



# **CRYOGENIC INSULATION TECHNOLOGY**



LNT Marine Pte Ltd (LNT) is an engineering and contracting company specialized in thermal insulation (from refrigeration down to cryogenic temperatures) primarily for the marine market. LNT offers a unique combination of advanced engineering, technical know/how and project management skills through years of experience with ship design and insulation. LNT's supply for gas installations includes insulation of all types of self supporting cargo tanks, including its own proprietary LNT A-BOX system and pipes, and we offer solutions for repair/upgrades and newbuildings.

LNT delivers tailor-made turnkey solutions including engineering, planning, purchasing, project management and supervision/installation. LNT offers support from the design phase throughout the lifetime of the vessel.

LNT has extensive experience in complicated repair- and upgrade projects and offers solutions ranging from smaller repairs to full upgrade of insulation systems. Upgrade can include improved performance by increasing insulation thickness in order to reduce boil-off rate.

*LNT aims for 100% customer satisfaction and supports customers in all aspects related to low temperature insulation.*

## INSULATION FOR LNT A-BOX® & LNT FUEL-BOX™ DESIGN FOR LNG – CARGO AND FUEL

LNT has developed an inverted insulation system for its proprietary LNT A-BOX® and LNT Fuel-BOX™ technologies in which the insulation is applied on the hull structure and has an integrated full secondary barrier protecting the hull in case of leakage of liquefied gas from the tank. This allows for the use of well proven- and relatively low cost IMO independent type A tank design – also for LNG tanks.

IMO type A tanks are considered the most economical solution for LNG cargo tanks as all available space is utilized and steel weight is low. LNT's insulation system is developed for both LNG cargo and LNG fuel tanks.

The demand for more environmentally friendly solutions has been a driving force for the development of large size LNG fuel tank solutions. The sizes are beyond what is feasible for cylindrical or bi-lobe tanks. It opens a new market for LNG fuel, namely oceangoing vessels with large LNG fuel storage tanks.

LNT's inverted insulation system has been class approved by major class societies, such as ABS, DNV GL, BV and CCS.

# SPRAY FOAM INSULATION

Fully bonded insulation system for LPG, LEG, LNG IMO Type A and C Tanks



Apart from the challenge of designing a system of structural integrity at cryogenic temperatures, the main problem with most cold insulation systems is ingress and accumulation of humidity over time.

Regardless of combinations of insulation materials, vapor barriers and jacketing systems, there will be joints and link-up regions - hence a potential for moisture ingress. The vacuum caused by cooling - and the inevitable vapor pressure directed from warm to cold side, can force moisture into- and through the system - reducing insulation efficiency and potentially cause frost wedging of insulation and corrosion of the tank- or pipe structure.

LNT's spray foam insulation is a fully bonded system sprayed on the tank surface. The insulation is flexible and follows the tanks contraction and expansion. There is no space for accumulation of moisture between containment structure and insulation and there are no joints. This is currently the most efficient low temperature insulation system available and maintenance demand is low.

LNT Marine can also offer a spray foam insulation system with integrated fire insulation similar to A60. The system is developed for use on cruise and passenger vessels and supplied to several large cruise vessels in recent years.

## INSULATION REPAIR AND RETROFIT

A well designed and maintained insulation system saves cost and ensures lowest possible impact on the environment. LNT offers engineered and cost efficient solutions.

LNT has the technology and experience to offer maintenance, repair and improvements of most existing insulation systems on all types of gas carriers.



### Repair and retrofit of pipe insulation and pipe support

Spot repair or full renewal of existing pipe insulation on marine installations, including supports.



### Repair and upgrade of MOSS tank insulation

From spot-repair to full upgrade and 0-hour refurbishment programs with 20-40% decrease in BOR and minimized Nitrogen consumption.



### Repair and upgrade of LPG/LEG tank insulation

From spot-repair to full upgrade of in-situ, spray and panel insulation.



# LNT Marine

Singapore | Drammen | Shanghai | Gdansk

## WE HAVE LONG EXPERIENCE WITH CRYOGENIC INSULATION

- from full design of new systems to repairs on vessels in service,  
and can offer a complete range of technical and supportive products:

### Engineering Services:

- FEA - from full global analyses of thermal and structural interaction to local detail analyses
- 3D CAD modelling - concept modelling, production and presentation drawings
- Heat Transfer and boil-off calculations
- Technical feasibility studies
- Full insulation design and documentation

### General Technical Services:

- Documentation for class approval
- Project management
- Cryogenic testing
- Supervision and installation
- Training of ships crew for on-board insulation maintenance and repair
- Inspection and status reports for vessels in operation



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