



# TIG

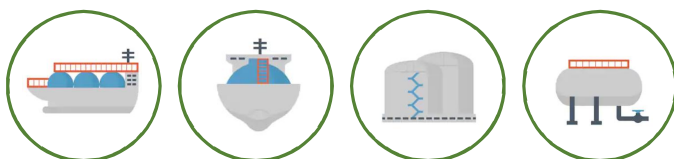
**THERMAL INSULATION GROUP**  
ТЕРМАЛЪ ИНСУЛАТИОН ГРУПЪ

Make a difference in

## Cryogenic

### Thermal Insulation

The world's leading cryogenic thermal insulation manufacturer with the leading technology and type approved products





TIG is a manufacturer of excellent quality thermal insulation widely used in the cryogenic field. Combining high-tech and expertise, we can meet customer's requirements in a short period of time and guarantee customer's satisfaction.

With our extensive experiences and accumulated know-hows, we offer a unique combination of advanced engineering solutions, technical insights, expert knowledge and project management skills to customers from liquefied gas carrier industry.

We have been providing the best quality insulation solution and services to customers based on innovative technology, state-of-art materials and accumulated expertise. We are fully committed to our mission to take the lead in the development of marine gas and cryogenic insulations.

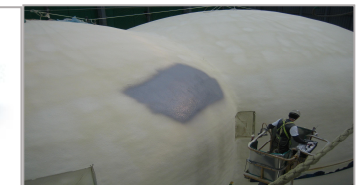
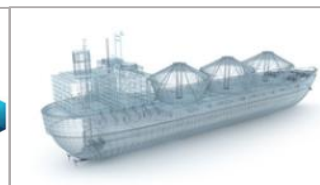
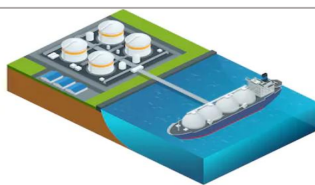
### TIG's Business and Primary Activities

- SPRAY TYPE INSULATION FOR LEG/LPG CARGO TANK ; S-CRYO®
- LNG FUEL TANK INSULATION ; S-STUD®
- PANEL TYPE INSULATION FOR LNG/LEG CARGO TANK ; S-PAN®
- CRYOGENIC PIPE INSULATION ; S-PIPE®
- REPAIR FOR CRYOGENIC CARGO & FUEL TANK INSULATION
- ENGINEERING AND CONSULTATION SERVICES FOR CRYOGENIC INSULATION



### TIG's Technical Highlights

- Low BOR insulation
- Insulation materials with eco friendly blowing agent(HFC, HFO)
- Highly fire-retardant material
- Non-VOC's material
- High quality insulation property
- Tailor-made engineering solution and support



# SPRAY TYPE INSULATION FOR LEG / LPG CARGO TANK

Insulation is required for LEG/LPG tank in order to protect the hull structure against adverse temperature fluctuations and withstand cryogenic temperatures.

TIG's LEG/LPG tank insulation technology incorporates two main materials of specialized spray-type polyurethane foam and polyurea coating specifically designed for the purpose of LEG/LPG cargo tank insulation. Combined with the dedicated and exclusive materials supplied from Woojo Hightech chemical company which has been developing and manufacturing polyurethane foam and coating chemicals for the insulation of liquified gas carries for over ten years, our insulation design and strategies based on extensive amount of experiences set TIG's insulation system apart from other insulation systems.

The high quality two-component polyurethane foam and polyurea coating are dispensed from equipment specially designed to serve the purpose. The foams and coatings are sprayed on most of the areas using a mixing gun whereas a brush is used for other areas where spraying method is not suitable or less ideal.

Both materials are designed for low temperature and cryogenic condition and follow the thermal contraction and expansion of the LEG/LPG tank.

APPROVAL IN PRINCIPLE 

## S-CRYO® SPRAY TYPE INSULATION FOR LEG / LPG CARGO TANK

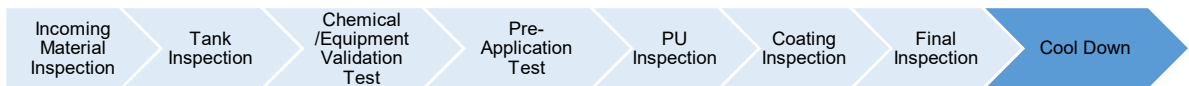


TIG's Spray Foams & Coating insulation are developed to improve insulation efficiency, minimize maintenance and reduce application time, based on extensive experiences in working with high impact resistance polyurethane foams and coating for LEG and LPG cargo tank insulations.

TIG uses WOOJO HIGHTECH's polyurethane foams(VESPOL®) & coating(VESCOAT®) approved by Class Society.

