

1 General Information

Main purpose of the insulation system:

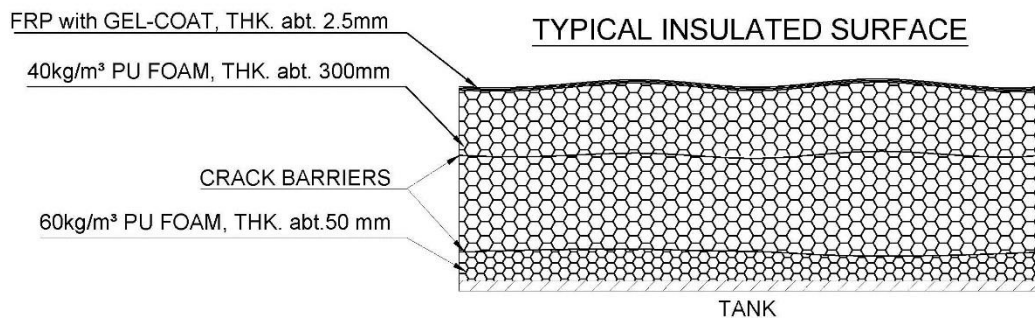
- Minimize loss of boil-off rate of fuel gas(LNG) by restricting heat ingress
- Protect the hull structure against harmful temperature fluctuations and absolute temperatures
- Minimize condensation or forming of ice on the cold surfaces and thereby reduce accumulation of water and moisture in the cargo containment system.

2 Main Tank Insulation

2.1 Description - Spray Foam System

The Spray foam insulation system based on polyurethane spray foam. The foam surface will be protected by the sprayed on protection coating which is flexible and gives a very good protection towards fire and impacts. The foam with coating are fully bonded to the entire tank surface and will allow the thermal contraction and expansion of the tank at operating condition.

Spray foam system is made to improve insulation efficiency, minimize the maintenance and reduce the application time.



<< Reference figure >>


2.1.1 Spray Foam

The spray foam consists of two main components i.e. premixed polyol and isocyanate (P-MDI), which are mixed and dispensed from a spray gun. Typical foam data are listed in section.5. The foam is generally to be applied in several layers up to 35mm to obtain specified total thickness, with a final tolerance of +30/-5 mm. Thickness and quality is continuously controlled during application. The polyurethane foam is flexible and well suited to follow the thermal contraction and expansion of the tank.

2.1.2 Crack barrier

A glass fiber mesh is applied in between foam layers to act as a crack arrester / barrier to ensure no through thickness cracking.

2.1.3 Weather Protection

Fiber-glass Reinforced Plastic(FRP) is applied on to the foam surface as a continuous protective layer. The FRP acts as weather protection both fire-retardant and mechanical protection and the FRP is terminated near supports, and bridged to thermo-break or steel structure. The thickness is about 2.5 mm typically.  Contraction joint is installed at the proper position on weather protection to absorb the shrinkage.

3 Design Condition

See below overview of design condition as used for dimension of the insulation system

Item / condition			Remarks
Boundary conditions: Temperatures	Ambient Temperature	Max +45 °C	-
	Sea water	Max +32 °C	-
	Cargo temperature	-163 °C	-
	Number of tank	Not determined	-
Tanks:	Type	Cylindrical	IMO type C
	Tank Surface	To be announced	PORT/STBD
	Capacity	To be announced	PORT/STBD

4 Design Criteria / Specification

See below overview of design criteria as specified by buyer, and corresponding system specifics necessary to meet them, or according to contract.

Item / criteria			Remarks
Tank wall insulation: - Including Sump	Insulation type	Polyurethane Spray foam	Contains HFC (HCFC FREE)
	Overall insulation thickness (mm)	As builder's spec.	As builder's spec.
	Fire resistance	B2	DIN 4102 part 1
Dome part insulation:	Insulation type	Polyurethane Spray foam	Contains HFC (HCFC FREE)
	Overall insulation thickness (mm)	As builder's spec.	As builder's spec.
	Fire resistance	B2	DIN 4102 part 1
Weather Protection:	Material	Fiber-glass Reinforced Plastic Or Equivalnet	As builder's spec.
	Fire resistance	B2	DIN 4102 part 1
Other parts insulation: - Supports - Pipe line - Etc.,	Insulation type	Same as for tank insulation, or mould	Depending on structure shape
	Overall insulation thickness (mm)	Varying	Tank insulation to be terminated depending on thermal break or on type.