



Gulf
Perlite^{LLC}



PERLITE CRYOGENIC INSULATION SOLUTIONS

EXPANDED PERLITE FOR CRYOGENIC INSULATION APPLICATIONS

- LNG, LAR, LOX, LIN, Ethylene Tanks
- Cryogenic Perlite for Evacuated Services
- Cryogenic Perlite for Non-Evacuated Services
- Cryogenic Storage Tanks
- Air Separation Units (Cold Box Insulation)
- Cold-Boxes, Heat-Exchangers and Cryo-Drains

Member of



APPLICATION OF EXPANDED PERLITE IN CRYOGENIC INSULATION SERVICES



Atmospheric Perlite Insulation

Perlite is a 100% natural volcanic glass mineral, formed by the sudden cooling and solidification of volcanic ash, which traps crystalline water into its mass. Perlite's most important natural property is the ability to expand when rapidly heated in Gulf Perlite LLC's factory, at temperatures of 800°C to 1,200°C. The abrupt, controlled rise of temperature forms a white mass of minuscule glass bubbles. Perlite simultaneously melts and expands up to twenty times its original size into an extremely porous material which in turn results in superior thermal insulation and sound proofing properties, as well as extreme lightness (weighs 48-72 kg/m³). As a volcanic glass, Perlite is non-flammable and an exceptional fireproofing material.



Service Temperatures	Type of Insulation
-150°F (-100°C) and below	Cryogenic
-150°F (-100°C) and above to + 40°F (+ 4°C)	Low temperature

Super cold or extremely cold cryogenic fluids such as hydrogen and helium are normally stored in spherical, double walled vessels with evacuated annular spaces using evacuated perlite.



Expanded Perlite



Non-Evacuated Perlite Insulation

Perlite insulation has found wide acceptance in the insulating of cryogenic and low temperature storage tanks, in shipping containers, cold boxes, test chambers and in food processing.



Evacuated Perlite Insulation

Cavity Wall Insulation

Perlite insulation suitable for non-evacuated cryogenic or low temperature use, exhibits low thermal conductivity throughout a range of densities; the normal recommended density range is 48 to 72kg/m³. In addition to its excellent thermal properties, perlite insulation is cost efficient, easy to handle and install, noncombustible and meets fire regulations, lowers insurance rates, does not shrink, swell, warp or slump.

There are many different design concepts for low temperature and cryogenic storage vessels. However, most are of double wall construction with the annulus filled with expanded perlite. Packaged or bulk perlite may be used to insulate smaller vessels by pouring or through pneumatic pumping by our installation crew.



Double Wall System

Color	Snow White to Grayish White
Organic Materials	0.1% Maximum
Moisture Content	0.5% Maximum
Loose Density	48 – 65 kg / m ³
Thermal Conductivity at -126°C	0.025 – 0.029 W/m ² K
Softening Point	870 – 1100°C
Fusion Point	1280 – 1350°C

Table #1: Cryogenic Perlite Physical Characteristics

GULF PERLITE CRYOGENIC Non-evacuated Service

GULF PERLITE CRYOGENIC with grain sizes of 0 to 1.18mm, with min 50% retained in 0.15 mm sieve, is produced under special specifications to be used for cryogenic insulation applications. The thermal conductivity at mean temperature -126°C is 0.025–0.029 w/m²K. We deliver in 100 liter UV and water proof bags, 1,000 liter jumbo bags, tanker trucks and any other packing upon request.



Mesh # (mm)	% Passing Range	% Retained by Weight
# 16, 1.18mm	90 – 100 %	10% Ret. Maximum
# 100, 0.15mm	0 – 20 %	80% Ret. Maximum

Table #2: Granular Size Distribution

Silicon Dioxide, (SiO ₂)	72.00 – 76.00%
Aluminum Oxide, (Al ₂ O ₃)	11.50 – 17.00%
Potassium Oxide, (K ₂ O)	4.00 – 5.00%
Sodium Oxide, (Na ₂ O)	2.90 – 4.00%
Calcium Oxide, (CaO)	0.50 – 2.00%
Ferric Oxide, (Fe ₂ O ₃)	0.50 – 1.50%
Magnesium Oxide (MgO)	0.10 – 0.50%
Titanium Oxide (TiO ₂)	0.03 – 0.20%

