LNG bunkering vessel for use in ice

Winters in the Baltic Sea can be challenging, especially in the Bay of Bothnia where the ice cover can grow up to one metre thick and wind forces ice into heavy ridges.

With the growing number of gas-fuelled vessels sailing in the Baltic Sea, the availability of liquefied natural gas (LNG) has been a bottleneck. Aker Arctic has now developed a concept for a bunkering vessel capable of operating in all prevailing ice conditions in the Baltic Sea.

Winters in the Baltic Sea can be challenging, especially in the Bay of Bothnia where the ice cover can grow up to one metre thick and wind forces ice into heavy ridges. Close to harbour areas, brash ice builds up over time creating uneven layers of rubble ice that can grow to be several metres thick.

New concept

"To improve the offering of LNG fuel to vessels sailing year-round in these conditions, we have developed a bunkering vessel concept with improved icebreaking capability compared to the ones currently in service or on order," says Naval Architect Joakim Konsin.

The versatile bunkering vessel is designed to bring LNG both to a terminal and directly to vessels, by rafting alongside another vessel at sea for delivery of fuel. The bunkering vessel will be able to move around in ice-infested areas to serve LNG-fuelled ships needing to bunker fuel.

The 115-metre long and 16-metre wide vessel concept is strengthened to the Finnish-Swedish ice class IA Super. It can manage harsh winters and all possible ice conditions in the Baltic Sea.

Equipped with two azimuthing propulsion units, the vessel can operate stern-first in heavy ice conditions utilizing the Double Acting Ship (DAS™) principle, to provide LNG bunkering services without need of icebreaking assistance. The LNG capacity of 5,000 m^3 is stored in independent Type C tanks.

Safety at all times

The hull form features a strengthened bulbous bow for efficient operations in open water and moderate ice conditions. The stern is designed to provide remarkable icebreaking capability while sailing stern-first in the worst ice conditions.

"Adopting this configuration, the ship is able to operate cost-efficiently and safely at any time," Konsin adds.

The ship's propulsion configuration provides a high degree of redundancy, reliability and superior manoeuvrability – which all are essential in ice navigation as well as provides efficient operation for bunkering. The twin azipods in the stern also ensure that the ship's ability to penetrate ridged ice fields will be excellent.

"The ship's open water design speed is 12.5 knots. Using its full propulsion power of 7 MW, the vessel can break 1 metre thick level ice in astern mode," Konsin says.

Additionally, all primary safety-related equipment and systems are protected by means of anti-icing arrangements and many deck elements are fitted with de-icing measures.

LNG bunkering operation in open water conditions. Photo by courtesy of Nauticor.

More availability of LNG

"A possible market for this type of vessel is delivering LNG from larger terminals in the area to smaller satellite terminals or storage facilities, which are currently served by trucks," Konsin contemplates. "Harbours in both Sweden and Finland could benefit of an ice-going bunkering vessel delivering LNG."

Newly opened terminals

Since last winter, several new LNG facilities have begun operations in the Baltic region. In addition to the terminal in Tornio in the north of Finland, a terminal in Vysotsk in south-western Russia has opened. Other LNG terminals include FSRU *Marshal Vasilevskiy* in Kaliningrad, Russia and Klaipeda in Lithuania.

The next developments in the LNG fuel industry are a bunkering vessel in Tallinn, Estonia, an LNG-terminal in Hamina, Finland (2020) and a large LNG terminal in Ust-Luga, Russia (2023).

"It is clear, that with the tightening of IMO emission regulations, LNG is increasingly chosen as fuel in new vessel acquisitions. An ice strengthened bunkering vessel is a viable option for securing fuel distribution in the toughest parts of Bay of Bothnia and also in the Gulf of Finland," Konsin says. ■

The new vessel concept is fitted with twin azimuth thrusters.

Technical details	
Lenght over all	114.0 m
Length between pp	111.5 m
Breadth moulded	16.0 m
Height	14.7 m
Design draft (LNG)	6.5 m
Draft (ballast)	6.0 m
Cargo volume	5200 m^3
Deadweight	2800 tons