INSULATION & EFFICIENCY

2017

INSULATION MATERIALS

Heat insulation is an application to reduce heat transfer.

INSULATION MATERIALS

- AEROGEL
- ROCKWOOL
- GLASS WOOL
- CERAMIC FIBRE
- POLYURETHANE FOAM
- ELASTOMERIC RUBBER FOAM
- POLYETHYLENE FOAM
- PVC FOAM
- CELLULER GLASS
- CALCIUM SILICATE
- EXPANDED PERLITE
- ETC.

TRADITIONAL SOLUTIONS

Traditional Insulation Solutions

GLASS WOOL

- It is obtained by making the silica sand to melt and fibrillate.
- The thermal conductivity value k = 0,040 W / mK.
- The water vapor diffusion resistance is m=542 mgm/Nh. Mu (μ)
- Glass fibers do not get wet. However, glass wool has 99% air voids between fibers. If the material comes directly or indirectly to the water, these air gaps are filled with water. Wet glass wool has a negative effect on insulation.

TRADITIONAL SOLUTIONS

Traditional Insulation Solutions

ROCK WOOL

- It is obtained by making the basalt stone melt and fibrous.
- The thermal conductivity value k= 0,040 W/mK.
- The water vapor diffusion resistance is m= 542 mgm/Nh Mu (μ)
- Rockwool is also an open-pored material. 99% of the material covers the air gap. In this respect, it is easy to get wet if measures are not taken.

TRADITIONAL SOLUTIONS

Traditional Insulation Solutions

CERAMIC FIBRE

- It is made of ceramic fibers. It can be made in the form of mattress, felt, fabric or rope.
- The thermal conductivity is k = 0,20 W / m-K.
- The water vapor diffusion resistance is m=542 mgm/Nh. Mu (μ)
- In terms of wetting and other properties, stone wool and glass wool are the same and are affected by water.

AEROGEL INSULATION MATERIALS

Pyrogel Insulation Solutions

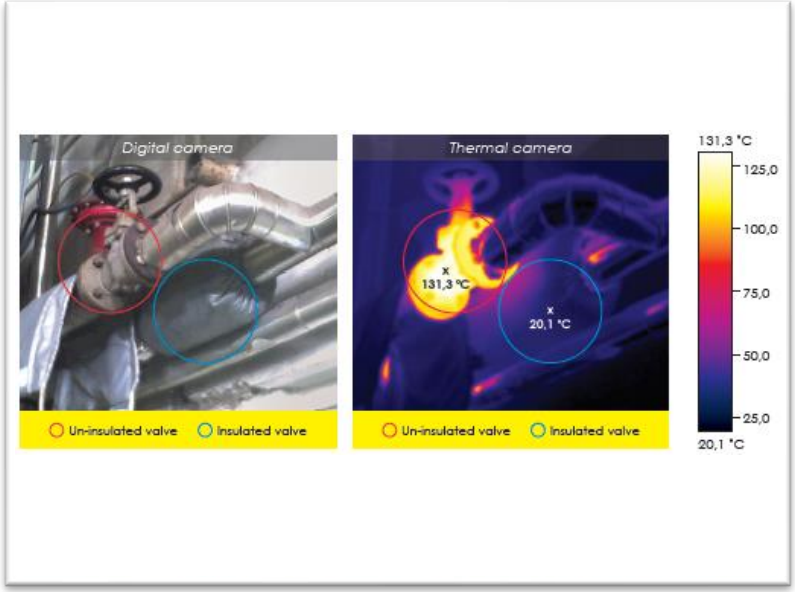
PYROGEL XT

- Thickness: 5 mm - 10 mm
- Max Usage Temperature: -40 ° C +650 ° C
- The thermal conductivity value k = 0.021 W / m-K.
- Color: Beige
- Density: 0.15 g / cc
- Hydrophobic: Yes
- It has 3-5 times better k value than other insulation materials.
- It is resistant to pressure and impact.
- Class A is a group of fireproof materials.

INSULATION MATERIALS SELECTION

SELECTION CRITERIA

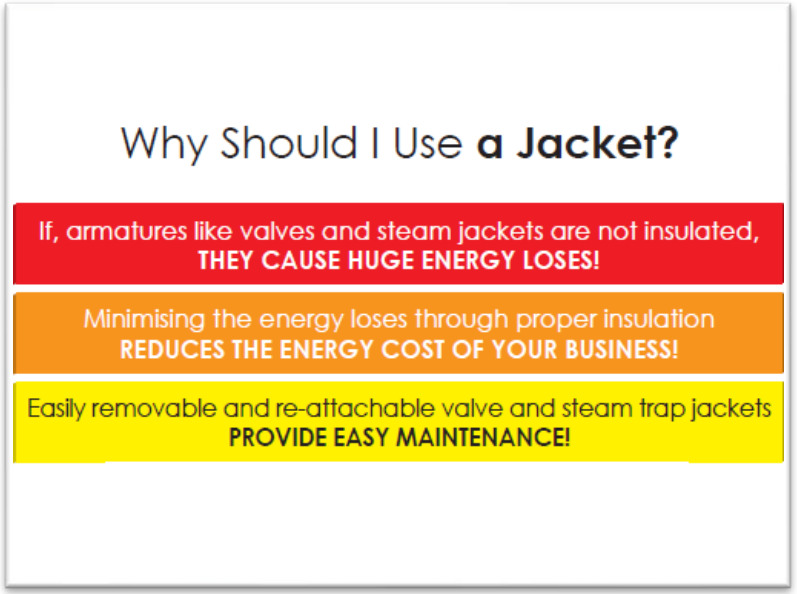
- **Resistance to different operating temperatures**: *Protects physical and thermal properties.*
- **Physical strength**: *It should not lose its original properties during (vibration), storage, loadings, operation and application.*
- **Mechanical strength**: *should not deteriorate in expansion and contraction.*
- **It must be easy to install**.
- **Resistance to flammability**: *must be considered and covered with appropriate coating techniques.*
- **Resistance to corrosive effects**: *Water, steam etc. resistance to leaks or condensation.*
- **Insulation thickness and weight:** Investment cost should be observed.