Table #3: Chemical Analysis

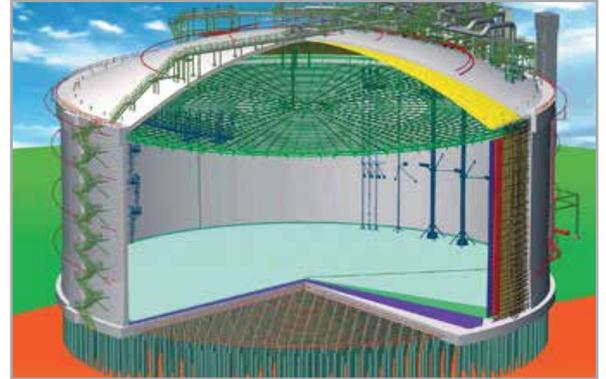


GULF PERLITE CRYOGENIC TURN-KEY SOLUTIONS

GULF PERLITE LLC boasts a specialized team of Engineers and Technicians with over 10 years of experience in cryogenic Perlite installation in Europe and worldwide. We offer to our clients in the Gulf region turn-key solutions in cryogenic Perlite insulation, combining expertise and fast deliveries from our brand new state-of-the-art Perlite factory in Jebel Ali, Dubai, in applications such as:

CRYOGENIC STORAGE TANKS

These tanks are designed with an inner and outer tank, with the insulation annulus in between the tanks filled with a cryogenic insulation material made from Perlite. During construction the Perlite is installed before any liquefied gas enters the inner tank. Cryogenic perlite is transferred into the void by pneumatic pump combined with conveying pipes. Finally, perlite is compacted to the desired requirement by electromagnetic vibrator.



AIR SEPARATION UNITS, (COLD-BOX CRYOGENIC INSULATION)

A brand new Air Separation Unit (ASU-Cold Box), cannot operate without the aid of cryogenic perlite. ASU-Cold Box separates gasses by setting different temperatures within the coldbox to liquefy each of the gasses nearest to its individual boiling point. Gasses such as Oxygen (-183°C), Nitrogen (-195.8°C) and Argon (-185.8°C) are the main products. Due to the different boiling points of gasses, and the closeness of boiling point of Argon and Oxygen, cryogenic perlite maintains the required temperatures and is highly efficient resulting in higher productivity and better quality.

Cryogenic perlite is poured into the ASU-Cold Box utilizing a stream of air through the conveying pipes and drops into the feed point. Pre-expanded perlite or on-site expanded perlite can be utilized.

PERLITE LIVE TOP-UPS OF ASU-COLD BOX

During cryogenic perlite filling, non-aided compaction of insulating perlite in a cold-box can be used to avoid possible damages within the air-separation unit. The Perlite level will settle in due time and stabilize. Compaction of perlite is dependent on gravity and on the vibration of the A.S.U. The initial fill will settle and internal pipes will get exposed. These will require perlite top-up to replenish the lost volume of insulation due to compaction.



GULF PERLITE LLC has the equipment and the skilled engineering staff to be able to inject Perlite into live Air Separation Units.

Dip Tests

A dip test is needed to determine the required quantity of perlite needed for Top-Up work. In these manner all parameters will be properly calculated thus avoiding shortage or over delivery of required cryogenic perlite.

GULF PERLITE LLC has skilled engineering staff with the ability to carry out a DIP TEST, through the filling nozzles/manholes/vents with-in the top of the Cold-Box. Following this dip test, we are able to predict the profile of the top surface of the Perlite insulation within the inner space, and based upon these results we can give recommendations for the quantity of Perlite needed on site to ensure that the Cold-Box can be completely filled, in order to reinstate a fully insulated condition.



