ContraTherm®
C25 Flexible Subsea Insulation
For complex subsea equipment such as jumpers, tie-in spools, risers, goosenecks, PLETs, PLEM, christmas trees and manifold structures
ContraTherm®

Better products for challenging situations

For further information about the ContraTherm® range of products, please visit www.advancedinsulation.com

Oil & Gas
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Find out more about ContraTherm® at: www.advancedinsulation.com
ContraTherm®

C25 Thermal Insulation

ContraTherm® C25 Insulation is a uniquely formulated syntactic silicone system tailored to meet stringent subsea requirements.

Advanced Insulation has specifically developed ContraTherm® C25 subsea insulation to meet the need for a flexible and resilient material capable of operating within the extreme high pressure / high temperature environment that subsea oil and gas production demands.

ContraTherm® C25 provides flow assurance for subsea structures by way of reducing the formation of hydrate plugs and wax build-ups.

The key applications for ContraTherm® C25 insulation are dynamic subsea equipment components such as jumpers, tie-in spools and risers. ContraTherm® C25 can also be applied to large complex equipment such as christmas trees, manifolds, PLETS and flange connections.
ContraTherm®

Benefits of C25 Insulation

ContraTherm® C25 has been specifically developed to operate under high temperature and pressure extremes

What makes ContraTherm® C25 different?

+ Unique ambient curing properties enable direct application to complex equipment in harsh environments.
+ Flexible to apply from a scheduling perspective at any stage of a project.
+ Excellent HTHP resistance and thermal performance provided by the syntactic silicone resin matrix.
+ ContraTherm® C25 forms a strong bond with a wide range of polymeric, ceramic and metallic substrates.
+ Capable of withstanding all environmental factors to ensure correct application.

| Water Depth | Tolerates water depths to 3000msw |
| Mechanically Robust | A long-life & maintenance free, flexible material |
| Flexible Application | Easily mouldable in complex geometries |
| Temperature Range | Capable of operating to 150°C |

Find out more about ContraTherm® at: www.advancedinsulation.com
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Designed to Protect, Built to Last

ContraTherm® C25 insulation is designed for life-in-service field use within the harshest subsea environments

ContraTherm® C25 thermal insulation is the product of years of research, development and testing to create a bespoke solution for challenging environments.

ContraTherm® C25 was developed and tested to outperform other insulation materials with better thermal and mechanical properties when operating in extreme conditions.

A set of very detailed requirements for the final product were met successfully and included:

+ Flexibility
+ Easy application to complex structures
+ A 30-year life span
+ Temperature rating of 150°C.
+ Water depth ratings to 3000msw.

Advanced Insulation is now able to provide the oil and gas industry with a robust, unique subsea insulation solution that can be applied by local site teams at any stage of a project, regardless of location or environmental conditions.

Advanced Insulation was delighted to win the 2017 Queen’s Award for Innovation for ContraTherm® C25, which followed the 2016 Queen’s Award for International Trade.

Innovation Award
C25® Recognised by Her Majesty the Queen
**ContraTherm® Certifications**

ContraTherm® C25 is the most extensively tested and qualified subsea insulation material in the world

ContraTherm® C25 is fully qualified to 3000msw (9,840ft) service at 150°C (302°F) service temperature.

The system has been accepted worldwide by major oil and gas companies including Chevron, Statoil, BP, Total and ExxonMobil.

Extensive laboratory testing and large scale testing has demonstrated that ContraTherm® C25 is a robust insulation system suitable for extended subsea service considering:

- High temperature production fluids
- Deepwater deployment
- Extended cool down performance

Advanced Insulation continuously works towards international and company standards.

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<th>Details</th>
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<td><strong>SWIS JIP Qualified</strong></td>
<td>Chevron led (subsea wet insulation systems)</td>
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<td><strong>Total Qualified</strong></td>
<td>Total GS EN COR 226 compliant</td>
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<td><strong>ExxonMobil Qualified</strong></td>
<td>ExxonMobil GP650801 compliant</td>
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<td><strong>ISO 12736</strong></td>
<td>Wet thermal insulation systems</td>
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ContraTherm®

Applications for C25 Thermal Insulation

ContraTherm® C25 Insulation can be applied to a number of applications across the subsea oil and gas industry

+ Christmas Trees
+ Metering Systems
+ Jumpers
+ Tie-in Spools
+ Risers
+ Flowlines
+ Manifolds
+ Pipeline End Terminations (PLETS)
+ Goose Necks
+ Valves
+ Dog Houses
+ Flange Covers

Oil & Gas

In-house Design Expertise
Solutions for complex & bespoke equipment

ContraTherm® | Thermal Insulation for complex subsea equipment
 Worldwide Application in all Climates

ContraTherm® C25 has been successfully applied to subsea structures in a varying range of climates across the world.

