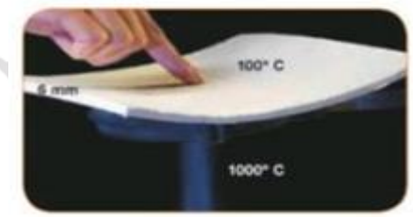
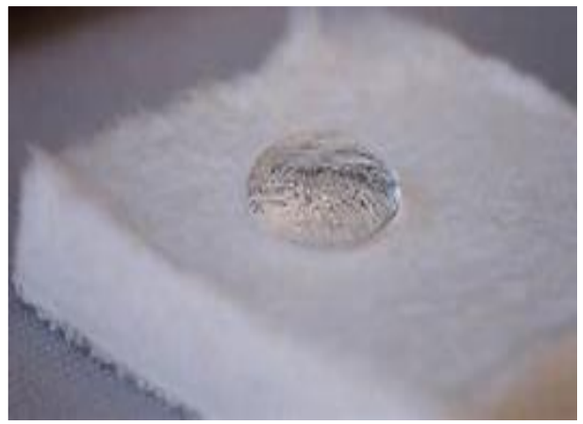
A+++ INSULATION

AMA AEROGEL





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Company Profile

AMA SPA

- The AMA group was set up in 1967 to ensure the availability of accessories and spare parts for farming and gardening machinery.
- Around the world with its 17 production facilities, 12 distribution subsidiaries, 5 commercial offices and over 1,200 employees serving more than 80.000 customers in 90 different countries with a range of over 500.000 products.
- AMA Group serves in the fields of agricultural and garden machinery, industrial and construction insulation materials and automotive spare parts.
- AMA Composite was founded in Modena in 2004.
- AMA Composite has a wide portfolio of products that meet the needs of international customers, manufactured with superior quality and high technology.
- AMA Composite specializes in high-efficiency and long-lasting insulation technologies and products using nanotechnology for industrial and building construction applications.

AMA TURKEY

- AMA Turkey was established in 2008 in Istanbul.
- AMA Turkey serves mainly in the fields of agricultural and garden machines, automotive, construction machinery, original parts and after-sales support.
- AMA Turkey has entered to the insulation sector with AEROGEL especially in industrial applications since 2017 and has completed successful applications in Turkey's largest industrial facilities.

Product History

1930's

AEROGEL discovered...

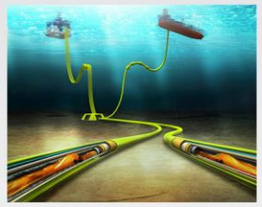
1993-1997

Applications for NASA...

2001

Flexible blanket production

2005



Undersea AEROGEL pipe isolation

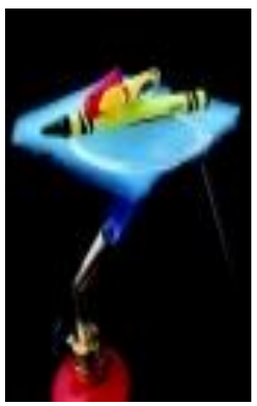
2012-2014

New AEROGEL production facility. Production of high temperature materials.

Product Definition

What is Aerogel?

- **Aerogel is a dry, nanoporous solid material.**
- **Characteristic material properties**
  - 97% air, low density
  - Low thermal conductivity
  - Lowest sound transmission on solids
  - Largest surface area
  - Low dielectric content
- **It was found in 1931.**



Aerogel's Development Steps

- **Aerogel was turned into a flexible blanket.**
  - High thermal performance
  - Industry-appropriate robustness and durability
  - Wide application temperatures
- **Production Process**
  - Low cost, high quantity production