PNEUMATIC PUMPING OF CRYOGENIC PERLITE

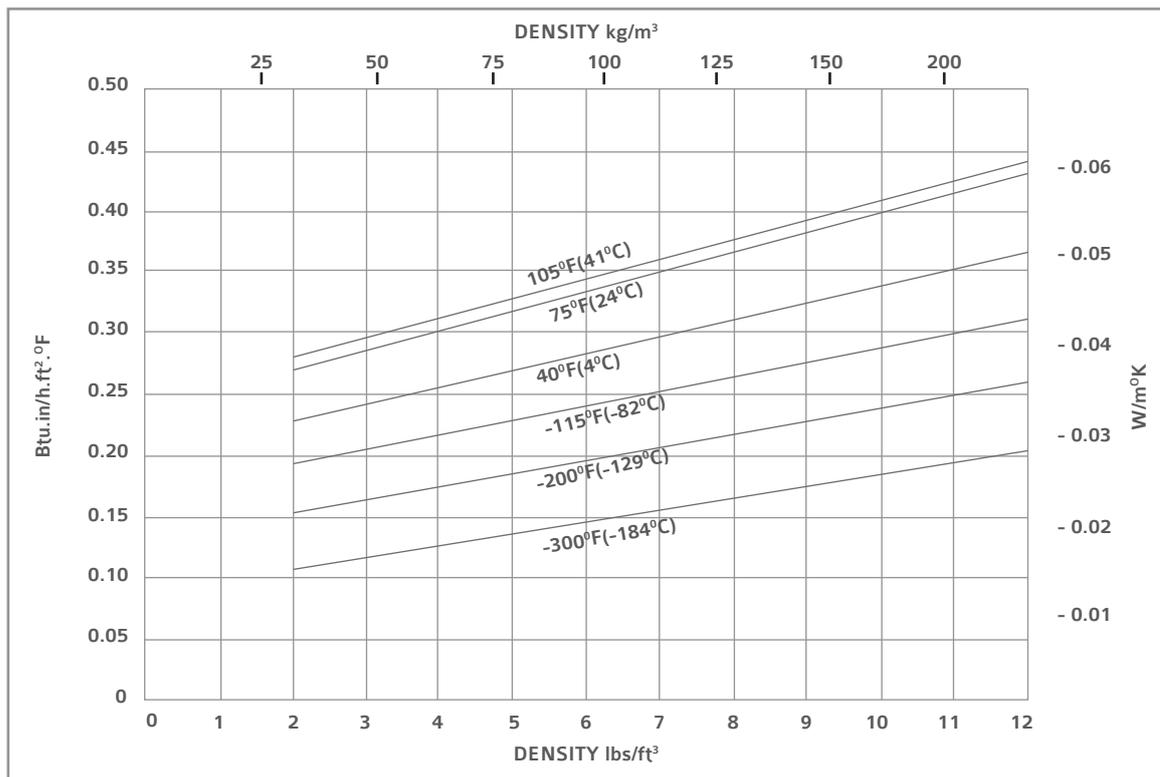
Cryogenic Perlite is conveyed to the filling point by using a pneumatic pumping system. It is conveyed by a constant flow of air through a pipe. Two blow pots are worked simultaneously to create a loading and pumping operation. In this type of process the crushing effect of conveying is minimized. Thus, the quality of perlite is safeguarded.

QUALITY ASSURANCE

A detailed Quality Manual is produced by our Project Manager, who is present on site throughout the project to ensure optimal co-ordination between the client's representatives, other contractors such as cranes and scaffolds, and our installation crew.

Our Engineering Team is Specialized in Expanded Perlite Cryogenic Insulation and has a successful and seasoned track record in this field. Our engineers have in the past insulated Columns, Heat-Exchangers, Cryo-Drains and Cryogenic Storage Tanks in projects exceeding 50,000m³ in total. Indicative previous engagements include:

Type of Project	Requirements/Specification	Quantity
Cold-Box Column and Heat Exchanger, Cryogenic Perlite Filling	Linde LS-152-08	40,000m ³
CCold-Box Column, Heat Exchanger and Cryo-DrainCryogenic Perlite Filling	Air Liquide	2000m ³
Cold Box Columns Cryogenic Perlite Filling	Chart Energy & Chemicals	3000m ³
Cold Boxes and Heat Exchangers Cryogenic Perlite Filling	Air-Products	1200m ³
Cold Box A.S.U. di-perliting	JGC	350m ³
Cold Box Column Di-perliting/Refilling	INEOS	300m ³
Cold Box Column Cryogenic Perlite Filling	BP	200m ³
Cold Box Column Di-perliting/Refilling	Conoco Philips	200m ³
Cold Box Column Di-perliting/Refilling	National Grid	250m ³
Cold Box Column Top-Up Job	GrowHow	10m ³
LNG Tank	UK-National Grid	400m ³
LNG Tank	SONATRACH	400m ³
Ethylene Tank	Polimeri Europa	180m ³
Ammonia Tank	INCE	20m ³



Thermal Conductivity 'k-value' Graph for Non-Evacuated Service of Expanded Perlite

GULF PERLITE LLC: THE RELIABLE PARTNER IN DELIVERING TOTAL SOLUTIONS FOR YOUR CRYOGENIC INSULATION NEEDS



- Lightweight Insulating Blocks
- Internal Tank Base Insulation
- Circumferential Tank Insulation along the base of Cryogenic tanks

Loosefill Insulation for:

- Air Separation Units
- Heat Exchangers
- Cryo Drains
- Cryogenic Storage Tanks
- Super Insulation for Spherical Tanks