AEROGEL INSULATION MATERIALS

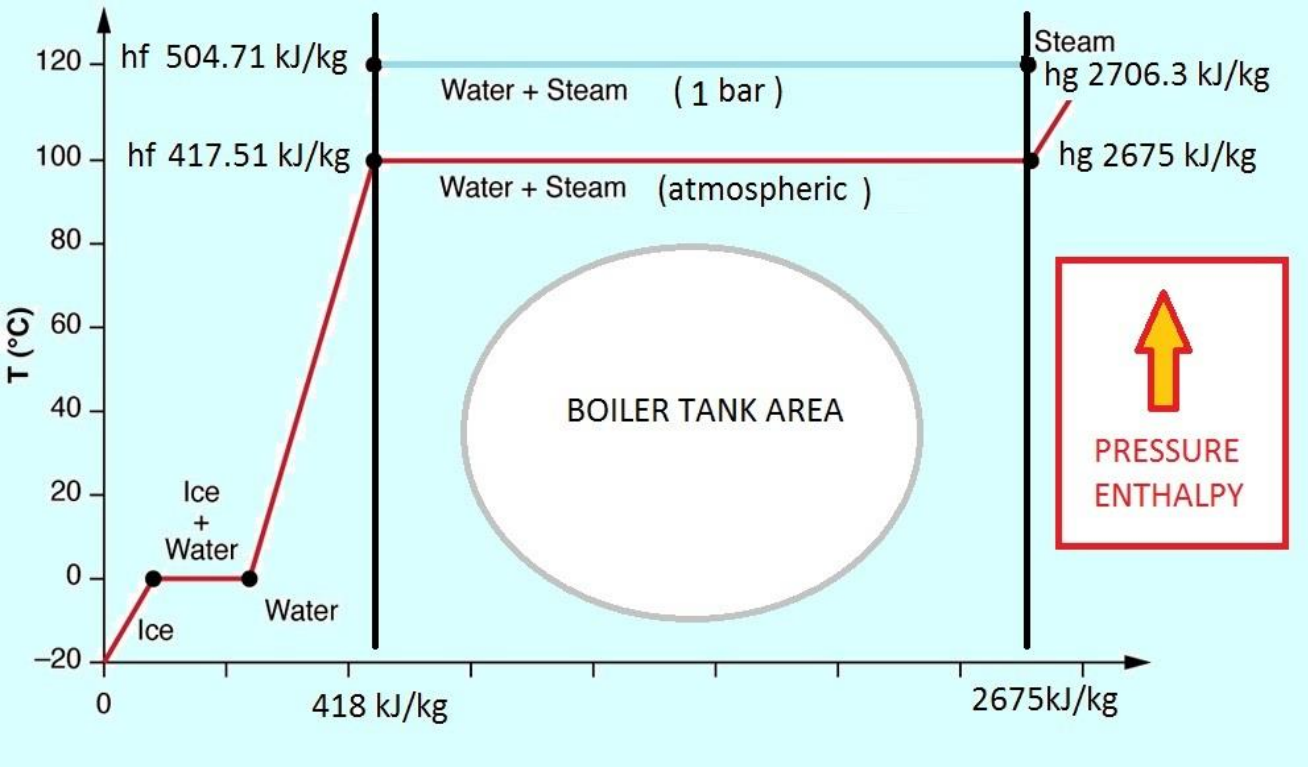
INSULATION ADVANTAGES

- Health, safety,
- Heat economy → Energy, competition, business
- Providing thermal comfort conditions
- Sound level
- Fire protection
- Prevention of sweating, coagulation, evaporation and frost,
- Temperature drop in pipelines, use of thermal capacity efficiently