- Short application time at the shipyard
- HFC & HFO eco-friendly blowing agent system
- Improved weather exposure resistance during assembly
- No protection needed for outdoor storage of insulated tanks
- Improved insulation shelf-life time
- Seamless operation with enhanced quality
- Streamlined operation with enhanced quality
- Excellent thermal efficiency
- Highly resistant to fire(DIN 4102 Part1, class B2 or higher)

## QUALITY CONTROL & INSPECTION POLICY



# SPRAY TYPE INSULATION FOR LNG FUEL TANK

APPROVAL IN PRINCIPLE



## S-STUD® SPRAY TYPE INSULATION FOR LNG FUEL/CARGO TANK

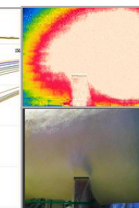
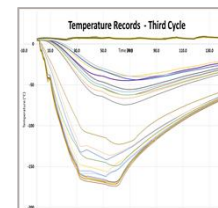
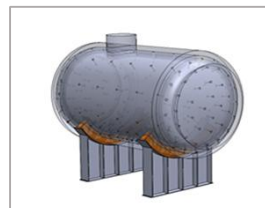
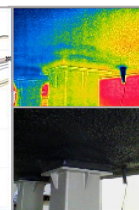
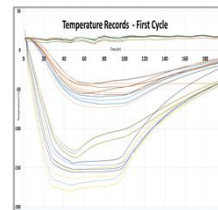
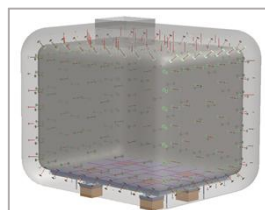
TIG has long experience with development and installation of cryogenic insulation systems for LNG cargo containment and is continuously working on developing new solutions following the market's demands. With our advanced engineering approach, cooperation with specialists and material manufacturers combined with proven application methods, we offer general engineering services as well as a new insulation system for complex containment structures.

Especially, TIG's composite spray foam insulation for LNG fuel tank is non-bonded system which follows the thermal movement of contraction and expansion unique to LNG fuel tank .

This non-bonded system has been specially designed for the use of LNG fuel tanks and IMO type A&C and B tanks.



- Optimized application time at the shipyard
- Improved weather exposure resistance during assembly
- Robust UV and seawater resistance (Deck tanks)
- Improved insulation shelf-life time
- Streamlined operation with enhanced quality
- Excellent thermal efficiency
- Highly resistant to fire(DIN 4102 Part1, class B2 or higher)





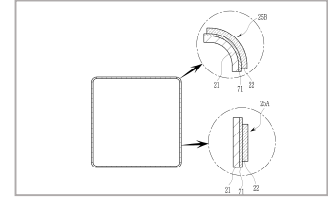
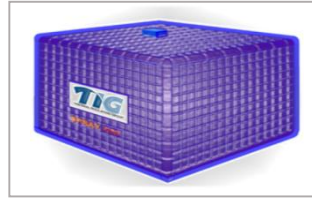
## PANEL TYPE INSULATION FOR LNG / LEG CARGO TANK

### S-PAN®

#### PANEL TYPE INSULATION FOR LPG/LEG CARGO TANK



The S-PAN insulation solution is a combination of a panel based system and a sprayed solution applied on top of the panels. In addition, the design platform of S-PAN® can be applied to most tank geometries and different independent tank types (IMO Type A, B, & C)

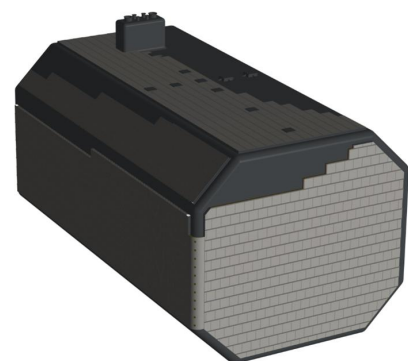
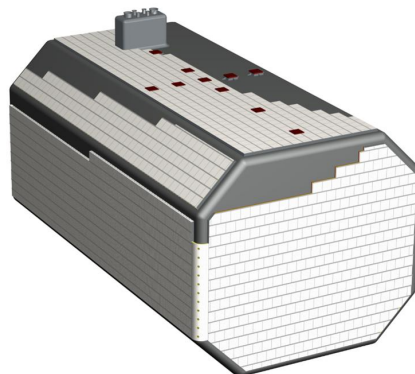


The S-PAN® system is well suited for tank insulation refurbishment as well as larger upgrading programs where reduced boil off rate (BOR) may be a primary target.

The insulation system is built up by a cold side layer of panels which are anchored but not bonded to the tank surface. The warm side of the insulation consists of sprayed-on layers of PU/PIR foam directly bonded to the cold panel layer. Continuous crack barriers are fully integrated at different levels in the structure.

The S-PAN® technology offers efficient insulation solutions working down to extremely low tank temperatures (-200° C) and where heat loss is reduced to an absolute minimum.