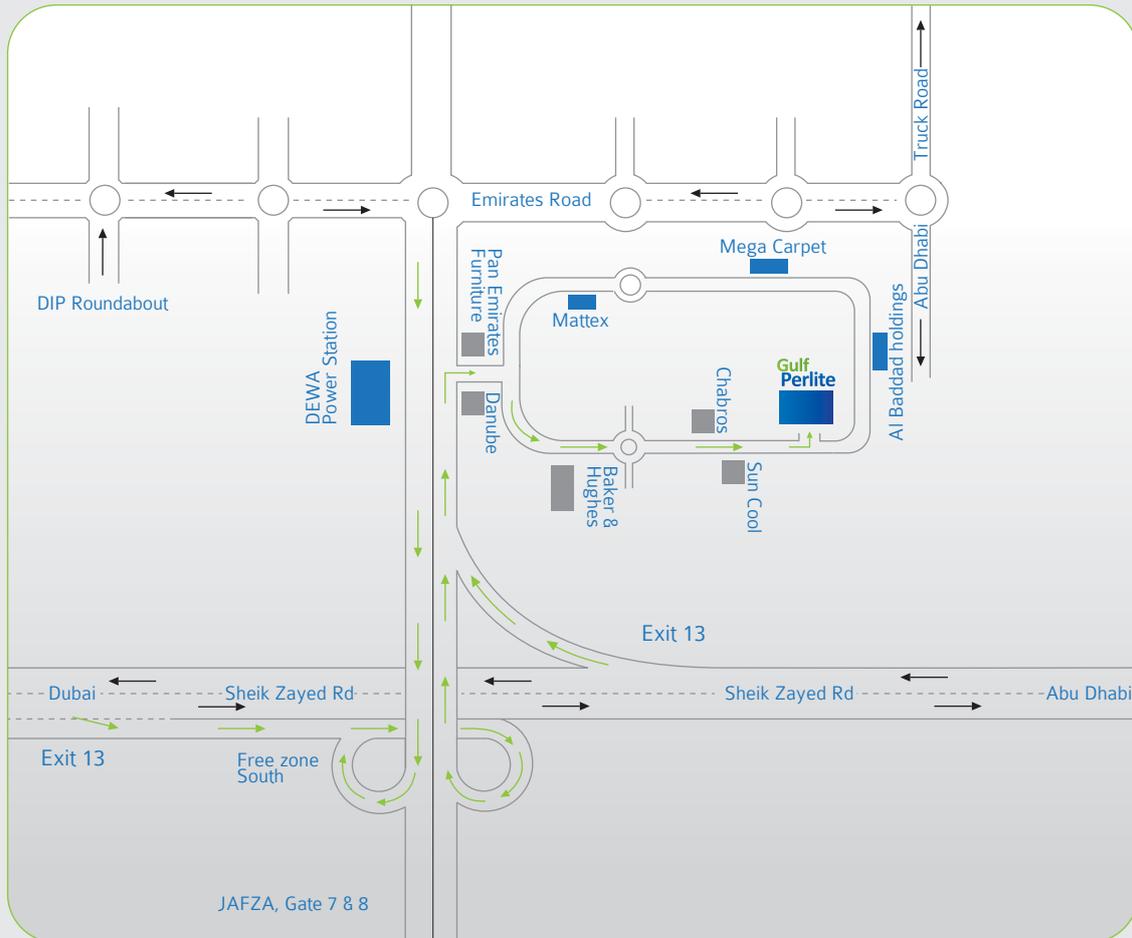


- Perlite Insulated Pipe Sections
- Perlite Pipe Boards
- Tailored made as per customer requirements
- Lightweight, Fireproofing and Water Repellent



Gulf Perlite LLC manufactures, supplies and installs expanded Perlite for Cryogenic, Industrial, Constructional and Agricultural applications. Our Cryogenic expanded Perlite '**GULF PERLITE CRYOGENIC**' is produced according to each client's specific needs, at densities ranging between **50 kg/m³ to 100kg/m³** and at granulometries ranging **0-1 mm**. Our brand new, state-of-the-art Perlite expansion factory in Technopark, Jebel Ali, has a capacity of **200,000 cubic meters per year** serving the **whole GCC region**. We process European perlite ore only and we deliver to our clients **top quality** white color expanded Perlite.

GULF PERLITE LLC FACTORY'S LOCATION MAP



P.O.Box: 263275
 Techno Park, Freezone South, Jebel Ali
 Exit 13, Sheikh Zayed Road, Dubai U.A.E
 Ph: +971 56 123 52 48
 Fax: +971 488 07505
 Email: info@uaeperlite.com
 Web: www.uaeperlite.com



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 Perlite** LLC