedures also need to be developed specifically to deal with the additional hazards posed by LNG such as: fire and leakage procedures, hazardous zoning and protection, safety exclusion zones and dropped objects.

#### Conclusion

There are a number of considerations and hazards associated with LNG as a fuel, from ship design and life cycle through to bunker operations and crew training. The rules appear to be based on each component within the system, rather than the entire gas supply chain operation, therefore several gaps exist which owners and operators should be aware of. To implement a safe operation of LNG fuelled ships, the entire ship's operation, safety procedures and training schedules should be risk assessed and integrated as a whole, rather than bolted on to the safety management system.

Our concerns are highlighted in a report issued by the Norwegian Authorities (May 2014) following an investigation into the accidental LNG release from a hose connection during truck to ship bunkering operations of passenger ship *Bergensfjord*. The report made a number of recommendations, including bunkering not to be simultaneous with cargo operations, additional training of crew and personnel on quayside for bunkering operations, greater hazard awareness and the extension of the safety zones around the ship.

The same hazards exist for LNG as cargo and LNG as fuel:

- cryogenic effects of low temperature (-163°C);
- high expansion ratio (600:1)
- low flashpoint temperature (<60°C).

However, the risks associated with LNG as a fuel are not the same. Training is essential.