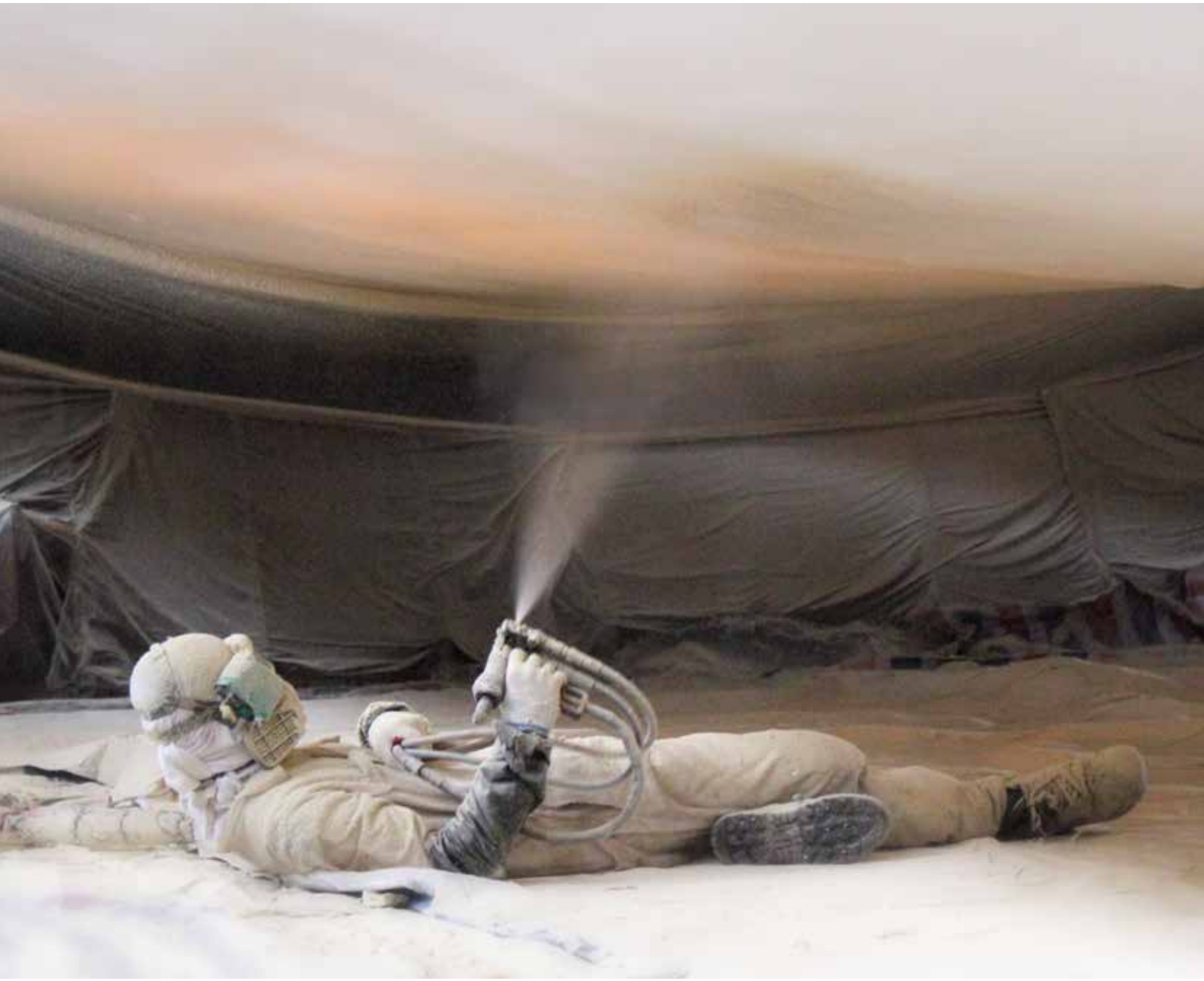


SPRAY FOAM INSULATION

Cargo tank insulation for LPG, LEG and LNG

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.

SYSTEM DESCRIPTION

- The spray foam system consists of two types of materials; a polyurethane foam for low temperature insulation, and a polymeric coating for surface protection.
- The foam is sprayed on the tank surface in 5 to 10 layers until a total insulation thickness of >120 mm for LPG and > 180 mm for LEG. Insulation thickness for LNG ranges from 250 mm to 300 mm. The surface thickness tolerance is +10/-5 mm.
- A coating layer is sprayed on the foam surface with a thickness of 3 mm on the top of the tank and 1 mm on the sides and bottom.
- The spray system is a bonded insulation system with flexible materials. The foam and coating will follow the contraction and expansion of the tank.

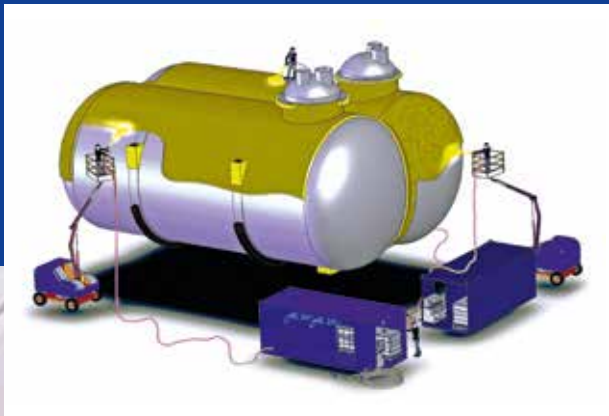
APPROVALS

Spray foam insulation system is designed to fulfil requirements from all the major classification societies.