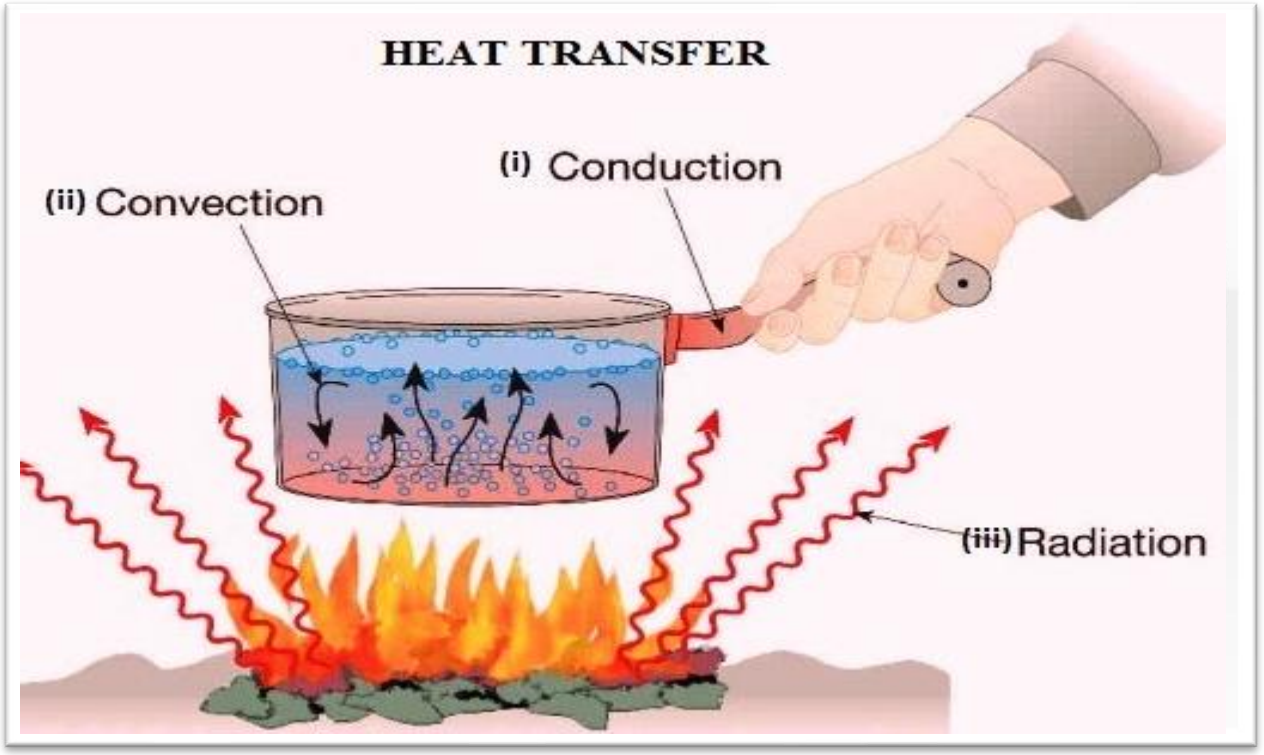
ENERGY SAVING

%90 ENERGY SAVING?



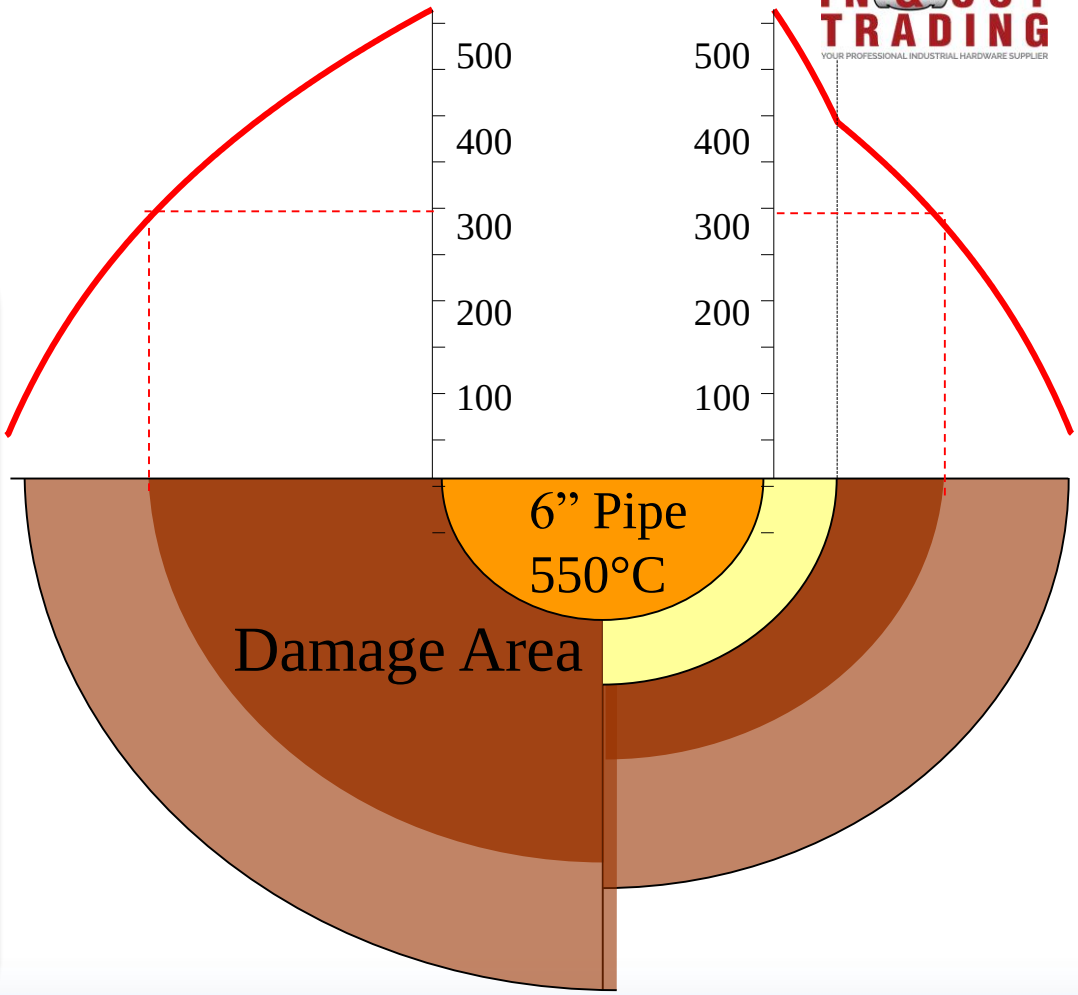
INSULATION TECHNICAL DATAS

HEAT TRANSFER KINDS



COMBINATION OF ROCKWOOL AND AEROGEL

- Combined use reduces surface area.
- PGXT at high temperatures
- TY at low temperatures
- It also reduces the cost of investment.
- At temperatures above 300 ° C, rockwool is damaged and the insulation quality is reduced.
- Combined use will also increase the lifetime and thermal resistance capacity of the limelight.