- **Cold Territories**
  - C25 projects include the UK & Norway

- **Hot & Humid Climates**
  - C25 projects include Malaysia and Australia

- **Hot & Remote Territories**
  - C25 projects include Brazil, Nigeria and Angola
Advanced Insulation has extensive experience in designing engineered solutions for a range of complex applications.

**Design Expertise**
In-house design engineers & pattern makers

**Custom Application**
Procedures can be developed in-house

**Bespoke Tooling Design**
To fit intricate shapes to meet project needs

**Silicone Specialists**
Industry leader in working with silicone materials

Find out more about ContraTherm® at: www.advancedinsulation.com
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Direct Application Method

ContraTherm® C25 is supplied as a wet coating applied directly to the primed substrate in the field

ContraTherm® C25 is a cast in place material which uses two component pumps to inject resin into pre-assembled mould tools. The material is left to cure before the tools are removed.

ContraTherm® C25 Silicone Tie Coat Primer is first applied to the substrate to provide an interlayer to the syntactic foam material and to give good bond integrity to the substrate. The Tie Coat Primer is specially designed to be tolerant of environmentally borne contaminants and is not sensitive to humidity.

ContraTherm® C25 can be cast to any reasonable thickness subject to any practical limitation within the subsea structure’s dimensions.

Mould tooling is engineered to suit areas that are difficult to access.

- **Room Temperature**
  - No need to heat the substrate being insulated

- **Long-term Security**
  - Proven adhesion during deployment and service

- **Homogenous Joints**
  - Ensures there are no weak points in the system

- **Easy Maintenance**
  - Straightforward to remove and repair

- **Ambient Curing**
  - Ideal for application at any stage of a project

ContraTherm® | Thermal Insulation for complex subsea equipment
Find out more about ContraTherm® at: www.advancedinsulation.com
ContraTherm® | Thermal Insulation for complex subsea equipment
ContraTherm®

Christmas Trees & Metering

ContraTherm® C25 can be applied to complex shape structures requiring insulation

ContraTherm® C25 is an ideal product for christmas trees and metering systems. Its cold curing, low shrinkage attributes offer defined thicknesses with minimised internal stress loadings. This guarantees a secure joint between mouldings that are often complex in shape and loading condition.

There is also no risk of the moulding process distorting sealed connections between components. ContraTherm® C25 is readily applied over bolted flange terminations and across varying types of connection systems.

Christmas trees and metering tend to contain numerous electrical and hydraulic line connections, which must also be accommodated within the insulation design.

Advanced Insulation can supply separate removable choke and tree cap covers where required.

Find out more about ContraTherm® at: www.advancedinsulation.com
Jumpers, Tie-in Spools, Risers & Flowlines

ContraTherm® C25 is a flexible solution for pipe insulation projects

Jumpers and tie-in spools are short pipes that connect oil field equipment together. Due to complexities involved with installing such structures the final length and shape is often not determined straightaway.

This requires a two stage installation process; the insulation of the bulk pipe and bends followed by subsequent field jointing.

Risers and flowlines tend to be longer sections of prefabricated pipe that are reeled prior to deployment offshore; the insulation production is very similar with only the presence of offshore fast field joints adding to complexity. C25 can be used as a fast field joint material.

ContraTherm® C25 material is readily applied in the various temperate and humidity conditions seen in the oil and gas industry. Examples range from the cold North Sea to hot, remote Angola.

Such pipeline applications often require the addition of buoyancy modules or VIV strakes. Advanced Insulation can supply these products ensuring an appropriate interface with the insulation material.

