

Thermal · Acoustics · Jacketing



Cold Service



Introduction to FEF Insulation



www.kflexenergy.com



L'ISOLANTE K-FLEX

A NEW GENERATION OF INSULATION MATERIALS



COMPANY PROFILE

L'ISOLANTE K-FLEX is an Italian-based company specializing in the production of thermal and acoustic elastomeric insulation materials. The company has production facilities (Italy, USA, Russia, China, Turkey, Poland, India, Malaysia, Dubai) and established distribution around the globe. Its diverse product range provides energy saving solutions for various market sectors, including building, refrigeration, transportation, petrochemical and renewable energy.

L'ISOLANTE K-FLEX is a worldwide market leader, thanks to its focus on technological innovation. The quality of its products play an essential role in energy consumption control and the reduction of greenhouse gas emissions. **K-FLEX** delivers state-of-the-art levels of technical knowledge and customer support to the global insulation market.

K-FLEX USA is the North American division of L'Isolante K-FLEX, headquartered in North Carolina. As an ISO 9001:2008 certified company, K-FLEX USA prides itself on being responsive to the market, providing dependable service to customers throughout North America, bringing an innovative approach to product offerings, and having products that are 3rd party tested and certified.

The Company is **ISO 9001:2008** registered and has more than 1,000 additional certifications for products that guarantee quality, reliability and performance standards for the whole insulation market.

HEALTH, SAFETY & ENVIRONMENT

L'ISOLANTE K-FLEX strongly supports a policy of sustainable development, which is a development through environmental protection, social responsibility and economic progress. We believe in helping to meet the needs of today's communities, while understanding the need of future generations.

TOTAL SERVICE

At K-FLEX, we understand the unique and individual needs of our customers. This is why we feel that our thermal and acoustic system should be engineered to meet the requirements of each specific project. K-FLEX is a partner from the design through the completion of your project, ensuring that we provide the best possible solutions for your needs. Our support ranges from thermal and acoustic design, installation training and supervision, to post-installation performance evaluation (i.e. thermal imaging). The K-FLEX R&D center leads the way in the development of custom design for thermal and acoustic systems. Utilizing advanced thermal and acoustic design software, we can model all aspects of an insulation system to ensure stringent specification demands are met. Unlike many other manufacturers today, K-FLEX develops and manufactures all of our thermal, acoustic and jacketing materials, ensuring quick delivery and flexibility in manufacturing to meet custom material specifications.

APPLICATION RANGE

In addition to the cryogenic service temperature references in this document, K-FLEX insulation has been specified for and installed on pipes, equipment and vessels Onshore (Gas / Chemical Treatment Plants, Oil Refineries / Storage Tanks, Terminals) and Offshore (Fixed & Semi-submersible Platforms, Rigs, FPSOs, and Marine Vessels). Partial reference list on page 9.

K-FLEX CRYOGENIC FEATURES

Microcellular structure (Thermal Conductivity)



Closed cell thermal insulation products have many advantages over porous or fibrous ones. The lower air mobility inside the closed cell structure reduces the convective component of heat exchange. With the development of a new production process resulting in a significant decrease in the average cell size (microcellularity), K-FLEX has achieved further reductions in heat transmission through radiation and convection, with a subsequent improvement in thermal conductivity.

Resistance to water vapor transmission (Permeability)



K-FLEX FEF materials are resistant to water vapor transmission (<0.01 perm-in). The higher the resistance to the penetration of water vapor, the greater the consistency of performance over a period of time. This benefit is significant when insulating cold items, where insulation thicknesses are chosen to achieve a surface temperature above the ambient dewpoint. The formation of condensation on the surface of piping and ducting is the main cause of corrosion under insulation (CUI), which quickly leads to damage of pipes and ducts. Vapor transmission into K-FLEX insulation products is so minimal that the thermal conductivity is guaranteed for longer, even without an additional vapor barrier.

Contraction Joint Compensator (CJC)



A mechanical joint, designed by K-FLEX engineers, to deal with temperature variations is an innovative solution created under the supervision of DNV (Det Norske Veritas). This is to compensate for the contraction of K-Flex insulation materials that can occur at cryogenic temperatures.

Quick Installation



FEF can be applied quickly and easily, making the installation efficient and significantly reducing maintenance costs. The innovative K-FLEX system does not need expensive, complex tools or special fittings.

Advanced Installation Design (AID)



K-FLEX installation procedures have been specifically designed to help prevent any installation mistakes with the added benefits of reducing working time and a significant decrease in scrap material. K-FLEX R&D is committed to constant improvement and revision of the company installation guidelines. The elastomeric insulation system offers superb material properties, easy installation, constant performance during operation and low maintenance requirements. K-FLEX provides technical support during engineering design and on-site Installation Supervision, as well as Installation Manuals and Training Courses.