INSULATION TECHNICAL DATAS

CERTIFICATIONS

BUREAU VERITAS
Certification

ASPEN AEROGELS INC.
HQ: 30 Forbes Rd.
Northborough, MA 010532

SEE APPENDIX FOR ADDITIONAL CERTIFIED LOCATIONS

Bureau Veritas Certification certifies that the Management System of the above organization has been audited and found to be in accordance with the requirements of the management system standards detailed below

Standards

ISO 9001:2008

Scope of certification

Design, Manufacture and Fabrication of Insulation Material

Certification cycle start date: **27 March 2014**

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **26 March 2017**

Original certification date: **27 March 2014**

Certificate No. **US006777-1** Revision date: **27 March 2014**

Certification Authority

ANAB ACCREDITED

Local office: Bureau Veritas Certification North America, Inc. 390 Benmar Drive, Houston, Texas, USA
www.us.bureauveritas.com/bvc

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity please call +(800) 937-9311.

INSULATION TECHNICAL DATAS

MS/DS REPORT

1. IDENTIFICATION

Product identifier: Cryogel® X201
Synonyms: Silica aerogel material

Manufacturer Name: Aspen Aerogels, Inc.
Address: 30 Forbes Road Bld. B
Northborough, MA 01532

Telephone number: (508) 691-1111
Email: EHS@aerogel.com

Emergency phone number: 800-535-5053 US (INFOTRAC)
352-323-3500 INTERNATIONAL

Recommended use: High performance insulation material
Restrictions on use: None.

Date of Preparation: June 11, 2015

2. HAZARD(S) IDENTIFICATION

Classification:

Physical	Health
Not Hazardous	Not Hazardous

Label Elements

Not hazardous in accordance with the GHS and OSHA Hazcom 2012.

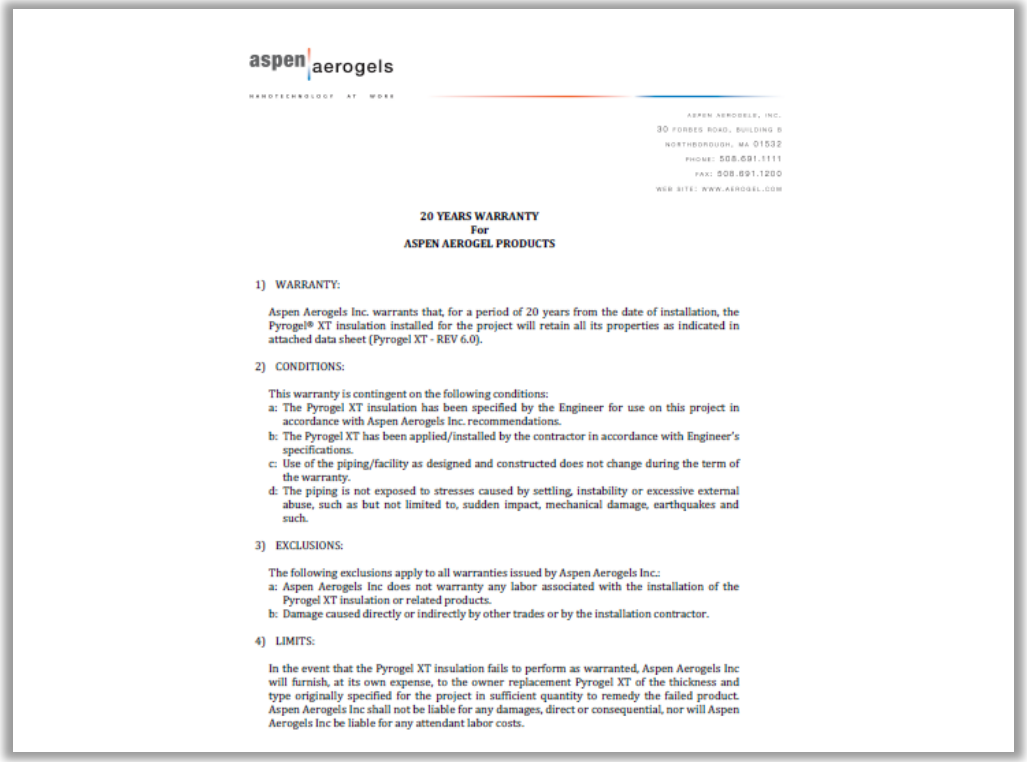
3. COMPOSITION / INFORMATION ON INGREDIENTS

Chemical name	CAS No.	Percent
Synthetic Amorphous Silica	7631-86-9	40-50%
Methylsilylated Silica	68909-20-6	10-20%
Polyethylene terephthalate (PET or polyester)	25038-59-9	10-20%
Fibrous Glass (textile grade)	Not Applicable	10-20%
Magnesium Hydroxide	1309-42-8	0-5%

The exact percentage (concentration) of composition has been withheld as a trade secret.

