



Message from the GTT Technical VP

GTT's contribution to the design of LNG Carriers, FSRUs and FPSOs in the form of the detailed design of the cargo tanks is well known. In this issue of GTT Inside, we will highlight the contribution GTT also makes to the Cargo Handling System (CHS) design, from the structural elements (Pump Tower, piping etc.) to the dimensioning of auxiliary equipment used in the handling of cargo and tank monitoring and also, more recently, transfer systems for bunkering applications.

On that last note, we will find further details concerning the bunker barge project in the United States, and an innovative small scale storage tank design for local distribution of LNG.

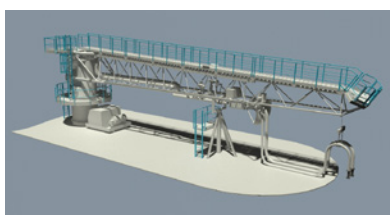
You will also find some further clarification on the use of the Thermal Assessment of Membrane Integrity (TAMI) test as well as an extension of the scenarii included in the GTT Hotline service (HEARS).

Please read on with interest.

Karim Chapot, Technical Vice-President

NEWS / GTT continues the development of the 2.200 m³ Bunker Barge in the United States

After 6 months of development of the basic design for a 2.200 m³ bunker barge dedicated for use in US waters, GTT hooked up with the Conrad shipyard in Orange, Louisiana to propose this concept to the market for small scale distribution and the bunkering of LNG as fuel. The barge will be equipped with an innovative LNG re-cooling unit designed to optimize the use of any excess boil-off generated in the tanks.



In parallel, GTT designed an innovative Bunker mast, known as REACH₄TM (see GTT Inside N°2) for use with such a barge. Conrad has taken these designs and with GTT's further assistance have developed their own detailed barge designs incorporating the REACH₄TM mast.

The first order for this barge was placed in February by CME-Wespac for the bunkering of the new TOTE container vessels which will be delivered in 2015/16. Detailed design of the barge is well advanced and there is on-going close cooperation with Class and the US Coast Guard to ensure that this first US LNG bunker barge meets the stringent requirements for operation in US waters. Construction should begin by the summer for a delivery in 2016.

This World first demonstrates GTT's capability to go beyond cryogenic tank design and also assist yards and owners in the design of small scale solutions for LNG transport, distribution and storage. The design can be transferred to other markets and this modular design makes up-scaling to 4.400 m³, for example, relatively straight-forward.

Distribution of LNG is now becoming a reality in North America. ■



SERVICES /

Thermal Assessment of Membrane Integrity (TAMI) test becomes the Industry Standard



The TAMI test was introduced by GTT in 2011 as an alternative method of assessing the integrity of the secondary barrier on membrane containment systems. The TAMI test can be carried out in-service or at quay side, and any indicated anomalies can then be investigated and rectified with adequate preparation and a minimum of time at the subsequent dry-dock. Over the last 4 years, more than 140 tanks have undergone a TAMI and this test is now a proven methodology (certain Class may have some specific requirements).

In GTT's opinion, the TAMI test can now replace the Secondary Barrier Tightness Test (SBTT) as the reglementary test required by the IGC code for checking the quality of the secondary barrier every 5 years. If a TAMI is carried out and there is no indication of any anomaly, no further testing is required.

GTT has also introduced a procedure for validation of suppliers who wish to be qualified to be able to carry out the TAMI test. This qualification takes place in GTT's premises and is validated by Class. Suppliers are invited to contact GTT to carry out this validation. Cryovision completed this process in January. ■



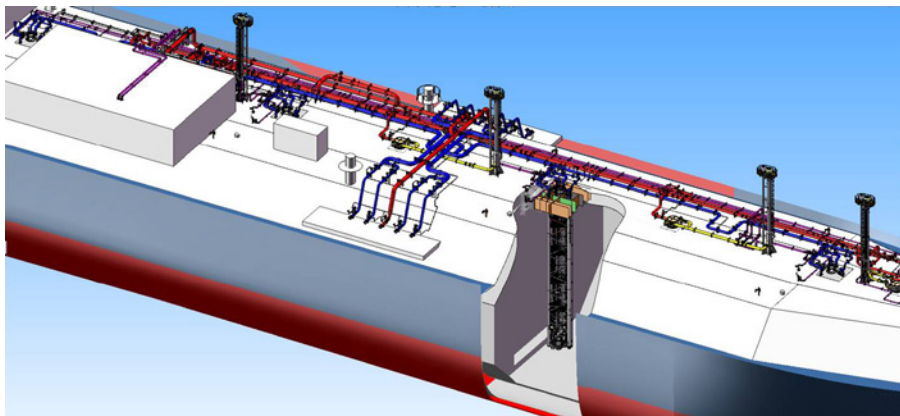
TECHNOLOGIES / Cargo Handling System (CHS): safe and efficient solutions to operate LNG

