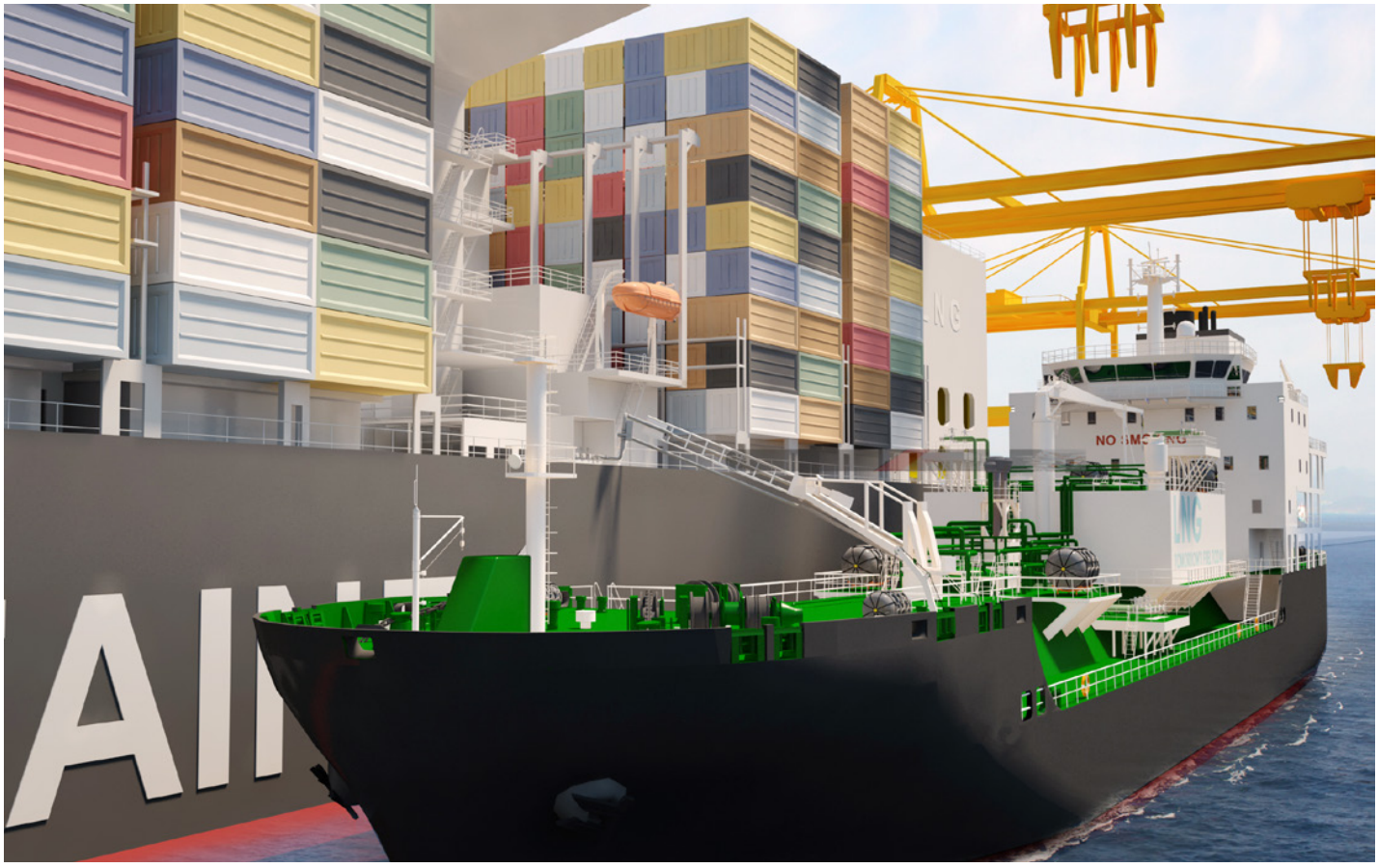
Safer and higher-performing LNG bunker vessels

We have entered a new era of ship fuels. The days when HFO was the supreme fuel are over and environmental concerns, demands for sustainability and stricter legislation have led to a variety of fuels to choose from: methanol, low sulphur heavy fuel oil (LSHFO), liquefied natural gas (LNG) and a variety of mixes of MGO (marine gas oil) and MDO (marine diesel oil). That LNG is one of the realistic alternative ship fuels among the ever-growing number of different fuels has probably not escaped anyone's attention. This article will focus on the new type of vessels that are coming to the market in increasing numbers, the LNG bunker vessel (LBV).



The STX 6500 LNG bunker vessel is under construction in South Korea. LBVs are short in length in order to be able to manoeuvre in port, and this means they will also be fairly wide in beam to be able to carry the desired amount of LNG. Finding the best compromise between cargo capacity, propulsion efficiency and manoeuvrability is the key to success. Courtesy of STX Offshore & Shipbuilding.

A long tradition of high performance and safety awareness

The performance and safety demands of conventional large LNG carriers (LNGC) are set at a very high level, both by industry associations, such as the SIGTTO (Society of International Gas Tanker and Terminal Operators) and the general public. The formal requirements together with a high level of health and safety awareness in the LNG business have been of great importance and the proactive safety culture within the industry has led to a very good track record when it comes to accidents and incidents.

