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Julien Bec of GTT: collaboration holds key to meeting future challenges

Julien Bec, Vice President, LNG as Fuel division at French technology and engineering company Gaztransport & Technigaz (GTT), offers his perspective on the lessons that the introduction of LNG into the fuel mix offers for other alternative fuels, and discusses the challenges of anticipating customer demand.

From an engineering and materials perspective, what do you think have been the most important technological innovations during your career?

I have seen a number of important innovations in several sectors. I started my career as an engineer at automaker Peugeot in the 1990s, where we were already conducting research into battery hybridisation. And I spent an important phase of my career at [leading French specialty steelmaker] Vallourec. The tubes Vallourec supplied during the Deepwater Horizon emergency remediation operation were incredible pieces of engineering – and they worked. Some of the advance in materials have been very impressive.

But selecting a single advance in LNG is very difficult. If you compare one of the latest most sophisticated LNG-fuelled vessels, such as CMA CGM's 23,000 TEU Jacques Saade – which is a superlative vessel – and compare it with the first LNG-fuelled vessels operating off Norway, which had tanks with a capacity of perhaps 300cbm, and did not even have gas compressors, every aspect of the vessel has been transformed. The Jacques Saade is a record-breaking vessel: The largest LNG tank. The biggest Otto cycle engine. Even MOL's Gas agility vessel that will bunker the Jacques Saade is the largest ever built.

Are there any projects that you have been involved in since you joined GTT that have been technological landmarks?

I enjoyed the development of an LNG bunker barge fitted with a Membrane containment system in Conrad Shipyard in Texas, US that will serve TOTE's Marlin Class container vessels. At the time, we did not know whether it would be a challenge to bunker a vessel with Type C tanks from a high-pressure system. Not only did we resolve that, but we have also successfully carried out bunkering in reverse. Now people forget that it was ever a challenge.

GTT has developed a set of close relationships in the world of LNG. Why do you think close relationships are so important for LNG containment?

Our close relationships reflect the technical advantages of our containment solutions, as well as our deep understanding of how LNG performs as a fuel. We undertook research projects into different aspects of LNG's performance as a fuel, such as its ageing behaviour, or boil off rates in the past. To give you a specific example: we started to carry out research into LNG bunkering six years ago in order to be ready long before the first large scale LNG bunkering transfer. Thanks to the innovations that we carried out over the last decades, we are considered as a reference to understand what is going on across the LNG vessel lifespan – we understand the integration of LNG into the ecosystem of the ship.

Another example of that is our experience developing solutions for the use of LNG carriers in Arctic operating conditions. [The Motorship notes that GTT has been chosen to supply NO96 GW membrane cryogenic containment systems to DSME for two of the largest Floating LNG storage units (FSUs) ever built that will operate in the Bay of Kamchatka for Novatek.]

The challenge of designing systems to operate in Arctic conditions affects everything from valve designs through to LNG pump towers and everything in between. This is an area that we have been carrying out research into for over 10 years. We began working on the qualification process with Yamal LNG and Total in 2008. This is an example of how our collaborative approach with our customers sets us apart.

How would you characterise the growth of LNG as a fuel for marine propulsion?

I think we are undergoing a shift in fuel, like the Royal Navy's switch from coal to oil before the First World War. I think that the shift to LNG is a similar transition. And I believe that in a century, they will look back on the Jacques Saade as a landmark project in the use of LNG.

How has GTT prepared for the growth in demand for LNG as a fuel from different vessels?

Our designs for 174,000 cbm LNG carriers needed to be adapted for smaller tank sizes. One part of the change was developing solutions ahead of demand from new customer groups: this meant modifying the design so they could be fitted for new applications, by new entrant and smaller shipyards. The tanks also needed to be adapted to the operational profile of new vessel types using LNG as a fuel. This meant understanding the ageing of the LNG, the sloshing, the boil-off gas, the bunkering – and sorting out all the details for the crew.

How is GTT looking at improving the economics of switching to LNG in new vessel classes?

Another landmark project that we have been involved in was the retrofit project of the Sajir with Hapag-Lloyd. This has been an important project for us in a lot of ways and has involved close cooperation with MAN ES and MAN Cryo. We have looked at alternative approaches to working to ensure the economics of the retrofit.

By contrast, working within the tanker market has posed a different set of challenges. As OPEX are lower, it means we need to find other ways to lower the CAPEX to shorten the payback period. We have ways to ensure that the construction can be cost-efficient, making use of a section or block strategy, for example.

But even if the payback period for oil tankers is slightly longer than for containerships, the case remains attractive. We are seeing rapid growth in LNG-fuelled Aframax and MR tanker orders, as well as the first LNG-fuelled VLCC projects. And aside from the economics - you are assured of compliance with current and future IMO regulations.

What are the next vessel classes that you would expect to adopt LNG?

The price structure is a key consideration for the Bulk carriers market. But I think the Newcastlemax and VLOC bulkers could be the next vessel class to switch to LNG. A second vessel class is PCTCs. The first LNG orders have already been placed and LNG is an interesting solution, particularly as we know the auto industry is very keen to lower its CO_2 footprint,

The wider tramp industry is limited by the need for the deployment of small LNG bunker vessels dedicated to ensuring availability in Asia and Africa.

How do you see LNG's role as a fuel for marine transportation in 2050?

We anticipate that a number of different fuels will enter the marine fuel mix. But concentrating on the deep sea market, which accounts for the majority of environmental emissions at the moment, DNV GL expects LNG to occupy a strong position in 2050 at about 40%.

Engine designers are continuing to improve the performance of their engines. We did not fix everything yet. And remember that fuel density remains key in the deep sea market. Taking an ultra large container vessel as an example, a liquefied ammonia-fuelled ULCV would require a fuel tank of 36,000m3, twice the size of an LNG fuel tank. It will be then a challenge to make sure that container lines will keep a strong business model with such constraints.

How is the recent increase in interest in alternative fuels, such as ammonia and hydrogen, influencing how GTT selects areas in which to focus research?

I remember clearly discussing hydrogen as a fuel for cars in the 1990s, when it was regarded as tomorrow's fuel. One of my bosses told me that it would still be tomorrow's fuel when I retired. [laughs]. Introducing a new fuel is like space travel – to get to Mars, you do not have to fix one problem, but all of them.

But you have to have a vision when you are in business, and an idea of where will be the market. Particularly when there is such a long difference between product development cycles and customer order cycles.

As a company, we're actively carrying out research into liquefied hydrogen and ammonia containment systems at the moment, and also looking into LBG and synthetic methane.

Liquefied hydrogen is interesting, as its cryogenic temperature (-253°C) poses challenges for large-scale containment designs. At -253°C, we are dealing with temperatures below nitrogen's freezing point.

We are also involved in a research project in which we are looking at ammonia containments. Our challenge is to make sure that our containment designs, will be able to cope with ammonia specific constraints such as its corrosive properties.