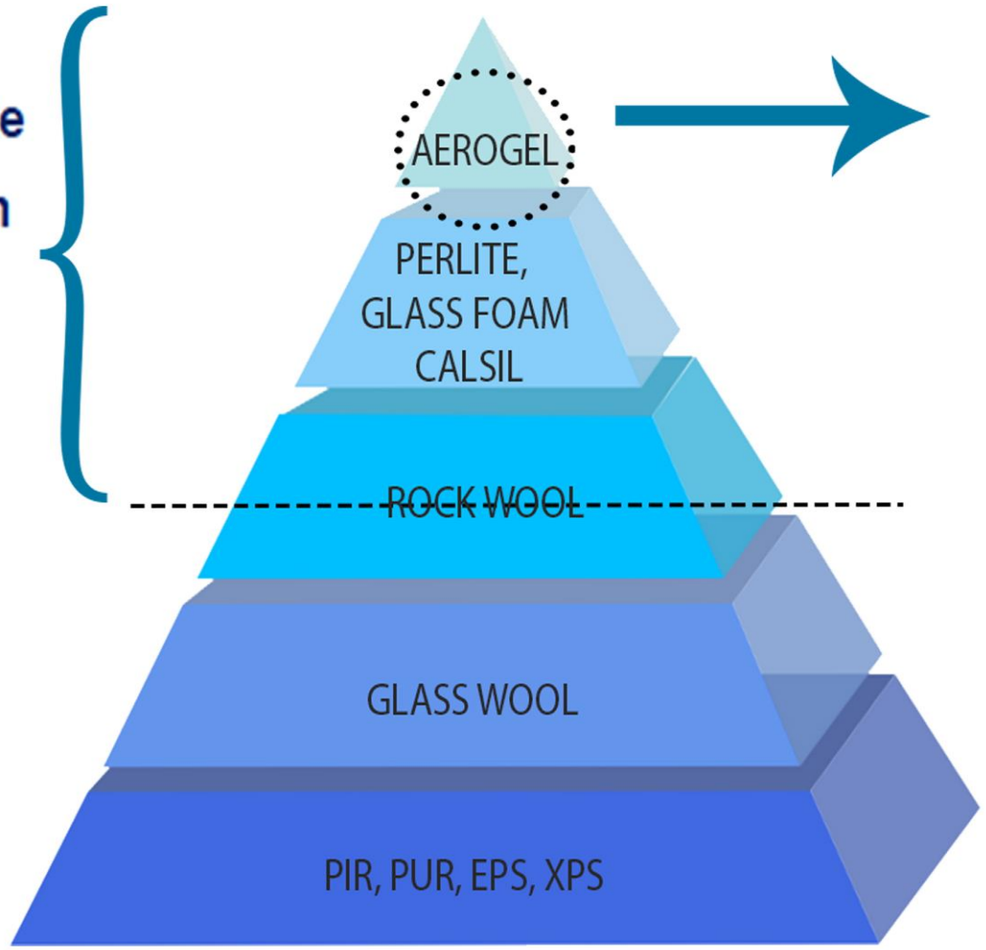
Advantages Against Conventional Insulation

- **Lower conductivity between 2 and 5 times**
- **Total Installation Cost**
  - Fast installation, low downtime cost
  - Reduction in transportation and labor costs
  - Safer Working Area
- **Total Lifetime Cost**
  - Energy saving
  - Definite solution to the corrosion
  - Excellent fire protection features

Insulation Market

Global Insulation Market

Appropriate Application area



Advantages of AEROGEL

- Low total cost
- Logistic Advantage
- Long Product Life
- Isolated Corrosion Solutions
- Resistance to water and moisture
- Termal performance
- Resistance to fire
- Vapor permeability
- Resistance to water

New Requirements For Insulation Applications

- **Demand for lower heat loss in various applications**

- **Total lifetime cost approach of products against the approach which takes into consideration of the initial investment cost in the insulation market for 50 years**
  - Each insulating material has different performance zone.
  - There is a loss of performance due to moisture-affected materials and materials containing binder.

- **New standards developed for low carbon emissions**
  - Some insulating materials are not capable of adjusting to the changing market conditions

- **Prior Insulation Markets**
  - Industrial applications (iron-steel, petrochemical, cement, defense industry, facilities with hot production and transfer lines)
  - Construction and building materials
  - Equipment Manufacturers

AMA Aerogel Products

- **Aerogel products cater to all industrial areas including petroleum, energy, cement, iron-steel, chemistry working with high temperature.**

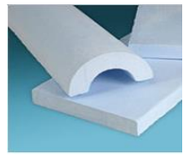
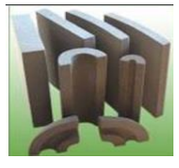
Product Name	Thickness		Thermal Conductivity		Density		Min. Operating Temperature		Max. Operating Temperature		Application Areas
	mm	in	mW/m-K	Btu-in/hr-ft^2-°F	g/cc	lb/ft^3	°C	°F	°C	°F	
Aerogel LT200ALU	5.0 10.0	0.20 0.40	15.0	0.104	0.13	8.0	-200	-328	100	392	Cold lines, tanks and equipments
Aerogel HT650	5.0 10.0	0.20 0.40	21.0	0.146	0.18	11	-50	-58	650	1,202	Hot production lines, tanks, equipments, military vehicles, fire barriers

