

LNG as fuel



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

LNG powered ships is not new technology; the LNG tanker fleet has used boil-off gas since 1982. 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); international classification rules for the Carriage of Liquefied Gasses in Bulk and Classification of Natural Gas Fuelled Ships.

It is clear that LNG bunker fuel is a solution to meet the future IMO MARPOL, Annex VI, regulations for nitrous oxides (NOx) and sulphur oxides (SOx) emissions, especially for ships that operate in emission control areas (ECA), such as the North Sea. Coupled with investment for LNG bunkering infrastructure in North Europe, it is becoming more commercially and economically viable for offshore support ships to operate using LNG as fuel.

Rules and regulations

At present, there are no statutory rules and regulations for LNG powered ships. In September 2014, the IMO formally accepted the draft International Code for Ships using Gas or other Low Flash-point Fuels (IGF Code), to establish statutory rules on ship design, operational safety and crew training for ships fuelled by LNG. The IGF Code is

expected to be adopted in 2016 or 2017. Until then, IMO's Resolution MSC 285(86) (as referred to above) serves as non-binding guidance for LNG fuelled ships. Next to the IMO standards and guidelines, class societies and NGOs such as SIGTTO, IEC and ISO have issued standards applicable to *inter alia* the system design and safety issues regarding LNG powered ships.

Technical risks

The technical risks of a LNG powered 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 societies need to be consulted early 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 shipboard 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'.

- LNG bunker fuel is a solution to meet the future IMO MARPOL, Annex VI, regulations for nitrous oxides and sulphur oxides emissions
- LNG bunkering could soon become commercially and economically viable for offshore support ships
- Whilst the same hazards exist for LNG as cargo and LNG as fuel, the associated risks are not the same

One of the biggest issues for our underwriters is how to benchmark the risk for LNG powered ships as, at time of writing, there are less than 50 ships operating worldwide. With so few ships and systems in operation, there is no industry driven preference or commonality.



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. Regrettably, the IGF Code doesn't address the interface between LNG powered ships and the bunker's supply link, and this appears to be a gap that owners and operators should be aware of when training their crew.

Training

Even though LNG shipping has good safety records, training and knowledge are 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 IMO and implemented by Flag administration alongside any national laws. Compliance with requirements is cross-checked by port state control, vetting inspectors and class societies. For crew on a gas carrier, they require a 'tanker familiarisation with liquefied gas' endorsement, whereas there are no statutory requirements for crew training on LNG powered ships.

The IGF Code sets out requirements on crew training: a shipowner/manager is required to arrange training based on crew roles and responsibilities. For those directly involved with LNG bunkering, i.e. deck officers and engine officers, training is type specific as decided by the company training manager. However, until these training requirements are adopted and fully developed, the responsibility for providing sufficient training falls to shipowners 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 powered 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.