This high standard is necessary as LNG can, if handled incorrectly, be a dangerous commodity with fatal and other serious consequences to personnel and the environment. Therefore, on account of the industry's desire to use LNG as a ship fuel, a new organisation has been established to ensure that these high standards are maintained in the LNG business: SGMF, the Society for Gas as Marine Fuel. SGMF has been formed by stakeholders in the LNG business in order to share best practices and promote safety

The balance between course keeping and manoeuvrability is key to success according to ship-owner BRP. BRP turned to SSPA with the goal of enhancing course-keeping performance on their two twin thruster-equipped bunker vessels, Fox Sunrise and Fox Luna. Courtesy of BRP.

when using LNG as a ship fuel and thus also as a bunker fuel.

The demands on LNG handling for LNG bunker vessels will be somewhat different compared to LNGCs, but nevertheless equally strict. Another document that comes into play is the recently published ISO guidelines regarding LNG and LNG bunkering: ISO/TS 18683. To learn more about it, you can read the article "A good starting point with challenges" in this issue of SSPA Highlights.

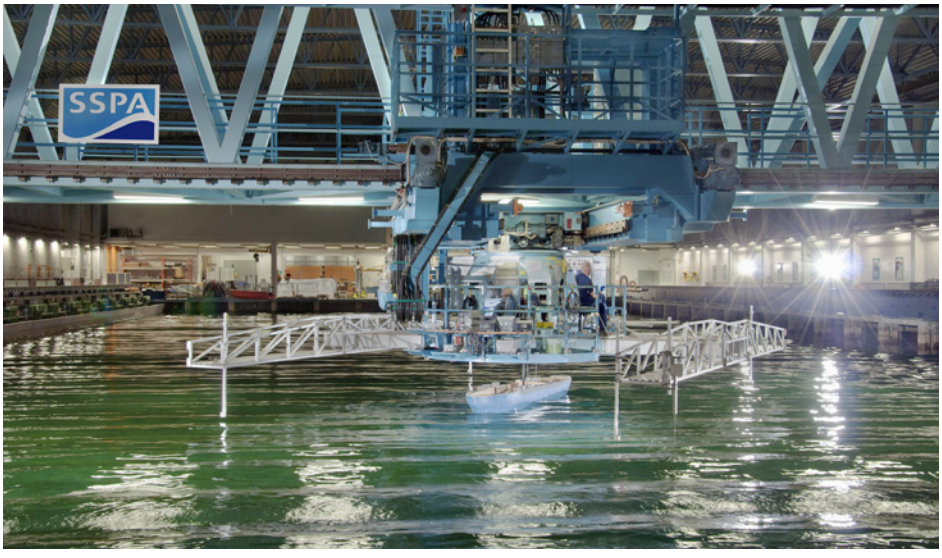
Contradictory performance demands require attention to detail

Using the traditional term "bunker barge", which is the most common term for a smaller tanker used to refuel other vessels, is in many cases misleading. Most of these "barges" are highly sophisticated tankers designed to carry out safe operations 24 hours a day, 7 days a week, 365 days a year. With liquefied natural gas in the fuel hose, ship-to-ship bunkering is more like refuelling a Formula 1 racing car than the traditional ship bunkering from old bunker barges that we are used to seeing in many ports. This is especially true in the case of refuelling Ro-Pax ferries with tight turnaround times, such as the Ro-Pax ferry M/S Viking Grace in Stockholm harbour.

The intended operational profile, i.e. the trading pattern, the different locations and harbours in which the LBV will operate, will decide the main dimensions and performance requirements of the LBV and will be taken into consideration when working on a new design. A vessel with a good fit to the operational profile will naturally have a larger operational window* and is thus likely to be more profitable.

Performance requirements are, however, often contradictory, such as the conflict between course-keeping performance and manoeuvrability. As there will always be trade-offs in the design stage, this is when the knowledge and experience of hull design, seakeeping and manoeuvring and propulsion design will be crucial.

As an example, the twin thruster solution, like that used in BRP's ships, will give superior positioning and manoeuvrability in narrow areas, such as inside a busy port or while positioning next to the receiving vessel in harsh weather conditions during offshore bunkering. The propulsion solution in this case will, however, often lack in course-keeping performance, especially when the vessel is designed with a full hull shape in order to carry a lot of cargo. The single skeg or twin skeg propulsion systems might offer better course keeping. Finding the best design compromise in order to fit the operational profile is challenging and there is not a single solution, since operational profiles frequently differ.



SSPA Marine Dynamics Laboratory – the useful tool for verifying seakeeping and manoeuvring performance. The free sailing model will ensure correct ship behaviour. Photo: Anders Mikaelsson.

A high-level solution partner for high-performance projects

SSPA has deep and far-reaching hydrodynamic knowledge regarding hull design and performance verification for a vast range of ships, including conventional large LNG carriers (LNGC). SSPA's ability to predict the ship's motions is not only crucial for assessing the performance of the ship, but it is also necessary for different kinds of operational studies and simulations, such as of ship-to-ship lightering and ships passing each other in narrow canals.

Verifying the design with a skilled partner, like SSPA, gives the future ship-owner, the shipyard or other stakeholders an independent view of the ship's performance, its fit to the requirements and highlights any possible improvements to the design.

SSPA has broad experience of performance verification and hydrodynamic design of this new type of vessel, the LBV. Using our collective skills, we are also able to support stakeholders in the LBV business with operational studies, risk analysis and simulations.

* Operational window = a term used to measure how often and in what weather and sea conditions a LBV is able to bunker.

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