- **Aerogel products are flexible to meet requirements.**
- **It is guaranteed for 20 years at all temperatures between – 200 °C and 650 °C.**
- **The products provide high performance in the specified temperature range.**

Hot Processes – Aerogel HT650

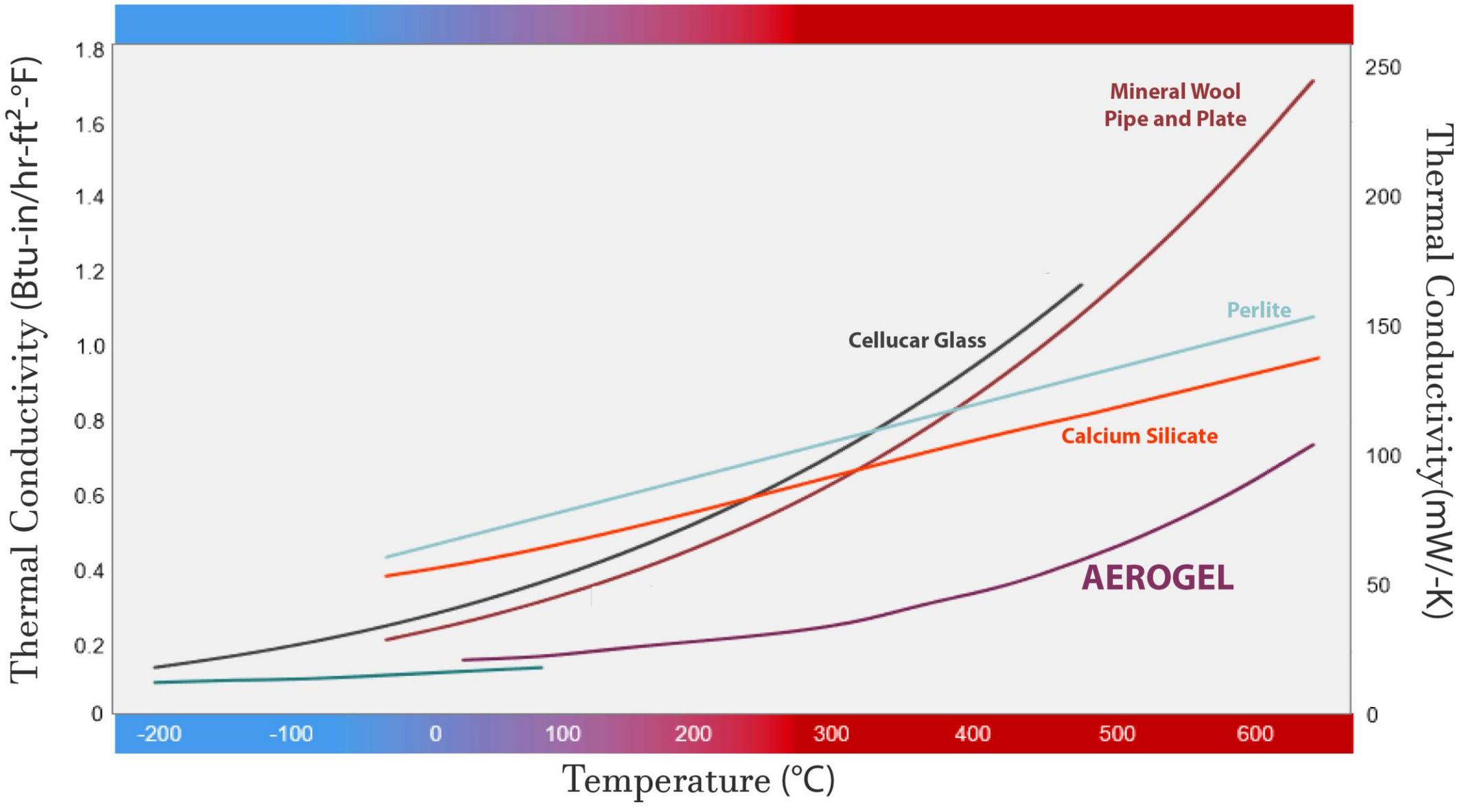
HT650 in high temperature processes, especially in gas, refinery, petrochemical, iron-steel, cement and energy sectors ;