A significant part of GTT engineering work includes the CHS design, the system facilitating all operations involving LNG cargo between tanks.

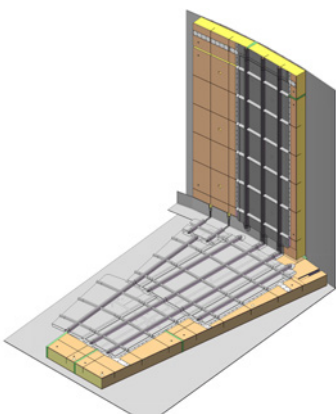
This system includes the pump tower and pump tower base support installed inside the tank, as well as the piping network and the complete instrumentation required to load and unload cargo into and from the tanks, manage the Boil-Off, and monitor the tanks and the insulation spaces.

During LNG carrier projects, GTT is involved in the installation of these elements. The pump tower is designed to handle the loads induced by liquid motion. The piping is designed to conciliate installation issues and code compliance, the aim being to optimize space on deck and accessibility and at the same time maintaining an intrinsically safe arrangement.

GTT is permanently developing new solutions for CHS design, notably to improve the Boil-Off rate. A pilot project is currently on-going between GTT and some ship crew to optimize the Boil-off during operation and voyage. ■



LAND STORAGE / Towards smaller onshore tanks applications



GTT has enlarged its panel of solutions for onshore LNG storage tanks for small and medium capacities with a new membrane Full integrity tank concept. Applicable for a range from 1 000 to 10 000 m³, the atmospheric solution with membrane offers definite advantages compared to the multiplication of pressurized bullet tanks: a reduced footprint, better safety (no risk of BLEVE, no dyke), a simpler logistics, reduced process piping and instrumentation etc.

The new concept is to use a simplified GST membrane system with one tightness barrier and a cryogenic steel outer tank

forming jointly an integrated, full integrity composite tank structure.

A membrane system without secondary barrier leads to very simplified prefabricated insulation panels with no requirement for corner panels. Moreover, an optimized 70kg/m³ density is used to increase insulation thermal conductivity properties and decrease panel weight in order to use a lighter construction handling system.

Design simplification associated with this suppression of secondary barrier makes for an easy and quick containment system installation for a competitive and safe overall solution.

The GTT concept is flexible and can adapt to project outer tank shape and required BOR. For instance, GTT recently designed a 2 000 m³ circular shape tank (18.5m diameter, 11 m high and less than 1 000 m² of insulated surface) using such concept. ■



OPERATIONS / New HEARS scenario for emergency departure

In addition to the 6 scenarii already existing in the GTT Hotline service (HEARS), marketed for a year, there is now an extra scenario. As most of membrane LNG carriers have been designed to withstand standard fillings inside cargo tanks, facing a sudden interruption of terminal operations may lead to non-authorized filling levels. In that extent, GTT has developed a so-called "Cargo Management Decision Making Tool" (CMDMT) software, to evaluate the shortest way to return to free-sloshing filling levels, thanks to tank-to-tank transfer.

The software is calibrated individually for each vessel to optimize transfer operations, taking into account tank geometry, maximum pump capacity, and piping characteristics.

It also offers the possibility to "freeze" or to specify a certain dead heel quantity in one tank to meet the operational constraints.

In case the shipowner or the captain call HEARS in such a situation, the HEARS on-duty officer issues a report detailing all intermediate operations to reach safe configuration. ■

Save the date

GTT will be at **Norshipping**, Oslo,
2-5 June 2015

Please come and
visit us at **Hall D.**

