

A microscopic SEM image of an AlkeGel blanket, showing a dense network of fine, needle-like fibers interwoven with irregular, porous aerogel particles. The overall texture is highly complex and fibrous.

A SAFETY (INSULATION) BLANKET

Harry Walkoff,
Technical Consultant with
Alkegen, describes how aerogel
insulation blankets can provide
advanced safety solutions.

A new generation of aerogel blanket products with advantages over existing aerogel blankets available today have recently been launched. Alkegen has introduced a new aerogel insulation blanket product line for hot applications (AlkeGel Ember™), cold applications (AlkeGel Glacier™), and for fire protection applications (AlkeGel Fyre™).

The company's aerogel blanket, for process piping and equipment in oil and gas facilities, has properties which result in improved thermal, fire, and acoustic performance which positively impact their overall operations. The AlkeGel insulation products also provide critical safety solutions for the owners of oil and gas facilities, the engineers and contractors that design and build them, and the insulation contractors and distributors that install and supply the insulation systems.

The safety solutions associated with these blankets are possible due to the company's manufacturing process. Alkegen has utilised its expertise in the design and production of fit for use fibre and aerogel

Figure 1. Microscopic SEM image of AlkeGel blanket showing aerogel particles and fibre matrix.

and have implemented its manufacturing experience in the design and manufacture of AlkeGel blankets.

AlkeGel aerogel blankets are comprised of silica aerogel and fibre. Aerogels are a class of synthetic porous ultralight material derived from a gel, in which the liquid component of the gel is replaced with a gas, without collapse of the gel structure and resulting in a synthetic amorphous silica which is modified to repel water.

They are composed mostly of air (approximately 90%) which is contained in extremely small pores. These nano pores are 10 nanometers in size. A nanometer is one-billionth of a metre. The result is a solid with extremely low thermal conductivity and density.

The fibre utilised in AlkeGel blankets is used as the carrier for the aerogel material and forms a matrix of fibre and aerogel and provides the strength required to enable the insulation blanket to be used in industrial applications such as piping and equipment.

Health and safety

Aerogel is the insulation material that is incorporated into a fibrous blanket, and which gives the material its superior

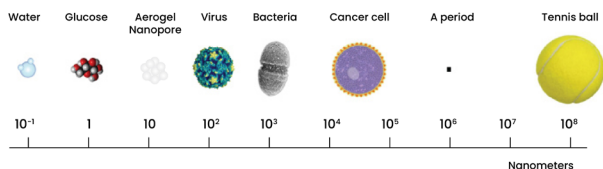


Figure 2. Nanodevices compared by nanometer size.



Figure 3. AlkeGel insulation blankets are lightweight, easy to handle, and install 20% faster than traditional aerogel blankets.



Figure 4. AlkeGel provides effective fire resistance.

thermal performance. Aerogel (amorphous silica) is certified as a safe material by the Environmental Protection Agency (EPA). In addition, aerogels are nano-porous, not nano-particulate. Therefore, aerogel blankets for use in industrial applications have been proven safe and used successfully for many years.

The aerogel materials used for insulation applications, however, are brittle and can produce particulate dusting during handling and application. The AlkeGel manufacturing process effectively fills the void space within the blanket and bonds the aerogel particles to each other and importantly also to the fibre matrix. Dust emission is therefore minimised to levels which are 80% less than the existing aerogel blankets that are in use today.

Alkegen conducts routine monitoring at its production facilities for measuring airborne particulate concentrations, including its alkaline earth silicate (AES) fibres, which is one of the primary components of AlkeGel. Historical results from the company's active monitoring have been far below the recommended exposure guideline for fibres per cubic centimetre (f/cm^3) of air, and considerably below the "particulates not otherwise classified" ($5 mg/m^3$), as specified by OSHA.

Excessive dust emitted from aerogel blankets creates two main safety issues. The first concerns inhalation of the aerogel particles, which at elevated levels can produce irritation to the nasal passages and throat. The second issue relates to dust coming in contact with the eyes and skin, which can result in a feeling of dryness, irritation, and discomfort. This health and safety concern is presently addressed by requiring personal protection equipment (PPE) to be employed to reduce the potential risks of dust exposure. The PPE required for personnel that handle aerogel blankets and are exposed to dust (in shipping, warehousing, fabrication, and installation) include the use of respiratory protective equipment, gloves, goggles, and full-body suits.

In addition, there are requirements for the use of air ventilation systems in facilities that manufacture aerogel blankets to limit worker's exposure. Also, tenting may be required on job sites in areas where aerogel blankets are being cut, to contain dust that is generated. All these health and safety requirements are prohibitive in terms of increased costs and decreased productivity.

To quantify the particulate emission of Alkegel products, Alkegen routinely conducts monitoring at its production facilities for measuring airborne particulate concentrations, which includes its alkaline earth silicate (AES) fibres and aerogel particles, which are the primary components of AlkeGel. Historical results from the company's active monitoring have been far below the recommended exposure guideline for f/cm^3 of air, and considerably below the "particulates not otherwise classified" ($5 mg/m^3$) as specified by OSHA. Fibres are also a component of AlkeGel fibrous blankets and have a major impact on the products' properties and performance. Fibres used in insulation products are heavily scrutinised for their effect on health and safety. Also, the fibre chemistry used in AlkeGel is designed to allow rapid biological clearance. The product meets the European regulatory requirement 1272/2008 (formerly European Commission Directive 97/69/EC) and does not require any special health hazard labelling.