- **Refine the insulation thickness 2-5 times according to alternative materials.**
- **Reduces coating costs, eliminates the costs incurred to ensure sealing .**
- **Provides quick installation .**
- **Eliminates corrosion problem .**
- **Delivers the same performance over the product life, no damage, reusable.**
- **Provides excellent fire protection .**

Comparison of features					
	Calcium silicate	**Perlite**	**Stone Wool**	**Glass Foam**	**HT650**
Product					
	Sheet, pipe	Sheet, pipe	Sheet, pipe, blanket	Sheet, pipe	Flexible Blanket
Water Absorption	Yes	No	Yes	No	No
Max. Temp.	650°C (1,200°F)	650°C (1,200°F)	650°C (1,200°F)	425°C (800°F)	650°C (1,200°F)
Density	230 kg/m^3 (15 pcf)	210 kg/m^3 (13 pcf)	100 – 130 kg/m^3 (6 – 8 pcf)	130 kg/m^3 (8 pcf)	170 kg/m^3 (11 pcf)

Thermal Conductivity Coefficient

Comparison of Thermal Conductivity Coefficients (AEROGEL HT650-Others)



Cold Processes– Aerogel LT200ALU

- Aerogel LT200ALU provides high performance in the production of industrial gases, cold storage in the LNG industry and cold lines insulation.
- Refine the insulation thickness 2-3 times according to alternative materials.
- Provides easy logistics and storage.
- Offers quick installation, reducing the total cost of installation.
- Eliminates the difficulties in the joint points for very cold applications.
- Does not absorb water and has a spontaneous vapor barrier.

Comparison of features			
	Glass Foam	**PIR**	**Aerogel LT200ALU**
Product			
	Sheet, pipe	Sheet, pipe	Flexible Blanket
Water Absorbtion	No	Yes	No
Min. Temp.	-250 to 415^{o}C	-250 to 150^{o}C	-200 to 100^{o}C
Density	120 kg/m^{3} (7.5 pcf)	50 kg/m^{3} (3 pcf)	130 kg/m^{3} (8 pcf)