INSULATION TECHNICAL DATAS

20 YEAR WARRANTY



aspen aerogels

NANOTECHNOLOGY AT WORK

ASPEN AEROGELS, INC.
30 FORBES ROAD, BUILDING B
NORTHBOROUGH, MA 01532
PHONE: 508.691.1111
FAX: 508.691.1200
WEB SITE: WWW.AEROGEL.COM

20 YEARS WARRANTY
For
ASPEN AEROGEL PRODUCTS

1) WARRANTY:

Aspen Aerogels Inc. warrants that, for a period of 20 years from the date of installation, the Pyrogel® XT insulation installed for the project will retain all its properties as indicated in attached data sheet (Pyrogel XT - REV 6.0).

2) CONDITIONS:

This warranty is contingent on the following conditions:
a: The Pyrogel XT insulation has been specified by the Engineer for use on this project in accordance with Aspen Aerogels Inc. recommendations.
b: The Pyrogel XT has been applied/installed by the contractor in accordance with Engineer's specifications.
c: Use of the piping/facility as designed and constructed does not change during the term of the warranty.
d: The piping is not exposed to stresses caused by settling, instability or excessive external abuse, such as but not limited to, sudden impact, mechanical damage, earthquakes and such.

3) EXCLUSIONS:

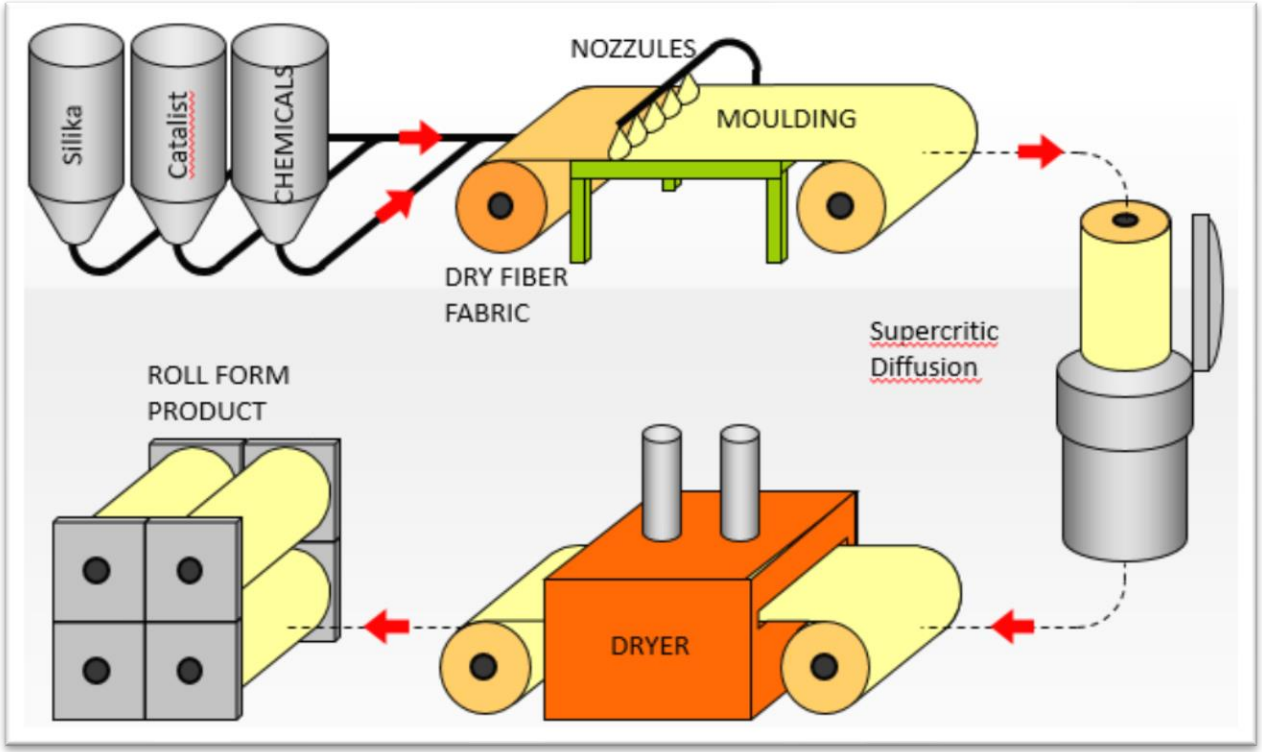
The following exclusions apply to all warranties issued by Aspen Aerogels Inc.:
a: Aspen Aerogels Inc does not warranty any labor associated with the installation of the Pyrogel XT insulation or related products.
b: Damage caused directly or indirectly by other trades or by the installation contractor.

4) LIMITS:

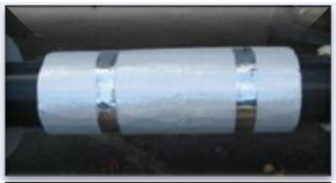
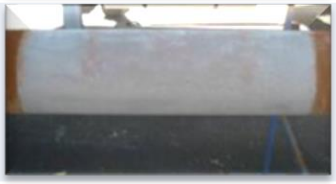
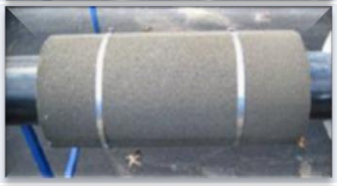
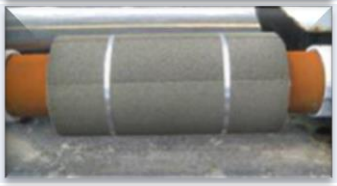
In the event that the Pyrogel XT insulation fails to perform as warranted, Aspen Aerogels Inc will furnish, at its own expense, to the owner replacement Pyrogel XT of the thickness and type originally specified for the project in sufficient quantity to remedy the failed product. Aspen Aerogels Inc shall not be liable for any damages, direct or consequential, nor will Aspen Aerogels Inc be liable for any attendant labor costs.