- Applicable to all types of cargo tanks
- Robust UV and seawater resistance
- Optimized and efficient application method
- Good mechanical property and fire resistance
- Optimal design for upgrading of existing insulation systems



# CRYOGENIC PIPE INSULATION

## S-PIPE®

### CRYOGENIC PIPE INSULATION



TIG's cryogenic pipe insulation solutions (S-PIPE®) are in principle based on the PU spray technology both for bonded and non bonded, cover based systems.

All solutions are founded on a high degree of factory line prefabrication processes. This gives a minimum of installation work and operations in the field and at site locations. This offers the most efficient and economic result as well as the highest of quality and longevity benefits to the customer.



- Suitable for cryogenic pipes and vessels
- Applicable for marine as well as land based terminal projects
- Robust UV and seawater resistance
- Economic, simple and efficient application method
- Excellent mechanical property and fire resistance
- Longevity
- Class approved insulation materials for cryogenic us
- Operation temperatures: +120/-200 deg. C



## REPAIRS FOR CRYOGENIC CARGO & FUEL TANK INSULATION

### REPAIRS FOR CARGO & FUEL TANK INSULATION

TIG has the technology and experience to maintain, repair and improve existing insulation on most types of gas carriers.

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

- On-board inspection, diagnosis and technical reports by specialists
- Tailor-made repair solutions provided by a network of specialists
- Repair and upgrade of cryogenic carrier tank insulation
- Repair and full renewal of existing pipe insulation, including supports
- On-time completion and minimal downtime





# INSULATION SOLUTION FOR ENGINEERING AND DESIGN

## CRYOGENIC MATERIALS AND SOLUTIONS DEVELOPMENT.

## CRYOGENIC INSULATION SYSTEMS ENGINEERING AND DESIGN.

## TESTING AND CONSULTATION SERVICES FOR CRYOGENIC INSULATION

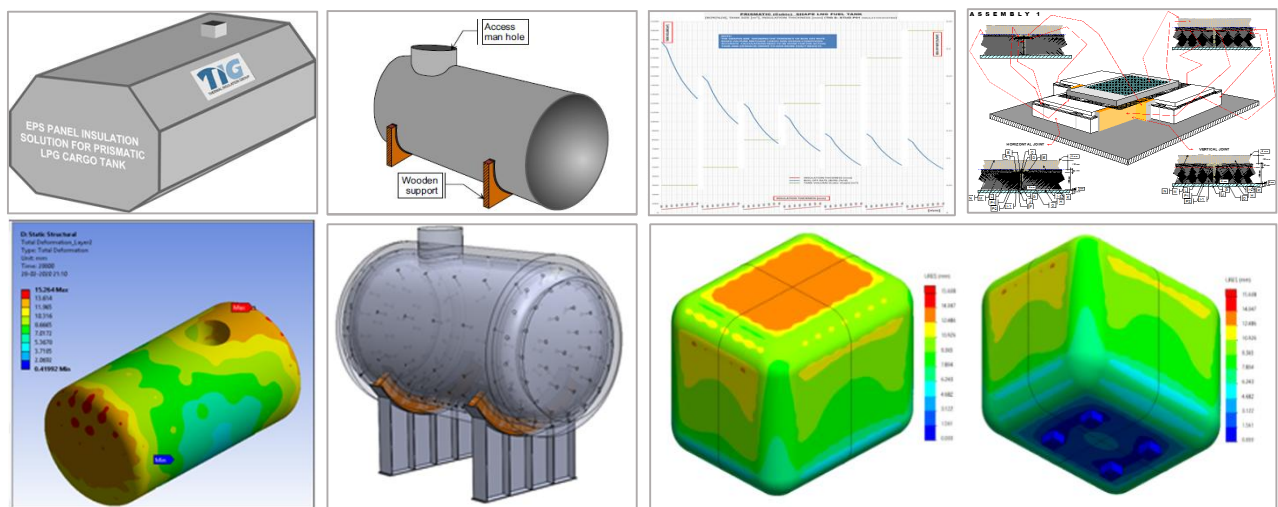
TIG provides cost-efficient, highly effective and sustainable solutions to businesses in marine industries.

With our highly competent and devoted professionals and engineers, TIG offers the best solution, combining technical insight, accumulated knowledge and project management skills for the marine industries.

- Full global and local structural analyses (FEA) as well as thermal and heat transmission calculations
- Concept modelling, production and installation procedures and documentation



- Heat transfer and boil-off calculation and assessment
- Technical feasibility studies based on real conditions large scale testing
- Full insulation design and documentation
- Documentation for class approval
- Project management
- In-house testing facilities for cryogenic materials and solutions
- Supervision and project management
- Training of ship crews for on-board insulation maintenance and repair
- Inspection and status reports for vessels in operation







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