ContraTherm®
C55 Subsea Insulation
For rigid subsea structures such as christmas trees, manifolds, supported jumpers and pipeline end terminations.
ContraTherm®

Better products for challenging situations

For further information about the ContraTherm® range of products, please visit www.advancedinsulation.com
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Find out more about ContraTherm® at: www.advancedinsulation.com
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C55 Thermal Insulation

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

Advanced Insulation’s ContraTherm® C55 insulation is a rigid thermostat material more suited to less dynamic subsea equipment components such as Christmas trees, manifolds, supported jumpers and pipeline end terminations.

ContraTherm C55® ambient curing properties make the system ideal for direct application to equipment on construction or manufacturing sites globally.

The hand applied application methodology combined with the minimum requirement for complex application equipment, and the absence of mould tooling, ensures ContraTherm® C55 is a very flexible material to apply from a scheduling perspective; a benefit where complex equipment build programmes are involved.
ContraTherm®

Benefits of C55 Insulation

ContraTherm® C55 has been specifically developed to operate under high temperature and pressure extremes.

What makes ContraTherm® C55 different?

+ Phenolic base guarantees excellent resistance to heat enabling extreme temperature performance.
+ Fabrication of mould tooling or complex pumping equipment is not required and makes application possible in areas that are normally difficult to access.
+ Can be shaped to suit detailed interface requirements prior to curing.
+ Utilises simple mixing and application equipment which is readily available. It does not require extensive maintenance or spares in the field.
+ Suited for application using local labour with appropriate Advanced Insulation training and under supervision.
+ Straightforward removal if required.

Water Depth
Tolerates water depths to 3000msw

Unique Ambient Curing
Apply at any stage of a project build programme

Flexibility of Application
Hand application directly to the substrate

Temperature Range
Capable of operating to 185°C

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

Designed to Protect, Built to Last

ContraTherm® C55 insulation is designed for life-in-service field use within the harshest subsea environments

ContraTherm® C55 thermal insulation is the product of years of research, development and testing to create a bespoke solution for challenging environments.

ContraTherm® C55 was developed and tested to outperform other insulation materials with better thermal and mechanical properties when operating in extreme conditions.

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

+ Excellent resistance to water ingress.
+ Water depth rating to 3000msw.
+ Temperature rating of 185°C.
+ Excellent resistance to compression loads.
+ Excellent resistance to impact loads.
+ Long term structural stability.
+ Ease of application to rigid structures.

Advanced Insulation is now able to provide the oil and gas industry with a flexible, 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 2013 Queen’s Award for Innovation for ContraTherm C55®, as well as the 2012 Queen’s Award for International Trade.

Innovation Award

C55® Recognised by Her Majesty the Queen
ContraTherm®

Certifications

ContraTherm® C55 is the most extensively tested and qualified subsea insulation material in the world

ContraTherm® C55 is fully qualified to 3000msw (9,840ft) service at 185°C (365°F) service temperature.

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

Extensive laboratory testing and large scale testing has demonstrated that ContraTherm® C55 is a robust insulation system suitable for extended subsea service considering:

+ High temperature production fluid
+ Deepwater deployment
+ Extended cool down performance

Advanced Insulation continuously works towards international and company standards.

<table>
<thead>
<tr>
<th>Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWIS JIP Qualified</td>
</tr>
<tr>
<td>Chevron led (subsea wet insulation systems)</td>
</tr>
<tr>
<td>Total Qualified</td>
</tr>
<tr>
<td>Total GS EN COR 226 compliant</td>
</tr>
<tr>
<td>ExxonMobil Qualified</td>
</tr>
<tr>
<td>ExxonMobil GP650801 compliant</td>
</tr>
<tr>
<td>ISO 12736</td>
</tr>
<tr>
<td>Wet thermal insulation systems</td>
</tr>
</tbody>
</table>

Find out more about ContraTherm® at: www.advancedinsulation.com
Applications for C55 Thermal Insulation

ContraTherm® C55 Insulation can be directly applied to a number of applications across the subsea oil and gas industry:

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

Retrofitted Doghouse & Flange Cover Service
C55 can be pre-cast into predetermined shapes.
ContraTherm®
Worldwide Application in all Climates

ContraTherm® C55 has been successfully applied to subsea structures in a varying range of climates across the world.

- **Cold Territories**
  - C55 projects include the UK & Norway

- **Hot & Humid Climates**
  - C55 projects include Malaysia and Australia

- **Hot & Remote Territories**
  - C55 projects include Brazil, Nigeria and Angola

Find out more about ContraTherm® at: www.advancedinsulation.com
**ContraTherm®**

Direct Application Method

**ContraTherm® C55 is supplied as a wet coating applied directly to the corrosion coated substrate in the field**

The process of direct application involves mobilising materials, equipment and personnel to construction sites worldwide and applying the ContraTherm® C55 system directly to the equipment substrate.

