

Cryogel[®] Z

Proven for LNG Service

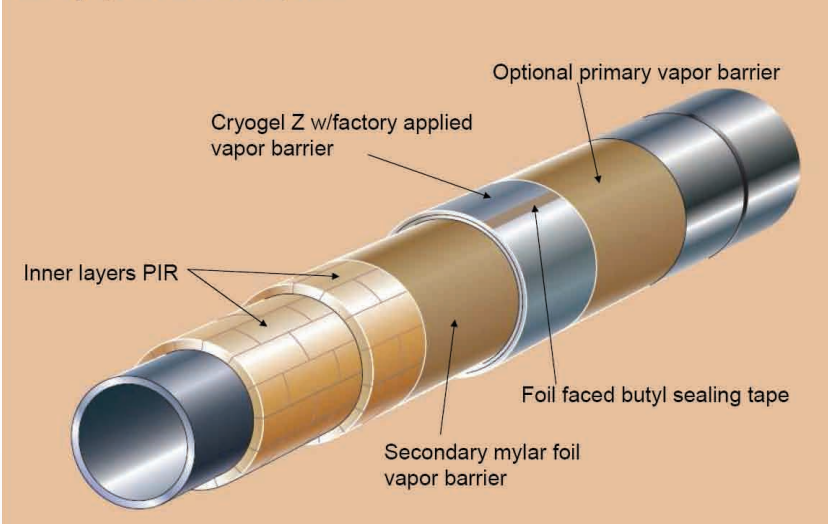
Project Profiles



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PIR-Cryogel Z Insulation System



Application LNG Gasification Piping and Equip.
 Project Canaport LNG
 Location St. John, New Brunswick, Canada
 Owner Repsol, Irving
 Engineer Saipem and SNC Lavalin
 Contractor BIS OKI
 In Service June 2009

LNG Gasification Piping and Equipment
 St. John, New Brunswick, Canada



Contractor installing two layers of Cryogel® Z over PIR pipe cover.

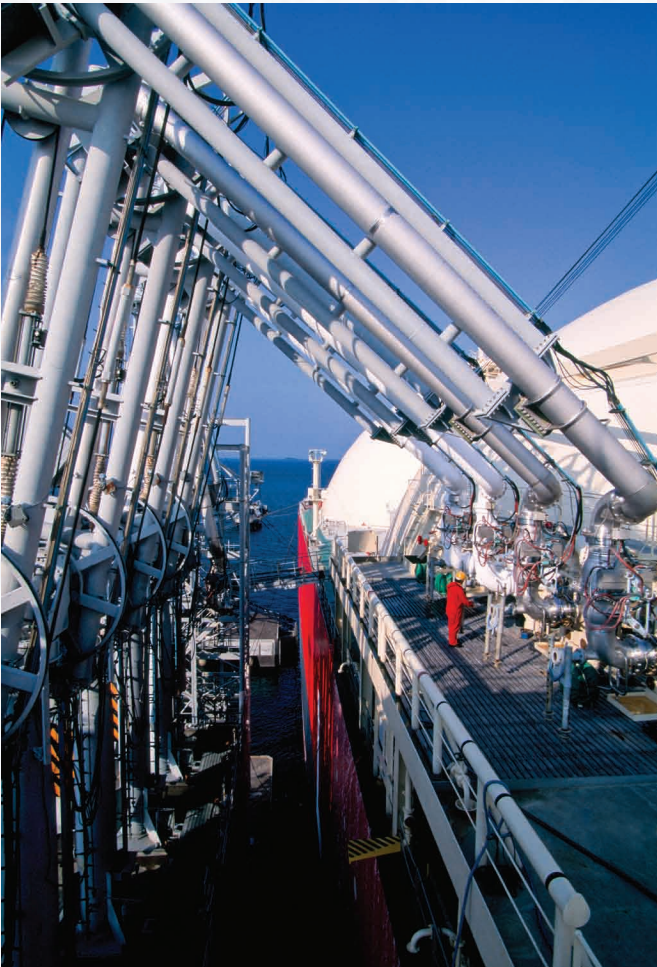
A composite insulation system of polyisocyanurate covered with 50 mm of cellular glass was originally specified for the gasification section of this facility. Due to time constraints in the construction schedule, 20 mm of Cryogel® Z was used in place of the cellular glass. The Cryogel® Z / PIR composite offered equivalent protection against heat gain, moisture, and fire, and greater durability against mechanical damage. Most importantly, the Cryogel® Z flexible blankets installed 80% faster than the cellular glass and eliminated expansion/contraction joints.