INSULATION TECHNICAL DATAS

PRODUCTION METHODS



ACCELERATED CORROSION TEST

MATERIAL & RESULT	DAY 1	DAY 84	UNINSTALLED INSULATION
CYROGEL Z – NO CORROSION			
PYROGEL XT – NO CORROSION			
GLASS FOAM - %78 CORROSION GENERALLY UP SIDE			
ROCK WOOL - %50 CORROSION			

HYDROFOBIC RESISTANCE TEST – ASTM C 1511

TEST DETAILS

- Hydrophobic Resistance Test (ASTM C1511)
- Hydrophobic insulation materials are cooked in oven at 300 ° C for 385 days.
- ASTM C1511 is being tested at certain intervals.
- This system is kept waiting for 15 minutes and the water withdrawal rate is being weighed.

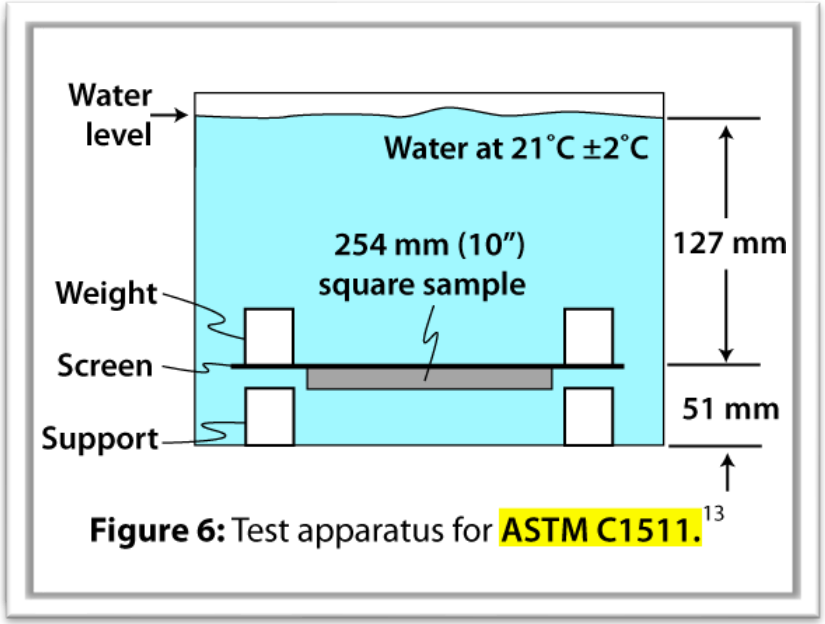
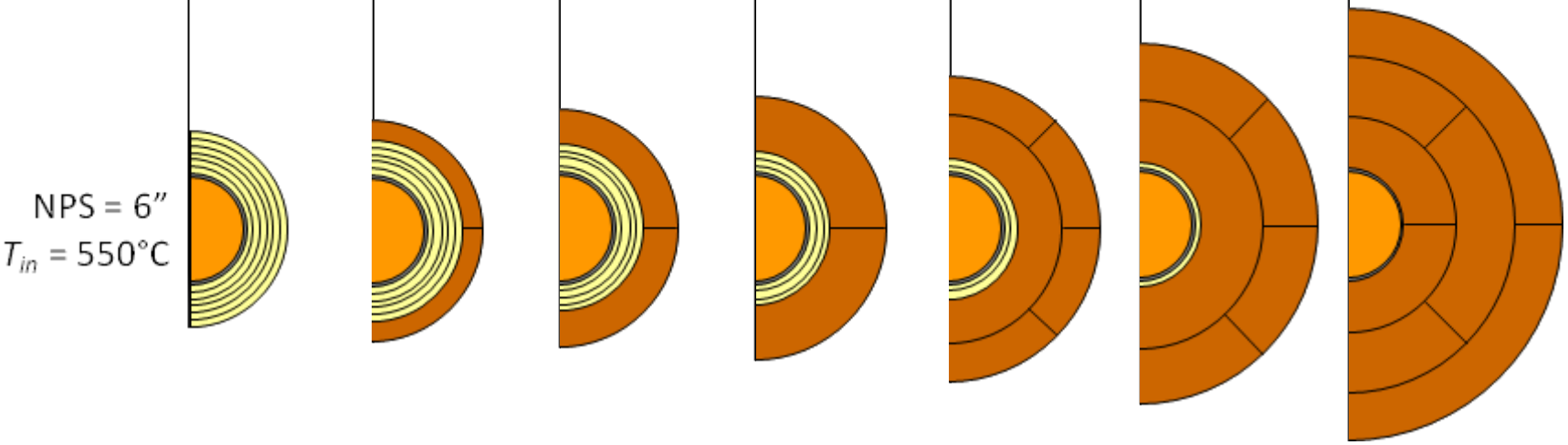


Figure 6: Test apparatus for ASTM C1511.[13]