<table>
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<th>Flexible Scheduling</th>
<th>Engineered Solutions</th>
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<tr>
<td>Can be applied at any stage of a project</td>
<td>For bespoke, complex applications</td>
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<th>Short Application Process</th>
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<td>A cast in place ‘go to’ solution</td>
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Find out more about ContraTherm® at: www.advancedinsulation.com
**ContraTherm® Manifolds & PLETS**

ContraTherm® C25 can be applied to complex structures comprising straight pipe and bend sections, linked to flowline anchors and/or bulkheads. Often ball and/or gate valves are present in the structure in differing sizes depending on the combination of pipe diameters used within the structure. The pipework is contained within a steel superstructure which can add complexity to the insulation process. Insulated components are often close to or placed on a sliding interface with the steel work. Such structures are generally coated with an anti-corrosion material. ContraTherm® C25 Insulation has been qualified for use with the generic substrates most commonly used in the market including:

- Polypropylene
- Polyethylene
- Fusion Bonded Epoxy
- Phenolic Epoxy Paint
- Inconel
- Stainless Steel
- Standard Paint Coatings

**Substrate Compatible**

- Capable of applying substrates/paint systems

**Bespoke Application**

- Procedures can be developed in-house

**Engineered Solutions**

- For bespoke, complex applications

Find out more about ContraTherm® at: www.advancedinsulation.com
ContraTherm® | Thermal Insulation for complex subsea equipment
ContraTherm®
Connection Systems

ContraTherm C25® can be applied to male and female pipe connections as well as the housing protecting any clamp system.

ContraTherm C25® is suitable for use on connection systems of any design.

The design of the connectors vary greatly between manufacturers with the common system being a clamp connection system that connects two pipe end sections. With horizontal clamping systems, the joint tends to be between two straight pipes whilst on a vertical system a Gooseneck can also be present.

Clamping sealing arrangements can be used on connection systems where two moulded component parts come together to form a joint in a removable structure.

Complex Geometry
- C25 is suited for this type of application

Cold Curing
- Ideal to apply within or over thin wall housings

Low Shrinkage
- Allows tight production tolerances to be met

Engineered Solutions
- For bespoke, complex applications

Find out more about ContraTherm® at: www.advancedinsulation.com
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C25 Insulation Construction

ContraTherm® C25 Insulation is designed to be applied at any stage of a project regardless of location and environmental conditions.

ContraTherm® C25 Construction

Silicone resins offer a highly flexible, high temperature system that is fast becoming the recognised solution for dynamic application service. Advanced Insulation recommends the C25 Series for service on dynamic applications such as production jumpers, tie-in spools and steel risers.

The system comprises of a layer of silicone tie coat primer which provides a strong bond of the C25 foam to the substrate.

C25 Syntactic Silicone Foam
C25 Silicone Tie Coat Primer
Substrate Coated with Anti-corrosion Coating
ContraTherm®

C25 Glass Microspheres

The excellent thermal performance and high hydrostatic pressure capability of ContraTherm® C25 is provided by specially developed glass microspheres supported in the silicone resin matrix.

ContraTherm® C25 insulation foam consists of an optimised fill of glass microspheres dispersed within a silicone resin matrix which provides a robust solution for extreme subsea environments.

The thickness of material is determined by the thermal requirements for the given project.

The microspheres are microscopic closed cells of borosilicate glass and exhibit very stable insulation properties over long term environmental exposure. The silicone matrix does not absorb water.

Tested for Maximum Water Absorption

When exposed to highly pressurised water
ContraTherm® C25 has been developed with continuous investment in internal research & development and through qualification programmes often involving third parties.

A constant focus was maintained on the critical parameters required of high temperature and high pressure insulation materials.

The material evaluation process can be split into two categories, material definition and full scale testing.

**Material Definition:**
Laboratory scale-testing determined material properties in new and aged conditions. Testing enables delivery of material performance according to:

- Temperature Capability
- Hydrostatic Pressure Capability
- Thermal Performance
- Material Density
- Mechanical Density & Performance
- Water Absorption Resistance

**Full Scale Performance Testing**
Advanced Insulation have tested their products predicted service performance through:

- Simulated Service Testing
- Thermal Cycling Testing
- Cool Down Testing
- Cathodic Disbondment Testing

**Product Testing**
C25® can be tested to client requirements

**Qualified Products**
Tested to major oil and gas company standards
ContraTherm® C25 has industry leading mechanical and thermal properties

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<tr>
<th>Property</th>
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<tr>
<td>Density [kgs/m³]</td>
<td>780-820</td>
</tr>
<tr>
<td>Thermal Conductivity (Dry) [W/mk]</td>
<td>0.15-0.16</td>
</tr>
<tr>
<td>Thermal Conductivity (Aged) [W/mk]</td>
<td>0.16-0.18</td>
</tr>
<tr>
<td>Specific Heat Capacity [J/kg]</td>
<td>1300-1700</td>
</tr>
<tr>
<td>Maximum Service Temperature [°C]</td>
<td>150</td>
</tr>
<tr>
<td>Maximum Operating Depth [msw]</td>
<td>3000</td>
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<tr>
<td>Hardness</td>
<td>70 Shore A</td>
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*Aged data is based upon long term exposure testing of un-faced foam having been exposed on all sides and represents the worst case scenario.