K-FLEX CRYOGENIC SYSTEM C O N F I G U R A T I O N

K-FLEX CLAD IN JACKETING *protective cladding*

A CPE/PVC-based UV and weather protective outer layer. It is adhered at overlapping joints without being directly attached to the final insulation layer. All joints must be sealed with K-FLEX sealant.

K-FLEX LS *NBR/PVC insulation*

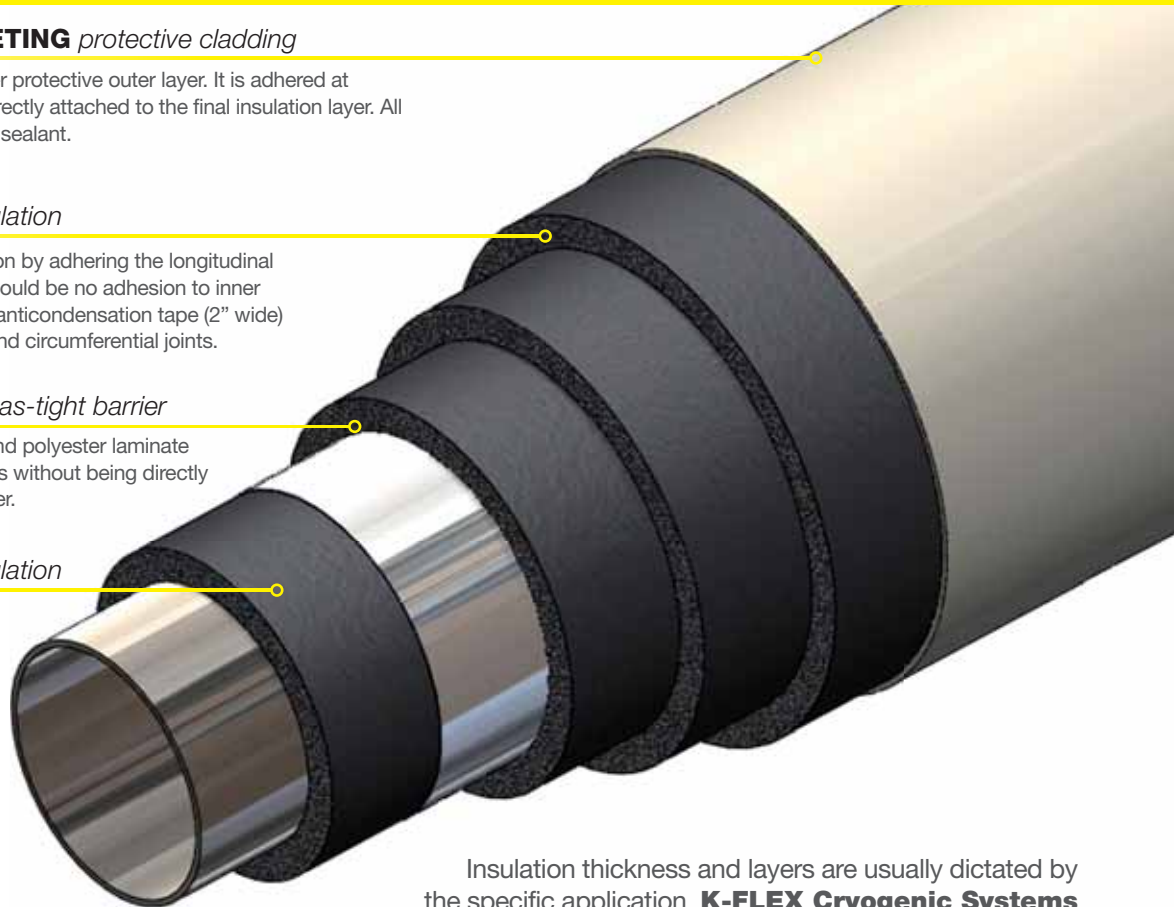
Additional layers are fixed in position by adhering the longitudinal and circumferential joints. There should be no adhesion to inner layers. For 2nd layer only, K-FLEX anticondensation tape (2" wide) should be applied to longitudinal and circumferential joints.

K-FLEX ALU *moisture & gas-tight barrier*

A "sliding layer" of an aluminium and polyester laminate that is adhered at overlapping joints without being directly attached to the inner insulation layer.

K-FLEX LS *NBR/PVC insulation*

1st layer is installed free to move and is not constrained or mechanically fixed to the pipe or to other layers to reduce thermal stresses induced by different thermal expansion coefficients. Longitudinal and circumferential joints are sealed by K-FLEX ALU Tape. This layer includes compression joints installed between sections to contract without creating gaps and thermal bridges.