In its wet state, the core material is designed to be easily applied to equipment and pipe work in layers.

The relatively simple application process makes any modifications or adjustments to the insulation thickness coverage during application quick and simple.

The composite outer skin will be applied to the ContraTherm® C55 core once the curing process is sufficiently advanced. The individual glass fibre layers are wrapped onto the core material and impregnated with resin between each individual layer.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cold Curing Properties</strong></td>
<td>Ideal to apply at any stage in the build programme</td>
</tr>
<tr>
<td><strong>No Curing Shrinkage</strong></td>
<td>Enables an accurate thickness control</td>
</tr>
<tr>
<td><strong>Homogenous Joints</strong></td>
<td>Ensures there are no weak points in the system</td>
</tr>
<tr>
<td><strong>Flexible Application</strong></td>
<td>In areas normally difficult to access</td>
</tr>
<tr>
<td><strong>Substrate Compatible</strong></td>
<td>Tie coat can be applied to anti-corrosion coatings</td>
</tr>
</tbody>
</table>
Find out more about ContraTherm® at: www.advancedinsulation.com
ContraTherm®

Christmas Trees & Metering

ContraTherm® C55 can be applied to rigid structures which have a complex shape and require insulation

ContraTherm® C55 is an ideal product for field application to equipment such as christmas tree and metering systems. Its cold curing, low shrinkage attributes offer defined thicknesses with minimised internal stress loadings. This guarantees a secure joint between equipment parts that are often complex in shape and loading condition.

There is also no risk of the material distorting sealed connections between components. ContraTherm® C55 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 with the insulation design and application.

These structures are generally coated with an anti-corrosion material. ContraTherm® C55 Insulation has been qualified for use with the generic substrates most commonly used in the market including:

+ Fusion Bonded Epoxy
+ Phenolic Epoxy Paint
+ Standard Paint Coatings

Find out more about ContraTherm® at: www.advancedinsulation.com
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Manifolds & PLETS

ContraTherm® C55 can be applied to rigid structures comprising straight pipe and bend sections, linked to flowline anchors and/or bulkheads.

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. Direct application of ContraTherm® C55 is relatively simple to apply to these difficult to access components.

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.

ContraTherm® C55 is capable of higher compression loadings than Advanced Insulation’s other insulation materials and presents a better solution where an insulated component must slide along the steel superstructure as part of the design movement.

Substrate Compatible
Suitable to apply to substrates/paint systems

Flexible Application
For areas difficult to access and complex in shape

Find out more about ContraTherm® at: www.advancedinsulation.com
Contra Therm®
Thermal Insulation for rigid subsea structures
ContraTherm®

Connection Systems

ContraTherm C55® can be applied to male and female pipe connections as well as the housing protecting any clamp system.

ContraTherm C55® 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.

Sealing arrangements are sometimes used on connection systems where two insulated parts form a joint in a removable structure. Such situations require close tolerance manufacture which is aided by the low shrinkage of ContraTherm® C55.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complex Geometry</td>
<td>C55 is suited for this type of application</td>
</tr>
<tr>
<td>Cold Curing</td>
<td>Ideal to apply within or over thin wall housings</td>
</tr>
<tr>
<td>Low Shrinkage</td>
<td>Allows tight production tolerances to be met</td>
</tr>
<tr>
<td>Flexible Material</td>
<td>For bespoke and easy direct application</td>
</tr>
</tbody>
</table>

Find out more about ContraTherm® at: www.advancedinsulation.com
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C55 Insulation Construction

ContraTherm® C55 Insulation is designed to be applied at any stage of a project regardless of location and environmental conditions.

ContraTherm® C55 Construction

Phenolic resins are widely used in high temperature applications and are the acknowledged choice for elevated service temperatures.

The system comprises of a tie coat layer that adheres to the substrate with layers of C55 phenolic insulation foam. A phenolic composite laminate is then applied with a final epoxy flow coat.

Tie coat may be applied directly to shot blasted steel coated with the standard high performance anti-corrosion coatings widely used by the subsea equipment manufacturers.

Phenolic Specialists
Industry leader in working with phenolic resins

Epoxy Flow Coat
D2004 Phenolic Composite Laminate
C55 Phenolic Insulation Foam
Tie Coat
Substrate Coated with Anti-corrosion Coating
Glass Microspheres

The excellent thermal performance and high hydrostatic pressure capability of ContraTherm® C55 is provided by specially developed glass microspheres supported in the phenolic resin.

ContraTherm® C55 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 which exhibit very stable insulation properties over long term environmental exposure.

The phenolic binder does not absorb water and any voids between the microspheres and the resin represent an almost insignificant volume into which water can ingress.

