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## Message from Philippe Berterottière, Chairman & CEO, GTT

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*Four years after its first edition, GTT Inside is evolving. I am pleased to present to you a new formula; 100% digital, with an aim to meet more efficiently your expectations and reading habits.*

*If the design is changing, we will continue to focus on our technical news. Innovation and transparency are in GTT's DNA, so we need to keep you informed on a regular basis.*

*In this issue, you will discover the solutions developed by GTT and Ascenz, our new subsidiary, to optimise loading and bunker operations, as well as a presentation of LNG Brick®: a compact and easy-to-install LNG storage tank, designed for commercial ships fuelled by LNG.*

*Please share your comments on this new formula, on the articles and your suggestions with us.*

*I hope you will enjoy reading this new issue!*

Philippe Berterottière

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## TECHNOLOGIES

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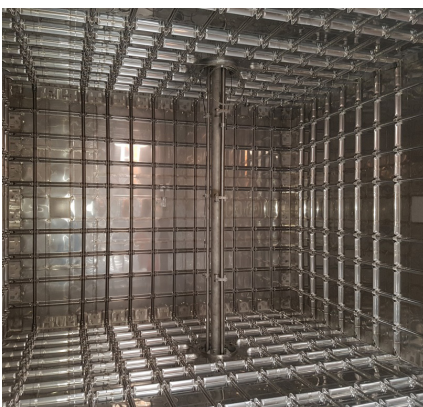
### GTT LNG Brick®: fuel tank for LNG fuelled vessels

With the rise in the use of LNG as a fuel, the marine industry requires new cryogenic storage solutions which are both compact and easy to install. To meet this demand, GTT has developed the LNG Brick® technology which has successfully completed a test campaign in early March 2018.

The solution, which incorporates our proven Mark III membrane system and is delivered as a block ready to be installed into the ship structure, provides LNG tank solutions for capacities below 3000 cbm. The construction of the LNG Brick® tank is carried out at a dedicated site, outside the shipbuilder's premises, and is transported to the yard and installed into an LNG-propelled vessel at the appropriate time.

This technology also addresses many other concerns, such as the management of boil-off for small volumes, thanks to its ability to maintain a higher pressure than traditional membrane tanks. In addition, LNG Brick® units, like all membrane tanks, can be customised thanks to its parallelepiped shape to suit the space available, thereby offering a more space-efficient solution than Type C tanks.

GTT's LNG Brick® technology is an innovative solution that meets market requirements both economical and environmental.





## OPERATIONS

### Bunker accuracy is crucial for shipping

*Focus on a service provided by Ascenz, a Singaporean company specialised in the Smart Shipping, who joined the GTT Group in December 2017.*

#### MASS FLOW METERS

As fuel consumption is one of the major operational costs for owners and operators, it is crucial for accuracy and transparency during the bunker transaction. As part of bunker accuracy, the Maritime Port Authority of Singapore (MPA) has taken the first step by mandating the use of mass flow meters (MFM) for all bunkering activities in Singapore with the implementation of TR48.

Ascenz too encourages the use of MFMs for accurate bunker measurements, especially for their customers on the receiving end. Aside from its direct measurement of mass (as bunker fuel is purchased in tons), the meter is often preferred due to its high accuracy, reliability, and capability of handling challenging fluids.

#### DELIVERING TRANSPARENCY

Ascenz prides itself in delivering transparency for customers with its monitoring systems. Since its incorporation in 2008, the company has provided monitoring systems to more than 400 vessels. Ascenz's customer base includes container vessels, workboats, bunker vessels, and tankers. Companies such as China Merchants Shipping Company (CMSC), one of the world's largest energy transportation enterprise with a longstanding history of 145 years is a well known user.

Owning one of the largest fleets of VLOC and LNG carriers, it was critical for the company to effectively manage their bunker procurement and assessment. Without the proper monitoring system, losses incurred from measurement inaccuracies could contribute substantially to the company's overall expenses.

#### ASSURED RELIABILITY

CMSC received its first vessel installed with Ascenz system in December 2014. Since then, the group has extended the installations to a total of 14 vessels. As a proof of Ascenz bunker monitoring system accuracy, a competency test against an MPA approved bunker barge was conducted for its latest installation on a tanker.

The following results were recorded:

	Start Date/Time	End Date/Time	Duration	Total Delivered
Ascenz' Bunker Meter	22-Jul-17	22-Jul-17	18:39:53	4081.472 t
MPA Approved Bunker Barge	20:44:38	15:24:31		4095.63 t
Difference				-14.158 t
Accuracy				- 0.35%

All MPA approved meters undergo comprehensive assessments and calibrations to ensure that its overall expanded uncertainty falls within the acceptable tolerance range of 0.5% for system accuracy. Similarly, all of Ascenz bunkering monitoring systems and their associated MFMs are tested for their high reliability.

