Reinforcing the LNG membranes

Floating LNG production and regas vessels will benefit from the more robust versions of GTT's No 96 and Mark III membrane tanks

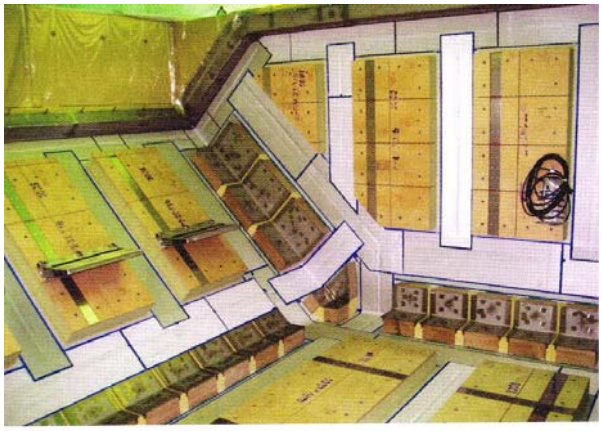
Gaztransport & Technigaz (GTT) continues to develop its No 96 and Mark III membrane tank containment systems with the aims of providing lower LNG cargo boil-off gas (BOG) rates and minimising the risk of damage due to sloshing loads.

The availability of cargo containment systems able to sustain higher loads is of particular interest to builders and operators of floating LNG production (FLNG) vessels and floating storage and regasification units (FSRUs). Such 'floaters' can be exposed to a wide range of sea states and are called upon to handle all possible cargo tank fill levels during the course of normal operations. It is also necessary for such vessels to remain on station providing uninterrupted service, sometimes for the full tenure of a 20-year project, without recourse to drydocking.

The No 96 system is a cryogenic liner directly supported by the ship's inner hull. The liner comprises two identical invar 36 per cent nickel steel alloy membranes (the primary and secondary barriers) and two independent insulation layers. The load-bearing primary and secondary insulation layers are comprised of prefabricated plywood boxes filled with expanded perlite and the standard size of the boxes is 1m x 1.2m. The thickness of the primary insulation layer is adjustable from 170mm to 250mm, to fulfil any BOG rate requirements, while the typical thickness of the secondary layer is 300mm.

To provide lower BOG rates, GTT has introduced two new No 96 systems: one designated GW, the other LO3. In the first, glass wool replaces the perlite while the second features three layers of insulation - two of glass wool and one of reinforced polyurethane foam (RPUF). The No 96 GW system provides BOG rates in the range 0.125-0.13 per cent of the cargo volume per day, in contrast to the average No 96 rate of 0.15 per cent. Rates of 0.105-0.11 per cent can be achieved with No 96 LO3.

Increased resistance to sloshing loads is provided by means of strengthened insulation boxes, and GTT has four levels of reinforcement available for its No 96 system-standard, standard-reinforced, ultra-reinforced and mega-reinforced. As an example of the strengthening, in a mega-reinforced primary box the top plywood sheet comprises two 15mm thick layers instead of the original single sheet of 12mm while the two external bulkheads are 15mm thick instead of 12mm. Also the box has been provided with a 15mm internal plywood bulkhead.



A section of a GTT Mark III Flex membrane tank

The GTT Mark III system is also a hull-supported cryogenic liner. In this case it comprises a primary, waffled stainless steel membrane positioned on top of a prefabricated insulation panel which itself incorporates two insulation layers of PUF and a complete secondary membrane barrier in the form of a composite, laminated material. Called Triplex, the secondary barrier is composed of a thin sheet of aluminium between two layers of glass cloth and resin and is positioned between the two PUF layers inside the prefabricated insulation panels.

GTT has recently introduced Mark III Flex as the next step in the evolution of the Mark III system. With Mark III Flex BOG rates are lowered by means of increasing the thickness of the insulation while the ability of the system to resist higher loads is enhanced by increasing the density of the glass fibres within the RPUF insulation. As an example, by increasing the foam density from the initial value of 130 kg/m^3 to 210 kg/m^3, the compressive strength of the overall system will be more than doubled. Shipowners are able to specify the level of reinforcement they require.

Source: Offeshore LNG supplement November2014