<table>
<thead>
<tr>
<th>Tested for Maximum Water Absorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>When exposed to highly pressurised water</td>
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</table>
ContraTherm®

Material & Technical Properties

ContraTherm® C55 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**
C55® can be tested to client requirements

**Qualified Products**
Tested to major oil and gas company standards
ContraTherm®

Mechanical & Thermal Properties Data

ContraTherm® C55 has industry leading mechanical thermal properties

<table>
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<tr>
<th>Property</th>
<th>C55 Series Syntactic Phenolic</th>
<th>D2004 Series Phenolic Outer Skin</th>
</tr>
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<tbody>
<tr>
<td>Density [kgs/m³]</td>
<td>600-850</td>
<td>1300-1350</td>
</tr>
<tr>
<td>Thermal Conductivity (Dry) [W/mk]</td>
<td>0.14-0.17</td>
<td>0.18-0.22</td>
</tr>
<tr>
<td>Thermal Conductivity (Aged) [W/mk]</td>
<td>0.19-0.22</td>
<td>0.22-0.24</td>
</tr>
<tr>
<td>Specific Heat Capacity [J/kgk]</td>
<td>1700-2200</td>
<td>-</td>
</tr>
<tr>
<td>Maximum Service Temperature [°C]</td>
<td>185</td>
<td>200</td>
</tr>
<tr>
<td>Maximum Operating Depth [msw]</td>
<td>3000</td>
<td>3000</td>
</tr>
<tr>
<td>Hardness</td>
<td>50 Shore D</td>
<td>-</td>
</tr>
</tbody>
</table>

* 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.

**Exceptional Chemical Resistance**
To seawater, oil, solvents, acids and aggressive chemicals

**Excellent Mechanical Stability**
Will not significantly change with time

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

Site Application & Training

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.

Training Certificates
Issued to each approved site applicator

Health & Safety
Award winning health & safety culture
Advanced Insulation are a market-leading provider for insulation types including thermal, PFP and acoustic.

Advanced Insulation also offer its ContraTherm® C25 product which is suited to more dynamic applications such as production jumpers, tie in spools and steel risers.

The low thermal conductivity and robust mechanical configuration of ContraTherm® C25 makes it highly suitable for the subsea environment.

ContraTherm® C25 is a multi-layer syntactic silicone 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. Popular types of ContraFlex® insulation include high temperature, acoustic, trace heating, leak detection and winterisation.

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

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 and engineered buoyancy

- **C.Tag® Subsea Markers**
  - High visibility underwater markers

- **Cable Protection Systems**
  - Cable Protection, bend stiffeners & J-tube seals

- **Clamping Solutions**
  - Piggyback, compliant and gromet clamps
Global Presence

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 HIGHLIGHTS:

A. Norwegian Sea
Skarv Idun Field
BP
WD: 400msw
Temp: 135°C

B. Norwegian Sea
Kristen Field
Statoil
WD: 380msw
Temp: 165°C

C. Offshore Mediterranean
MOG/ENI
Bahr Essalam Field
WD: 190msw
Temp: 142°C

D. Offshore Nigeria
Akpo & Akpo South Fields
Total
WD: 1750msw
Temp: 115°C

E. UK North Sea
Jade & Judy Fields
Conoco
WD: 100msw
Temp: 160°C

F. Offshore Brazil
Guara & Lula Fields
Petrobras
WD: 2500msw
Temp: 135°C

Fabrication Facilities
In-house application areas, maintenance & Sales

ContraTherm® | Thermal Insulation for rigid subsea structures
GLOBAL SALES OFFICES:

1. United Kingdom
   Qedgeley West Business Park
   Bristol Road Hardwicke
   Gloucester
   GL2 4PA
   Tel: +44(0)1452 880880

2. Angola
   Rua Direita do Gamek
   N26 Base Kubics
   Largo Corimba-Samba
   Luanda
   Tel: +244923 364 273

3. Brazil
   Rodovia SP 107, km 29
   Jaguariúna – SP
   Caixa Postal 255
   13820-000
   Tel: +55 19 41417117

4. Kazakhstan
   184/1 Iksanova St.,
   090300, Burlin region,
   Aksai
   West Kazakhstan Oblast
   Tel: +7 701 786 9158

5. South Korea
   72-1 Sinsan-Ro
   Saha-gu
   Busan
   49434
   Tel: +82 51 921 6367

6. Malaysia
   56 Jalan Anggerik Vanilla
   Canal Garden
   Kota Kemuning
   Shah Alam 40460
   Tel: +603 5121 3886

7. United Arab Emirates
   P. O. Box 18512
   Jebel Ali Free Zone
   Dubai
   Tel: +971 4 8819821

8. United States of America
   11490 Westheimer Road
   #925
   Houston, TX
   77077
   Tel: +1 (713) 425 6320

9. Canada
   121 Germain Street
   Saint John,
   NB
   E2L 2E9
   Tel: +1 (780) 905 4723

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