Application LNG Loading Arms
 Project Mejillones LNG
 Location Mejillones, Northern Chile
 Owner Tractebel Suez
 Engineer Technicas Reunidas
 Manufacturer FMC Technologies
 Contractor Prezioso

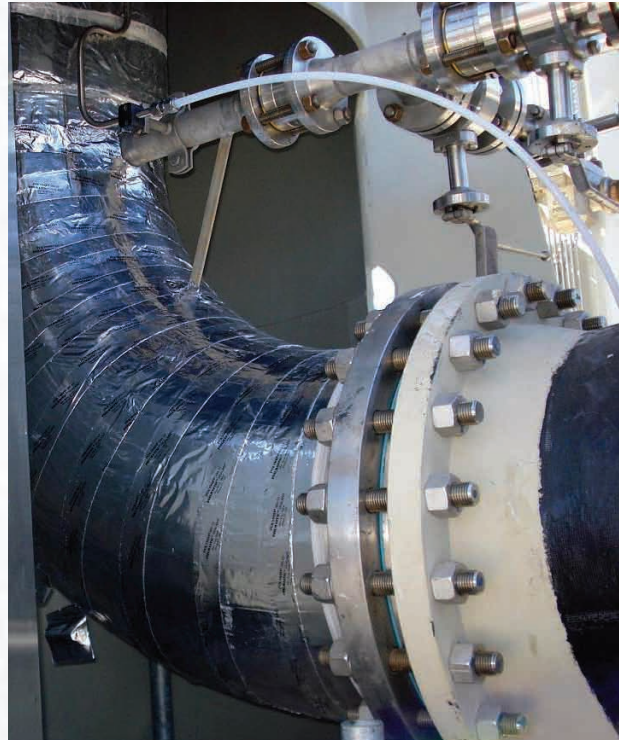
LNG Loading Arms

Mejillones, Northern Chile



LNG loading arms in operation.

Loading arms are usually uninsulated due to the severe stresses of cycling between ambient and LNG (-160°C) temperatures. This can result in heavy ice formations during operation, and dangerous ice falls during the subsequent warm up. The Mejillones LNG loading arms were insulated with Cryogel® Z because it is impervious to cryogenic cycling, light enough to not affect the structural dynamics, and thin enough to avoid interference with the swing mechanism.



Cryogel® Z installed on an elbow at the base of a loading arm.



Application LNG Unloading and Vapor Return Lines
Location Everett, Massachusetts, USA
Owner Suez Energy
Contractor Zampell
In Service October 2007

LNG Unloading and Vapor Return Lines Everett, Massachusetts, USA



Cryogel® Z tie-in to adjacent insulation material.

LNG loading/unloading lines in this facility commonly used rigid polyisocyanurate insulation or cellular glass. Since this facility does not continuously maintain the piping at cryogenic temperatures, the constant thermal cycling poses severe stresses on the insulation. To combat the wear-and-tear on the pipe insulation, a trial with Cryogel® Z was performed in October 2007. In addition to the decreased thickness, the contractor found substantial improvements in application time. The system has been through more than 100 deep thermal cycles to date, with outstanding results.



Application LNG Cryogenic Valves
Project Adriatic LNG
Location Adriatic Sea
Owner ExxonMobil
Engineer Aker Kvaerner
Contractor Kaefer
In Service August 2009

LNG Cryogenic Valves Adriatic Sea



Cryogenic valves before and after being insulated with Cryogel® Z.

Adriatic LNG is an offshore LNG receiving terminal located just south of Venice, Italy. Rigid insulation material was specified for the piping, but due to construction timing issues, Cryogel® Z was used to insulate the cryogenic valves and flanges. Cryogel® Z was chosen due to its extremely thin profile, ease of construction and logistics, and fast application time.



Application LNG Cryogenic Bellows
Project Haverhill Peakshaving Plant
Location Haverhill, Massachusetts, USA
Owner National Grid
Contractor Anchor Insulation
In Service November 2007

LNG Cryogenic Bellows

Haverhill, Massachusetts, USA



This uninsulated bellows coupling at the base of an LNG tank was accumulating ice balls and impairing the movement of the stainless steel corrugations. The relative motion inherent to bellows necessitated the use of Cryogel® Z because it always remains flexible, even at cryogenic temperatures.