Insulation Selection Process

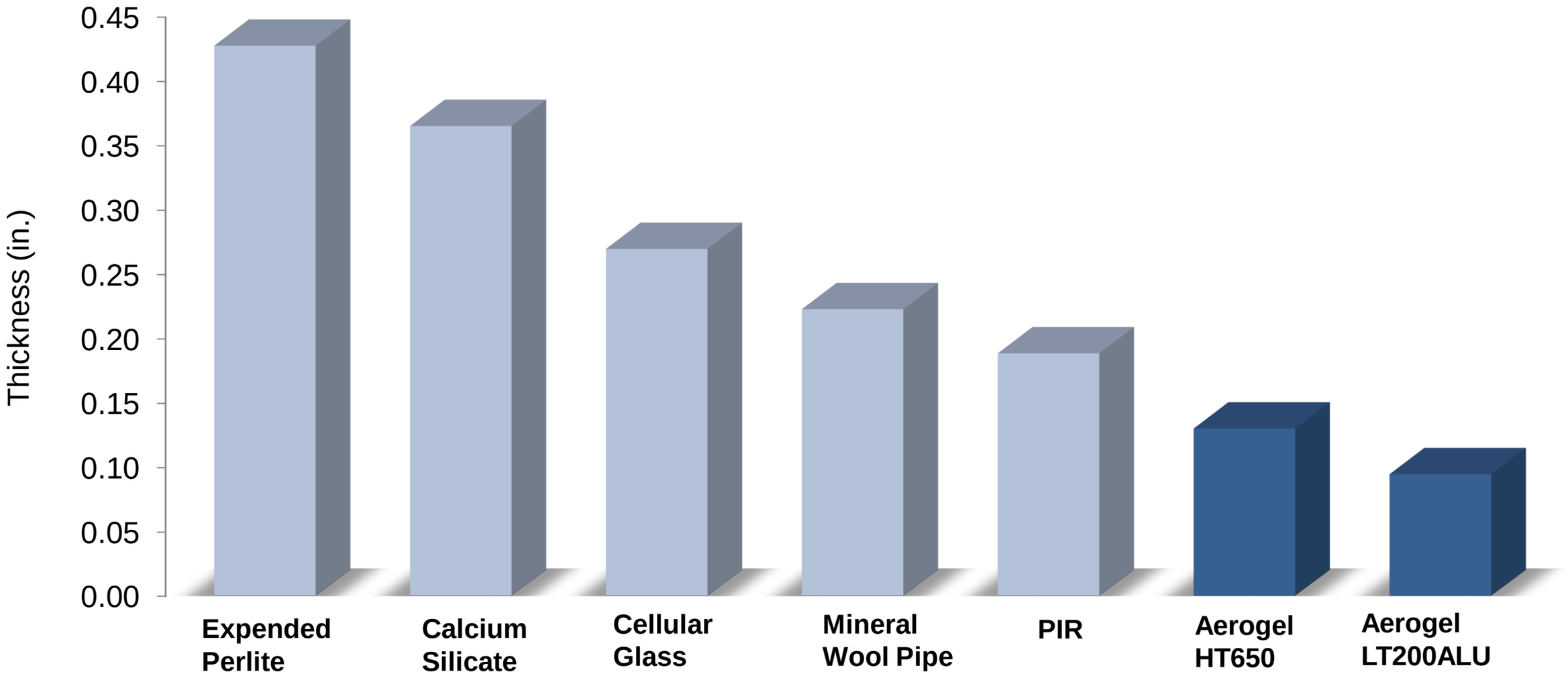
End-user Benefits

- **Application**
  - Shapeability: Pipe, tank, pressured cap, spherical shaped equipment, valves, walls etc.
  - Service temperature: Variable temperatures

- **Insulation Properties**
  - Thermal Performance:
    - Reduction in cold heat gain and condensation control
    - Reduction in hot heat loss and personal protection
    - Enviroment temperature R Value
  - Structural integrity: Sustainable performance, reusability
  - Fire resistance: A2
  - Water and moisture resistance : Hydrophobic

- **Installation**
  - Cost: Quick installation, reduced costs
  - Logistic: Lower space

Impact of insulation thickness on performance



Aerogel provides the same level of thermal protection with a much thinner material thickness.

Impact of insulation thickness on performance

If insulation temperature is the same;

- Line diameter : 6”
- Temp. : 420 °C
- Enviroment.Temp : 20 °C
- Insulated target temp. : 40 °C
- Stonewool thickness : 140 mm
- Stonewool heat loss : 242,7 W/m-saat
- Aerogel 650 thickness : 50 mm
- Aerogel 650 HTC heat loss : 150,1 W/m-saat

Impact of insulation thickness on performance

If performances are same;

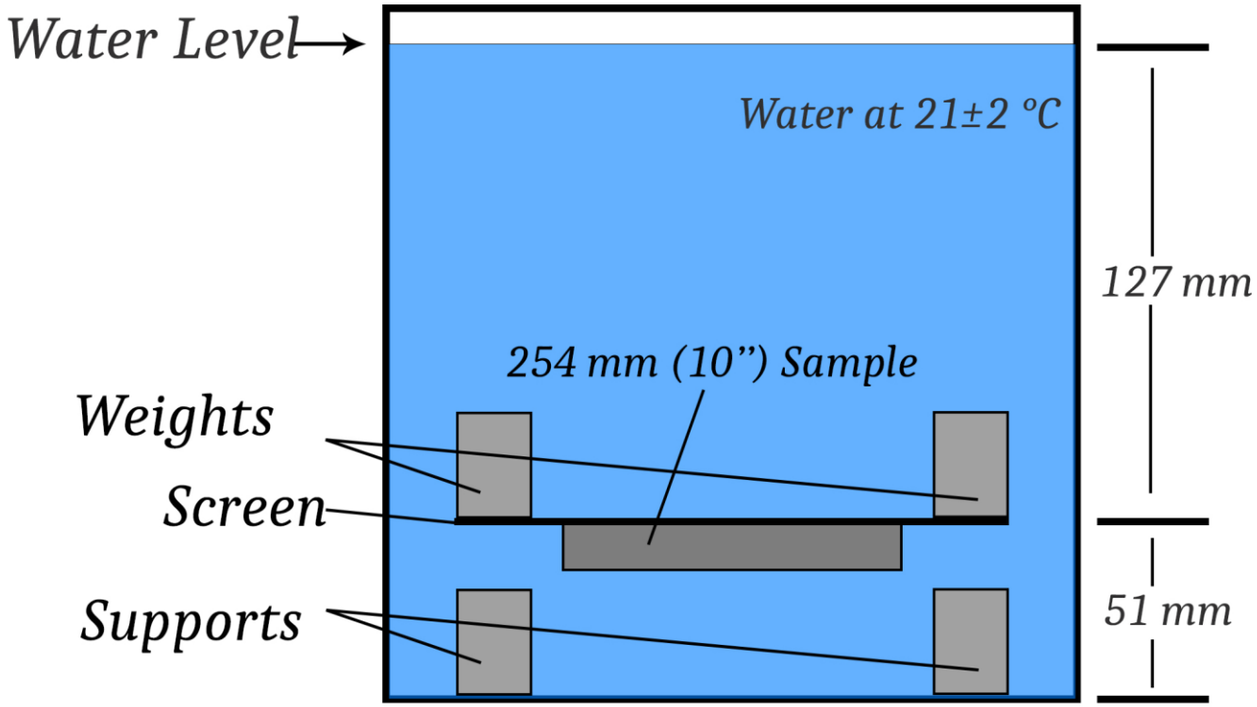
Insulation thickness	: 340 MM
Temp.over insulation	: 27,2 °C
Heat Loss	: 148,5 W/m-saat

