

PERFECt LNG-fuelled box ship moves into second phase

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An LNG carrier tank equipped with GTT technology. PERFECt partner GTT wants to break into container shipping (credit: Samsung Heavy Industries)

The PERFECt container ship project has accelerated. Rebecca Moore spoke to key partners, including DNV GL, about the design

The PERFECt liquefied natural gas (LNG) fuel project has moved forward after entering its second phase with new participants ABB, Caterpillar subsidiary Solar Turbines and Odense Maritime Technology (OMT) coming on board.

The trio and original project partners Gaztransport & Technigaz (GTT), CMA CGM and its subsidiary CMA Ships, and class society DNV GL signed a co-operation agreement at the SMM trade fair in Hamburg in September.

The Piston Engine Room Free Efficient Containership project investigates the possibility of using a combined gas and steam turbine (Cogas) system to power an ultra large container vessel. The first phase of the project, carried out by GTT, CMA Ships and DNV GL, showed promising results regarding the commercial competitiveness of the design compared to a heavy fuel oil (HFO)-fuelled ship with a conventional propulsion system. The aim of the second phase of the project is to detail the technical concept and its commercial feasibility and work towards the issuance of an approval in principle.

“CMA CGM and its subsidiary CMA Ships position themselves as pioneers by contributing to this world-leading innovation. We are glad to be part of the second phase of the PERFECt project, which aims at ensuring the efficiency of this innovative vessel design,” said CMA Ships executive vice president Ludovic Gérard. “The Cogas system with electrical propulsion gives us a great deal of freedom in the general arrangement and in tailoring the

installed power to the real operational requirements we are facing. New partners will bring their expertise to go further than the initial concept,” he added.

Malte Zeretzke, senior project engineer at DNV GL, told *Container Shipping & Trade*: “The result of the first stage of the study was really promising and persuaded us, along with CMA CGM and GTT, to investigate even further. In the second phase we are going into much greater detail to fully explore the optimisation potential. We want to be very concrete in terms of the costs and feasibility of this concept.”

The second study will finish in the middle of next year.

The benefits of using LNG to power a box ship are numerous. Mr Zeretzke said: “It is beneficial for the container ship industry to use this fuel, especially in light of the incoming sulphur cap in 2020. New liquefaction terminals are likely to be built, and it is expected that in future the price of LNG will drop, resulting in lower energy costs.”

He said the PERFECt concept was a good fit for the use of LNG. Even though the volume of the fuel tank is larger, because of LNG’s lower energy density, it saves space and even allows more containers on board compared with the same ship using HFO. “In this arrangement we selected gas and steam turbines combined with electric drives, which all have a very high power density. This means that just a few cubic metres are needed to provide the same amount of power, compared to an HFO concept, which saves space and enables the engineroom to be reduced in size.”

In the usual HFO vessel design, the engineroom is placed aft and a funnel is needed to get rid of exhaust gases. This arrangement encroaches on cargo space. Mr Zeretzke said: “The Cogas system means the funnel does not need to be aft. This allows us to shift the funnel for the turbines to the wheelhouse, while the turbines themselves are placed above the LNG tank, so cargo space is saved aft. This space saving more than compensates for the larger size of the LNG tanks.”

Gas and steam turbines have been used before on cruise ships, but never in a container ship. Today, a modern, land-based combined cycle LNG-fuelled power plant can reach fuel-to-power efficiency ratios of up to 60 per cent. This is considerably higher than conventional diesel engines, which can achieve up to 52 per cent, said Mr Zeretzke. This served as the impetus for the PERFECt project, he added.

There are challenges to overcome, as the system is complicated. “It is a complex power system where different components are interacting. And in a conventional vessel, having the engine positioned aft provides additional stiffness to the hull structure. However, the first phase of the PERFECt project demonstrated that with minor changes to the hull structure, such as some additional thickness in some steel plates and added radii, we can achieve the same results as in a conventional vessel.”

GTT is one of the founding companies of the PERFECt project. The France-based designer of containment systems with cryogenic membranes is supplying the design and engineering of the LNG tanks and the fuel gas handling system. Two tanks will be arranged with a total capacity of around 20,000m³ to match the power requirements of the ship. There will be structural elements between them to add to the structure of the ship.

“The results of the first phase prove not only that the project is technically and economically viable, but also that the proven technologies can be deployed to make the PERFECt project a reality”, said GTT chairman and chief executive Philippe Berterottière.

He added: “Our two main areas of focus for LNG as fuel are cruise ships and container ships. At present there are consolidations in this sector and fuel prices are low, but at a certain point in time there will be new orders for container ships, and I think owners will consider LNG prices attractive and be ready to invest in LNG tanks and associated systems. There is also the fact that there are an increasing number of initiatives for setting up the infrastructure needed for LNG supply in harbours and ports.”

GTT has detailed plans about how to fit an LNG tank into a container ship and is in talks with several shipyards on this subject. Mr Berterottière said: “We are looking at ways to apply our technology to container ships. The main GTT advantage for container ships is that our tanks are optimised, so for a given volume you can carry more LNG than competing systems. This makes our technology more cost effective.”

The reason there is more space for LNG is that the GTT system is totally integrated into the vessel’s structure. As well as being the right shape to fill with more liquid, it fits the natural shape of the ship.

To assist the shipping industry with this energy transition and to better respond to customer requirements wishing to adopt LNG propulsion systems, GTT is forging strategic industrial partnerships with key players such as Endel in France, AG&P in the Philippines and Spain’s Gabadi. AG&P and GABADI.

This partnership reinforces both parties’ product offering to clients seeking to equip their vessels with LNG membrane tanks adapted to suit a range of ships – including cruise liners, container ships, bulk carriers and ro-ro vessels.

“All these partnerships and initiatives are welcome and helpful in the long run to encourage these industries to move to LNG,” Mr Berterottière said. “Today, LNG is clearly less expensive than marine gas oil and nearly at par with HFO. Once the price differential becomes more important, it will fully justify the investment in LNG tanks. All GTT initiatives aim at establishing a competitive and environment-friendly supply chain”.