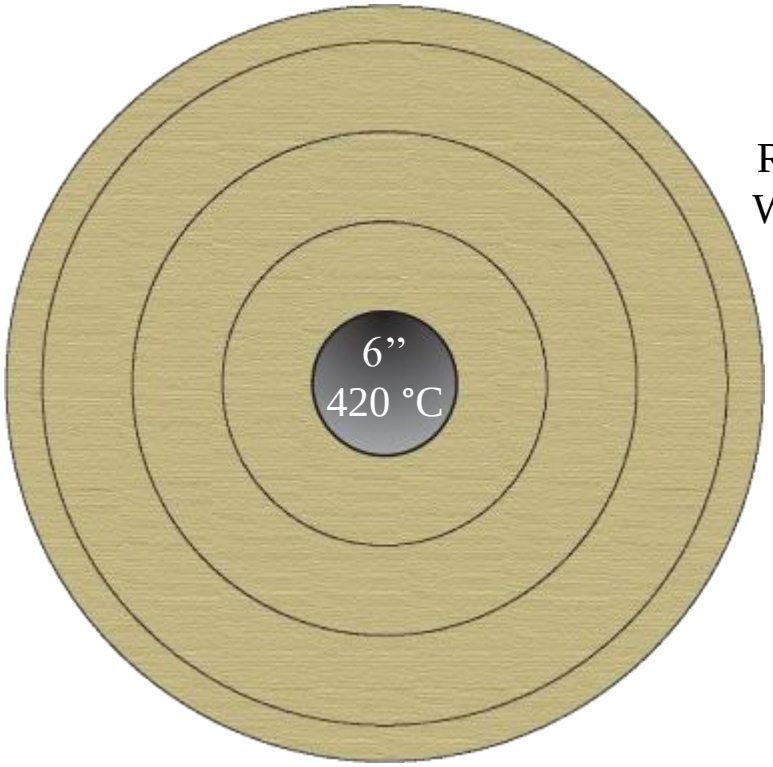
HEAT EFFICIENCY

PYROGEL	(mm)	70	50	40	30	20	10	-
ROCKWOOL	(mm)	-	30	50	80	110	160	230
TOTAL	(mm)	290	310	330	370	410	490	610



In all application, ambient temperature is 20 °C and insulation surface temperature is 40 °C.

INSULATION THICKNESS EXAMPLE



ROCK
WOOL

PYROGEL
XT

INSULATION THICKNESS: 340 MM
OUTTER TEMPERATURE: 27,2 °C
HEAT LOSS : **148,5 W/m-hour**

INSULATION THICKNESS: 50 MM
OUTTER TEMPERATURE: 39,3 °C
HEAT LOSS : **150,1 W/m-hour**

AUDIT PHOTOS

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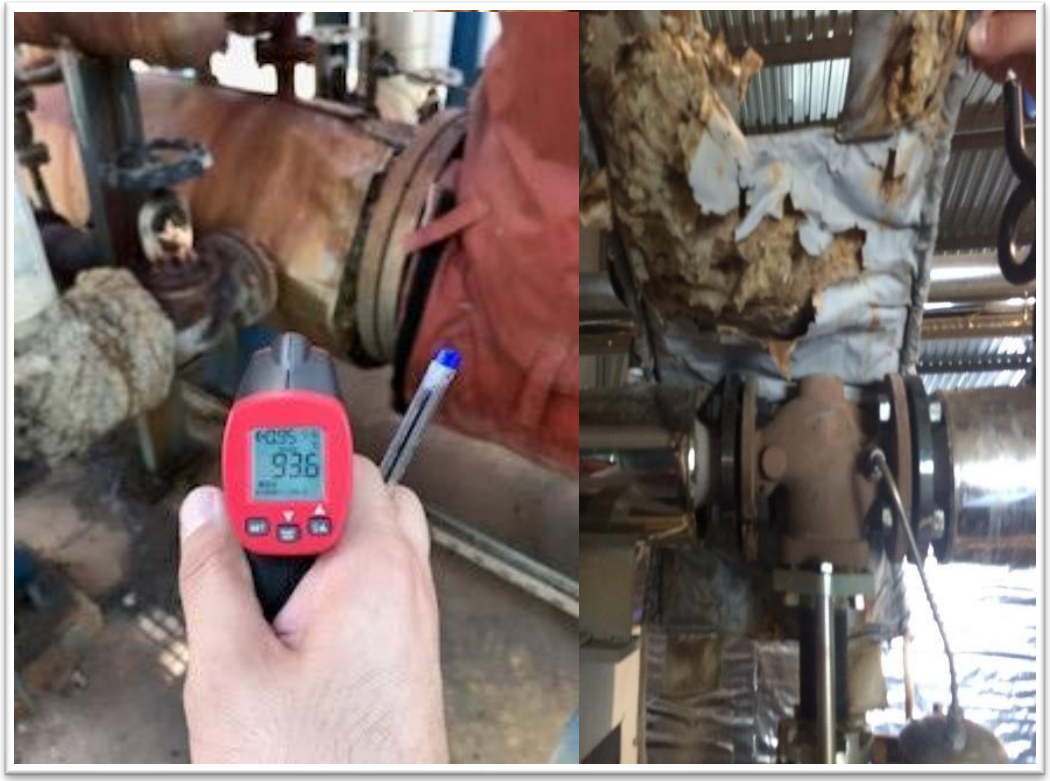
INSULATION PROBLEMS