Insulation thickness	: 50 MM
Temp.over insulation	: 29,3 °C
Heat Loss	: 149,1 W/m-saat

Water and moisture exposure

Hydrophobic Strength Test (ASTM C1511)

- Hydrophobic insulation materials are cooked in ovens at a temperature of 300 °C.
- The ASTM C1511 test is applied at certain times to material.
- Materials are waited 15 minutes in this system and water pulling rate is checked.



Test device for ASTM C1511 test

Water and moisture exposure

% Humidity	% Insulation Property Reduction
0	0
2	9
4	20
6	30
8	39
10	48

Corrosion Under Insulation

Reasons for corrosion under insulation:

- Corrosion occurs when the water enters under the insulation on equipments or lines.
- It is seen between 25 – 175 °C; active between 50 – 100 °C.
- The probability is even higher in cyclic temperature variations or discrete processes.

Materials:

- Carbon steel and low alloyed steels
- In case of chlorine availability in the environment, corrosion can also be seen in 300 series Stainless Steel.

Factors:

- Insulation design, Material property
- Temperature, environment (humidity, rain, sea, industrial area)

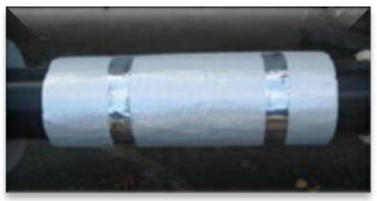
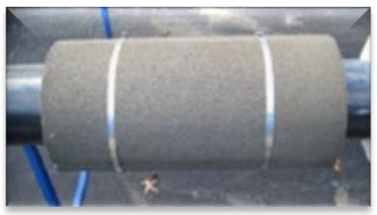
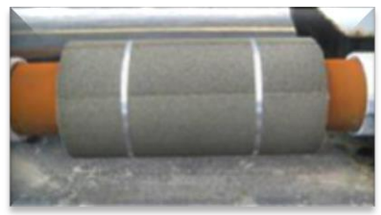
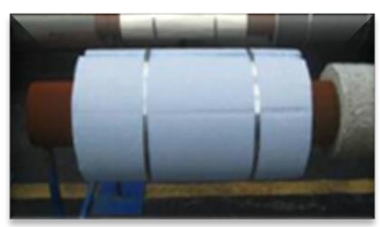
Corrosion Under Insulation

12 Weeks accelerated Corrosion test

- 2 separate test stands were installed in this test .
- Thicknesses were adjusted on the basis of the same thermal efficiency.
- First day and 84 days after was photographed **.**

Corrosion Under Insulation

Accelerated Corrosion test

Observations	Day 1	Day 84	Insulation removed
Aerogel No corrosion			
Glass Foam High corrosion			
Perlite Low corrosion			
Stone Wool Mid level corrosion			

Application Advantages of Aerogel Products

Best Thermal Performance	■ 2-5 times lower thermal conductivity than other insulating materials
Compact Design	■ Reduction of insulation thickness up to 1/5
Shape Factor	■ Easy shape-ability to reduce labor costs
High Resistance	■ High resistance to vibration and mechanical strain
Strong Fire Protection	■ A2 level fire protection
Water and moisture resistance	■ No need for metal protection and mastics due to its hydrophobic structure
Corrosion Protection	■ Due to its hydrophobic structure and vapour permeability, corrosion problem is completely eliminated
Logistic	■ Storage and transportation advantage due to small footprint

Valve Jackets w/Aerogel

For maintenance-intensive equipments, it is more suitable to use jacket type insulation which can be disassembled instead of fixed insulation applications.