This assessment of the Ascenz monitoring system against the MPA-approved system demonstrates high accuracy with the results indicating a mere 0.35% difference which is within accuracy parameters.

#### CONCLUSION

By relying on the Ascenz bunkering monitoring system, shipowners are assured of the accuracy and overall transparency it brings to its bunker procurement and operations. The comparison made against the TR48-approved system assures our customers that our system meets the leading bunkering standards on MFM-based systems.

Full transparency and traceability not only ensure the conformity for both buyers and suppliers, but also reduces uncertainties. This allows companies to have better control over their bunker costs for more accurate decision making, potentially bringing very significant savings.

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## STUDIES

### More flexibility for the cooling down of membrane tank

In order to deal with specific situations that vessels may encounter before LNG loading, GTT has revised the cargo tank cooling down criteria.

This has been carried out to provide more flexibility for cooling-down at sea when the remaining heel in tanks is insufficient or has warmed up due to an increase in the proportion of heavy component, or, on the other hand, to allow a shorter time and reduce overall loading duration when the cooling-down is performed at the terminal.

Throughout a complete analysis covering all parts of the cargo tank system, membrane NO96 and Mark III Cargo Containment Systems (CCS) technologies have been assessed considering more constrained operational parameters. GTT membrane technologies have been exposed to different cooling-down profiles, shorter and faster than usual practice, and have shown a remarkable flexibility to withstand potential thermal shock. Membrane CCS NO96 and Mark III are even able to receive LNG without any cooling-down.

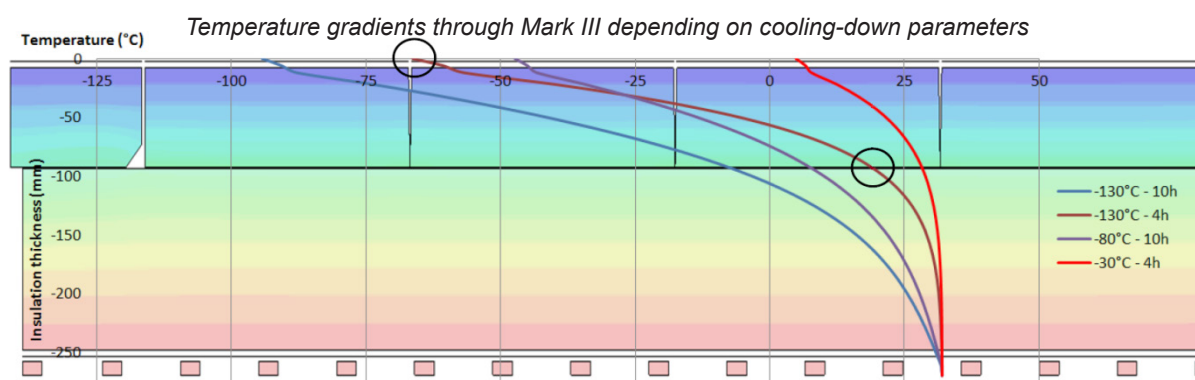
Due to the insulating properties of the CCS, and the thermal diffusivity throughout the depth of the CCS, the main part is not impacted by the cooling-down. Whatever the CCS, the thermal shock mainly impacts a thin layer under the primary barrier. While the primary barriers of NO96 and Mark III are insensible to transient state; all areas and junctions have been studied very deeply.

For NO96, the behaviour of the primary boxes and staple junctions of the cover, identified as the most loaded part, have been validated while, at the same time, maintaining a high safety factor and without any increased fatigue level.

For Mark III, the knots around the Pump Tower Base Support and its secondary plate with the bounded junction have also been deeply studied. Even with direct loading stress, the analysis demonstrates a sufficient safety factor and no fatigue damage for over 40 years of operation.

Bureau Veritas has already given an Approval in Principle (AIP), which validates the fact that NO96 and Mark III membrane containment systems are able to withstand fast cooling-down and direct LNG loading without prior cooling-down.

The remaining main limitations are the cooling down criteria for the cargo pumps. At this time, cargo pump makers have enhanced their criteria by raising temperatures before loading. As a result, GTT also proposes to add a temperature sensor fitted on the pumps to monitor the most relevant temperature for the end of cooling-down, and consequently save up to six-hours, if necessary.



## TRAININGS - SAVE THE DATES!

### LNG CARGO OPERATIONS

- 24-27 September 2018
- 22-26 October 2018

### MEMBRANE TECHNOLOGIES

- 15-18 October 2018
- 4-8 November 2018

More information on:

<http://www.gtt-training.co.uk/>