



# Rapid advancement for LNG carriers

As the market for liquefied natural gas continues to expand, with big orders for LNG carriers in prospect and small-scale LNG taking off, Bureau Veritas looks at how vessel technology is fast evolving.

**L**NG carriers are evolving rapidly, with innovative containment systems, propulsion methods and re-liquefaction systems responding to charterers' and shipowners' changing needs.

The seaborne carriage of LNG has developed rapidly in recent years, thanks to a series of technical innovations. Today, many in-service LNG carriers benefit from new technologies such as evolved membrane containment systems, new engine technology and, for icebreaking ships, podded propulsion systems.

However, with new equipment comes new challenges. For owners and yards, the biggest concern is ensuring strong global architecture when building a new carrier. This means balancing the right containment and propulsion systems with the corresponding supporting equipment.

The operating profile of modern LNG carriers has changed – flexibility is now more important, with ships calling at different loading and offloading terminals, and requiring high fuel and energy efficiency. Where early LNG carriers were contracted for long periods (typically

20-25 years) and predetermined routes, modern vessels are chartered for relatively short periods and may travel numerous and changing routes. This requires greater flexibility in terms of ship size, onboard equipment, propulsion systems, and cargo management.

As early prototypes of containment systems developed, two dominant families rapidly emerged: the French membrane-type containment systems developed by Gaztransport and by Technigaz, and the self-supporting type 'B' containment systems developed by Norwegian company Moss Maritime and Japanese company IHI Group. Today, the merger of Gaztransport and Technigaz – now known as GTT – dominates the world of LNG containment systems, with variants of the NO96 and Mark III membrane systems installed in most newbuilds.

Increasingly, GTT has been offering more efficient variants of its Mark III and NO96 systems, approved by Bureau Veritas, that reduce daily boil-off rate (BOR). The lowest BOR, offered by GTT's Mark III Flex+ system, is now 0.07% of the tank volume per day.

## Fuel flexibility

Meanwhile, new propulsion methods have been developed to complement the design of LNG carriers. Steam turbine ships evolved into dual-fuel diesel electric (DFDE) ships, and from there into two-stroke dual-fuel powered vessels. Two-stroke engines offer major propulsive efficiency, and the dual-fuel capacity allows for the use of different kinds of fuels. This offers much needed flexibility for LNG carriers and improves cost-optimisation for shipowners.

The demand for fuel flexibility has driven leading companies such as Wärtsilä, Cryostar, Air Liquide and Babcock to develop a second wave of re-liquefaction systems, which are being installed on most new LNG carrier projects today. By re-liquefying LNG boil-off gas, ships can arrive at port with more of their cargo intact, providing greater flexibility and making this technology attractive to charterers and shipowners.

The search for optimal systems continues as technology advances. Key issues remain the relationship between propulsion and containment systems, the related question of re-liquefaction, and how to balance both elements to support the development of safe, efficient LNG carrier designs.

At Bureau Veritas, our experts focus on helping clients find the right balance for their vessels and address the related safety, regulatory and risk aspects. We help stakeholders make the best safety and commercial decisions based on critical technical insight, supporting shipowners and shipyards worldwide.

A notable recent example of innovative problem solving is the series of 15 Arctic-capable, ice-breaking LNG tankers built for the Yamal LNG project, dual-classed by Bureau Veritas and the Russian Maritime Register of Shipping (RS). Work involved developing an entirely new class of LNG carrier that can be operated year-round in second-year ice with old ice inclusions with a thickness up to 2.5mtr. Classed to Bureau Veritas notation COLD, this ensures the hull and equipment are winterised, and can continue to operate in temperatures as low as -45°C. ●