General purpose in valve jackets applications ;

To minimize energy loss on hot lines in order to reduce total energy costs.

The heat energy gained varies depending on the elements such as process temperature, enviroment temperature, wind speed etc.

Valve Jackets w/Aerogel

Design

Fabric and Rope:

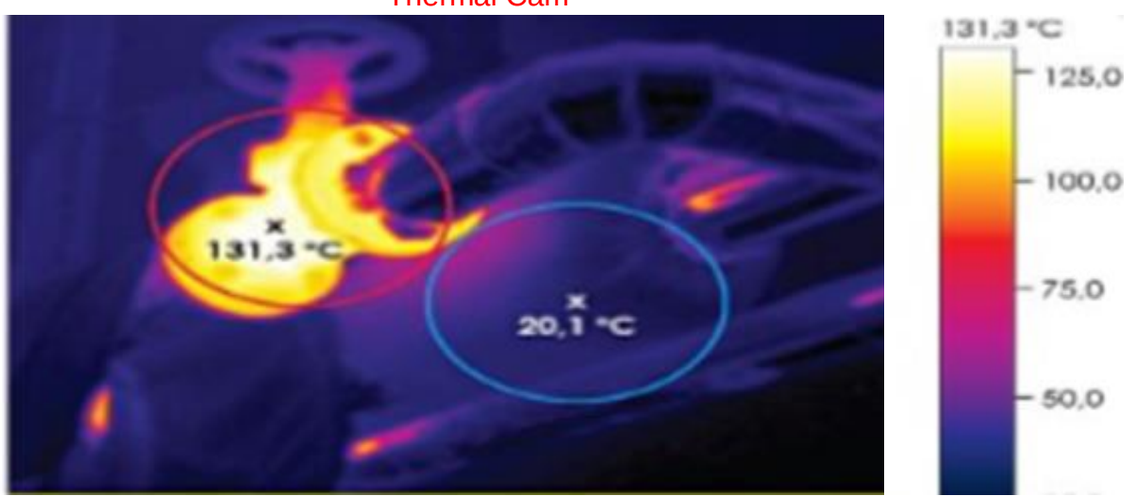
- Fabric type is selected according to the temperature of the system for valve jackets.
- Generally 80gr – 100 gr silicone Coated fiberglass fabric is preferred.
- During the sewing of fabrics, kevlar and stainless steel wire yarns are used, depending on the temperature.
- Braided and high temperature resistant glass fibre rope is used for the strangling parts.

Size:

Available for all valve types from DN15 to DN300.

Std Cam

Thermal Cam



Sample Application #1

Best Thermal Performance

Compact Design

Shape Factor

High Resistance

Strong Fire Protection

Water and Moisture Resistance

Corrosion Protection

Logistic

- **User:** TÜPRAŞ
- **Product:** AMA Aerogel HT650
- **Project:** Plt-9 Steam line between boilers and turbine (420 ^{o}C)
- **Problem:** To eliminate 5 ^{o}C temp. reduction on the line
- **Solution:** Temp**.** reduction decreased to 0.5 ^{o}C with 20 mm Aerogel HT650 application.

Sample Application #2

- Best Thermal Performance
- Compact Design
- Shape Factor
- High Resistance
- Strong Fire Protection
- Water and Moisture Resistance
- Corrosion Protection
- Logistic

- **User:** İZMİR JEOTERMAL
- **Product:** AMA Aerogel Blanket HT650 10 mm
- **Project:** Insulation project of heat exchanger and connection valves
- **Problem:** Increase efficiency by 30% by eliminating heat leaks
- **Solution:** With 10 mm Aerogel HT650 and valve jacket application, the targeted efficiency increase was realized.





References

Customers

Tüpraş · ERDEMİR · KARDEMİR · ÜLKER · İZMİR JEOTERMAL

ASİL ÇELİK · arçelik · ŞİŞECAM · DÜZCE CAM · ANADOLU EFES

HABAŞ · Petkim · BEKAERT · COATS · BMC

* Aerogel products provided by AMA Spa. Industrial applications made by different 3rd parties till Feb 2019.

Keep the world moving with our components

Thanks

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