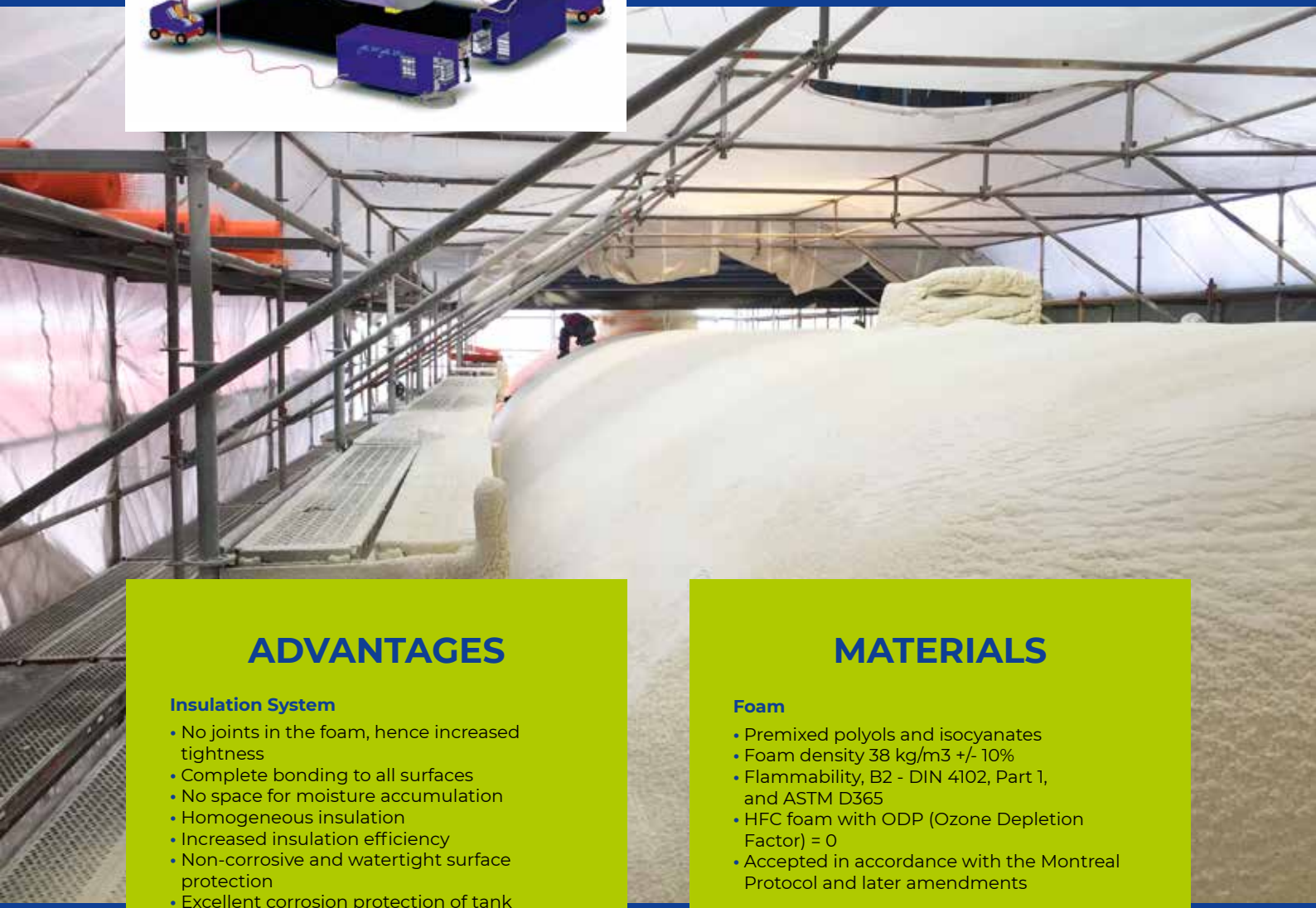
We have approvals from:

- DNV GL
- RINA

WHY SPRAY FOAM INSULATION?



- Best available thermal efficiency
- Improved insulation life time
- Low maintenance demand
- Improved weather exposure resistance during assembly
- No protection required for storage of insulated tanks outdoor
- Short application time at shipyard



ADVANTAGES

Insulation System

- No joints in the foam, hence increased tightness
- Complete bonding to all surfaces
- No space for moisture accumulation
- Homogeneous insulation
- Increased insulation efficiency
- Non-corrosive and watertight surface protection
- Excellent corrosion protection of tank
- The risk for voids in the insulation is eliminated by the spray method

Application Method

- Visual control during spray application ensures required quality
- Shipboard or onshore application
- Easy to repair
- Low material consumption
- Easy material handling
- Low storage volumes
- Short application time

MATERIALS

Foam

- Premixed polyols and isocyanates
- Foam density 38 kg/m3 +/- 10%
- Flammability, B2 - DIN 4102, Part 1, and ASTM D365
- HFC foam with ODP (Ozone Depletion Factor) = 0
- Accepted in accordance with the Montreal Protocol and later amendments

Coating

- Two component polymeric coating (solvent free)
- Density: 1.1g/cm3±10%
- Flammability, B2 - DIN 4102, Part 1, and ASTM D365
- Thickness from 1 mm to 3 mm depending on surface location

LNT Marine

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SPRAY FOAM INSULATION

LNT has, in cooperation with specialized material manufacturers, developed state-of-the-art polyurethane spray foam- and coating systems for temperatures down to -163°C.

Our high quality materials and carefully engineered and tested application methods ensure reliability and efficiency of the spray foam systems.

LNT`s spray foam systems are developed, based on long experience with polyurethane foam, for IMO Type A tank LPG and IMO Type C tank LPG/LEG and LNG.

The overall quality is dependent on a number of parameters, such as: raw materials, design, skill of the machine operator and project management. LNT strives to deliver the best solutions for owners, yards and class societies.

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