- WRONG APPLICATIONS
- LIFETIME PROBLEMS
- TRADITIONAL SOLUTIONS

AUDIT PHOTOS

INSULATION PROBLEMS

- HARD COVERS
- WRONG INNER FABRICS
- WHEATER CONDITIONS



VALVE (JACKET) KINDS

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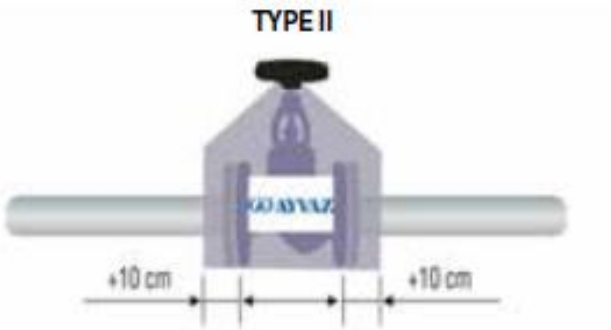
VALVE KINDS

- GLOBE VALVES
- BELLOW SEALED VALVES
- GATE VALVES
- BALL TYPE VALVES
- NON-RETURN VALVES
- STRAINERS
- PRESSURE REDUCER VALVES
- BALANCE VALVES
- BUTTERFLY VALVES
- SAFETY VALVES
- CONTROL VALVES
- VALVE JACKETS
- ETC.

VALVE JACKET TYPES

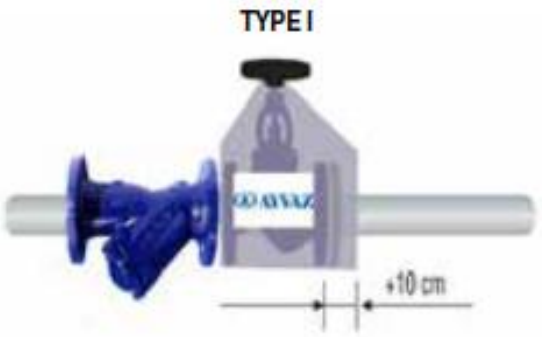


TYPE II VALVE JACKET

- STANDART APPLICATION
- BYPASS VALVES
- SEPERATORS
- PRESSURE REDUCER VALVES
- SINGLE VALVE MOUNTAGE

TYPE 0 VALVE JACKET

- STRAINERS
- NON RETURN VALVES
- STEAMTRAPS
- FLANGED APPLICATIONS



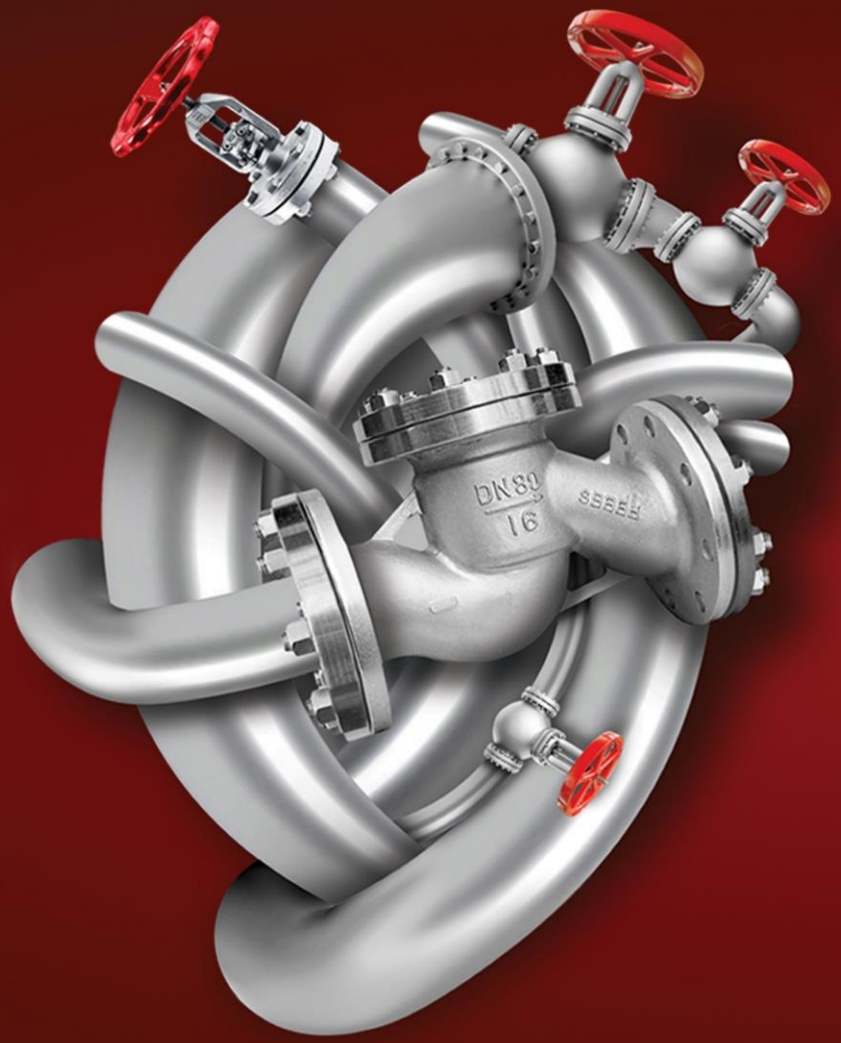
TYPE I VALVE JACKETS

- STEAMTRAP GROUP VALVES
- GROUP APPLICATION END

FORCE STRENGTH

RESISTANCE TO FORCE

- Cryogel and Pyrogel> 100 psi. can easily return to normal thermal performance if it is exposed to any load, even when exposed to pressure. There is no fragile mechanism.



SINCE 1994

IN & OUT TRADING

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AT THE HEART

OF YOUR BUSINESS