Application LNG Field Joints
Project Freeport LNG
Location Freeport, Texas, USA
Owner Dow
Engineer Technip
In Service April 2008

LNG Field Joints

Freeport, Texas, USA



The Freeport LNG terminal uses vacuum piping for the LNG transfer lines, and the field joints required an insulation that could be easily applied and have a very thin profile. Cyrogel® flexible insulation blankets offered the best solution for this application.

Cryogel® Z

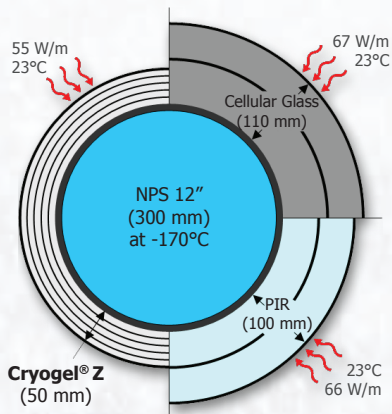
Flexible Industrial Insulation With Integral Vapor Barrier for Sub-Ambient and Cryogenic Applications

Cryogel® Z has the lowest k -value of any cryogenic insulation material in the world, reducing thicknesses by 50%-75%. Cryogel® Z's flexible blanket form, with a factory-applied vapor barrier, is both faster to install and more durable once in service, resulting in lower-cost, higher-performing designs.

Applications for Cryogel® Z include sub-ambient piping and equipment, cryogenic storage and transport, industrial gases, and LNG import/export pipelines and process areas.

Cryogel® Z Insulation System Advantages

- Thinness creates more space in and around pipe racks and equipment.
- Thinness can decrease the overall size of a production facility, resulting in major material reductions and cost savings.
- Thinness results in volume and freight savings, decreased accessory materials, minimal site storage, and simplified logistics.
- Unique flexible form and wrap application makes installation faster, easier, and less costly. Rigid insulation systems require numerous segments that must be effectively sealed.
- Will not break during shipment.
- Competitive with other insulation systems on an installed basis due to decreased material requirements, logistics improvements, reduced installation time, and shorter construction schedules.



All three designs meet the same condensation control criteria.

Service Temperature Range -460°F (-270°C) to 195°F (90°C)

Thermal Performance Cryogel® Z has the lowest thermal conductivity of any material used for cryogenic service. It is therefore much thinner compared to other cold insulation materials. In most cases, condensation control thickness is sufficient to meet the desired heat gain limitations. Cryogel® Z's minimal thickness results in a smaller surface area and reduced heat gain compared

to other insulation materials. This heat gain "safety factor" maximizes system performance by improving process control, reducing boiloff and saving energy. Also, Cryogel® Z does not have blowing agents that diffuse out over time, so its thermal performance remains constant.

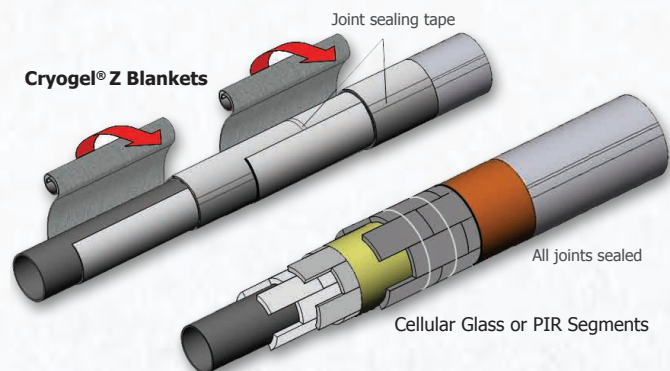
Moisture and Vapor Resistance Permeability to water and water vapor are critical to any insulation system operating at cryogenic temperatures. Cryogel® Z uses a factory-applied mylar vapor barrier to achieve a zero-perm system.

Structural Integrity

Cryogel® Z is well-suited for sub-ambient and cryogenic applications. Under these severe conditions, its structure experiences no thermal shock and remains totally flexible. This is unlike rigid, cellular insulation materials, which experience contraction, thermal shock, extreme stresses, damaged structure, freeze-thaw crack propagation, and degraded insulation performance under the same conditions.

Dimensional Stability

Cryogel® Z insulation has a coefficient of thermal expansion similar to that of stainless steel, so there is minimal movement of the insulation system. Its low contraction rate and flexible wrap application eliminate the need for costly and labor-intensive expansion and contraction joints required by traditional rigid insulation systems.



In addition to reducing labor, Cryogel® Z blankets minimize sensitivity to workmanship.