Please note this information is based on our present state of knowledge and is intended to provide general notes on our products and their properties. It should not therefore be construed as guaranteeing specific properties of the products described or their suitability for a particular application. The values are subject to changes without notice, please consult with us prior to the application.
ContraTherm® comes with a single point responsibility from Advanced Insulation; ensuring quality is measured at every stage during manufacture, shipping and on-site installation.

Advanced Insulation offer a single point responsibility on all ContraTherm® insulation systems.

This means that its global application teams are trained and certified to apply and inspect ContraTherm® on subsea oil and gas structures according to the ContraTherm® application procedure.

During the application phase, trained Advanced Insulation applicators ensure the correct application process is followed.

Advanced Insulation promote a world class health and safety culture in the workplace with a “Think Safe, Act Safe, Be Safe” initiative recognised by the EFF-The Manufacturers’ Organisation.
Advanced Insulation are a market-leading provider for insulation types including thermal, PFP and acoustic

Advanced Insulation also offer its ContraTherm® C55 product which is suited to more rigid structures such as Christmas trees, manifolds, supported jumpers and pipeline end terminations.

The low thermal conductivity and robust mechanical configuration of ContraTherm® C55 makes it highly suitable for the subsea environment.

ContraTherm® C55 is a multi-layer syntactic phenolic composite system with properties that can be tailored to meet specific project requirements.

Advanced Insulation are also market-leading providers of ContraFlex® insulation and ContraFlame® passive fire protection for a range of topside applications. Types of ContraFlex® insulation include: high temperature, acoustic, trace heating, leak detection and winterisation.

ContraFlex® is suited to many industries including oil and gas, petrochemical, nuclear, LNG and industrial.

ContraTherm® C55
Insulation for more rigid subsea structures

ContraFlex® PFP
Ask for a ContraFlex® PFP Brochure for more

ContraFlex® Insulation
Ask for a ContraFlex® Insulation Brochure

ContraFlame® PFP
Ask for a ContraFlame® PFP Brochure

Find out more about ContraTherm® at: www.advancedinsulation.com
Advanced Insulation has the ability to offer a comprehensive range of subsea systems

Advanced Insulation offer a cost-effective solution for subsea oil and gas projects by providing a full package of products alongside ContraTherm® insulation.

The product range includes buoyancy, clamps, cable protection and underwater markers.

- **ContraTherm® Insulation**: Syntactic flexible subsea insulation
- **Manuplas® Buoyancy**: Installation & engineered buoyancy
- **Cable Protection Systems**: Cable Protection, bend stiffeners & J-tube seals
- **C.Tag® Subsea Markers**: High visibility underwater markers
- **Clamping Solutions**: Piggyback, compliant and gromet clamps
Find out more about ContraTherm® at: www.advancedinsulation.com
Advanced Insulation is a market-leading insulation provider with global reach.

Advanced Insulation offers a fully comprehensive service that includes survey, design, manufacture, application and technical support.

Requests for quotation and marketing enquiries should be submitted to: info@advancedinsulation.com

GLOBAL PROJECT EXAMPLES:

A. Offshore Canada
Hebron Field
ExxonMobil
WD: 70msw
Temp: 70°C

B. Offshore Malaysia
Siakap Field
Murphy
WD: 1490msw
Temp: 80°C

C. Caspian Sea
Shah Deniz Field
BP
WD: 600msw
Temp: 90°C

D. Offshore Ghana
TEN Field
Tullow
WD: 2000msw
Temp: 98°C

E. East Mediterranean
Tamar Field
Noble Energy
WD: 1800msw
Temp: 100°C

F. UK North Sea
Montrose Field
Repsol Sinopec
WD: 90msw
Temp: 100°C

G. Offshore Angola
Kaombo Field
Total
WD: 925msw
Temp: 118°C

H. Norwegian Sea
Bryhnild Field
Lundin
WD: 82msw
Temp: 135°C

I. Gulf of Mexico
TVEX Field
Chevron
WD: 2134msw
Temp: 135°C