Insulation performance effect on safety

AlkeGel products provide improved thermal performance due to the uniform fibre/aerogel matrix and due to its exceptionally tight property tolerances. These factors in conjunction with proper

insulation system design have a positive impact on many safety related concerns.

Glacier, Ember, and Fyre insulation blankets provide consistent thermal performance, meeting or exceeding industry standards and project specifications, thereby avoiding the potential for insulation failure and related safety issues.

Key safety innovations

Dust-free installation environment

Unlike traditional aerogel products, AlkeGel blankets generate approximately 80% less dust, creating a cleaner and safer work environment. This innovation reduces the need for stringent PPE, lowering installation complexity and improving worker safety.

Enhanced worker health standards

AlkeGel blanket's handling properties ensure exposure levels remain well below OSHA's Recommended Exposure Guidelines (REG). With respirable fibre levels far under the threshold of 0.5 f/ml, AlkeGel demonstrates a commitment to worker health and safety through its voluntary product stewardship programme, recognised as a model for the industry.

Integrated fire protection

AlkeGel Glacier and Fyre are inherently fire-resistant, offering critical protection against thermal hazards. This makes it a reliable choice for cryogenic and high temperature systems where fire risk mitigation is essential.

An insulation blanket for cold and cryogenic applications

- Helps to prevent moisture ingress in insulation, which can lead to steel and stress crack corrosion and can result in piping and equipment damage and unsafe conditions can occur.
- Prevents moisture from entering the insulation system, which can lead to ice formation and falling ice, leading to injury.
- Provides improved fire protection which provides ample response time for firefighting personnel and protects piping and equipment from catastrophic failure and loss of life.
- Provides improved acoustic noise mitigation which offers safety to site personnel, as well as the surrounding environment.
- Is lightweight compared to other insulation materials and can prevent injuries during transport and installation.

An insulation blanket for hot applications

- Provides proper process temperatures so piping and equipment surface temperatures are maintained at safe touch temperature levels.
- Ensures moisture ingress is avoided by providing excellent hydrophobicity to moisture which mitigates the potential for corrosion under insulation (CUI). CUI can lead to pipe and vessel failure and subsequent fire and explosion.
- Provides improved acoustic noise mitigation which offers safety to site personnel, as well as the surrounding environment.
- Ember provides improved fire protection which provides ample response time for firefighting personnel and protects piping and equipment from catastrophic failure and loss of life. Fyre insulation blanket offers additional fire performance ratings for the most demanding fire-related applications.

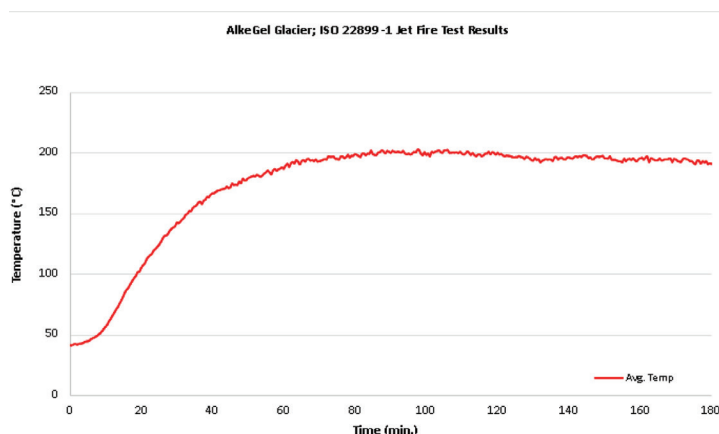


Figure 5. AlkeGel Glacier jet fire test results.



Figure 6. AlkeGel installation: minimal dust (left), and traditional aerogel blankets: extreme dust (right).

Conclusion

The company's aerogel insulation blankets have been proven as a safe and effective solution for oil and gas facility piping and equipment – they are less dusty than other insulation products and provide a safer work environment, which reduces some of the stringent requirements that other insulation materials require. This also enables installation to be accomplished more effectively and economically.

AlkeGel blankets have properties that result in improved performance, such as thermal, water repellency, fire, and acoustic, which aids in the prevention of insulation failure which can lead to many safety related issues, thereby protecting personnel, facility assets and overall operations. AlkeGel has a global manufacturing footprint and a scalable process to produce these blankets, ensuring capacity and supply for global oil and gas projects. [LNG](#)

DITCH THE DUST

AlkeGel Glacier™

Aerogel Technology BY ALKEGEN

80% Less Dust and a Breeze to Install

AlkeGel Glacier™ is part of our new portfolio of ultra low dust aerogel insulating technology materials for cryogenic applications, engineered to minimize heat transfer and install quickly with minimal PPE.

AlkeGel Glacier offers improved energy efficiency, lower greenhouse gas emissions, proven asset protection from fire and ice, with a zero-permeability integral vapor barrier.

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