Insulation thickness and layers are usually dictated by the specific application. **K-FLEX Cryogenic Systems** must be installed using the correct procedures and installation manuals (see page 5).

PERFORMANCE B E N E F I T S

- Low thermal conductivity = reduced heat transfer, improved process control, energy savings and reduced boil-off gas
- Minimized risk of CUI: Built-in continuous high resistance to water vapor transmission + reduced seams, joints and barriers + pH neutral material + 100% sealable and high emissivity outer jacket
- Low flame spread: Meets ASTM, IMO, DNV, ABS and Lloyd's Register Requirements & Approvals
- Easy access to pipe / equipment for inspection and maintenance
- Built-in resistance to fracturing from thermal shock (freeze/thaw process) and vibration
- Lightweight for reduced load on pipes
- Resistance to harsh application and environmental conditions

INSTALLATION B E N E F I T S

- Flexibility at low temperatures
- Reduced installation complexity, materials (layers, sections, seams, vapor barriers, sealants, mastics) and time (*see below top & middle*)
- Sections can be cut from jumbo rolls / flat stacked on-site to reduce inventory volumes and off-site warehouse space
- Maximum site man hour compression (allows for on-site and off-site fabrication)
- Lightweight for easy handling, storage and transportation
- Durable products that are not easily damaged in transport or on-site (resistant to fracture, corrosion, deformation, punctures, dents and tearing)
- Conformable for easy installation of difficult shapes (*see right*)
- Free of fibers, dust and sharp edges for a cleaner and safer working environment
- Simple maintenance for cost savings after commissioning
- Cost Effective (*see below bottom*)



ND (8" / 250mm)	1st FEF Layer	ALU Layer	2nd FEF Layer	3rd FEF Layer	4th FEF Layer	Clad IN	Sealant	Total
Straight Pipe	0:15:18	0:03:07	0:18:01	0:21:37	0:25:13	0:18:01	0:18:01	1:59:17
Elbow	0:22:09	0:05:48	0:08:42	0:08:42	0:08:42	0:13:56	0:29:01	1:37:02
Flange	0:17:52	0:11:59	0:16:38	0:17:52	0:19:10	0:35:57	0:31:11	2:30:38

Time norm calculations based on 1 unit of each item (1 meter of pipe, 1 elbow, etc.) as installed by K-FLEX Technicians. Contact K-FLEX technical support for additional part and pipe size data.

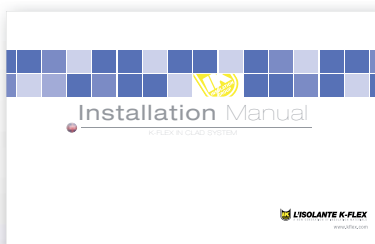
Insulation System	Time: Pipe (1m)	Time: 90° Elbow (1)	Time: Tee (1)
FEF	Baseline	Baseline	Baseline
Cellular Glass	40% more	25% more	10% more
PUR	80% more	20% more	40% more

Time calculations based on 1 unit of each item (1 meter of pipe, 1 elbow, etc.) as installed by K-FLEX Technicians. Materials, layers and steps for competitive insulation types based on manufacturer installation recommendations. Contact K-FLEX technical support for additional comparison data.

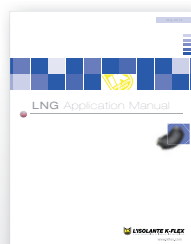
Insulation System	Material Cost	Labor Cost	Total Installed Cost
Traditional PIR	Baseline	Baseline	Baseline
Cellular Glass inner layer with PIR	5% less	15% less	9% less
FEF	40% less	25% less	35% less

Cost analysis based on calculations by industrial contractor Giovenco Industries and AIS insulation distributors for the Gladstone LNG Project in Australia. Cost analysis is dependent on material and labor costs in each specific region and could vary by region.

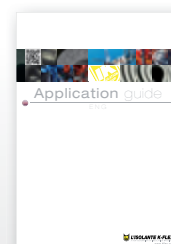
SPECIAL PARTS
Fittings, Flanges
Valves, End Caps.



CLAD IN SYSTEM INSTALLATION MANUAL



LNG APPLICATION MANUAL



FEF APPLICATION MANUAL

Full installation
procedures available
for download
at www.kflexusa.com.



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LNG P R O C E S S

Montoir LNG Terminal, GDF Suez, Technip, France



*The first flexible
elastomeric foam
approved by DNV
for LNG and cryogenic
applications*



The Montoir LNG Terminal in France, operated by GDF Suez, was a successful full scale qualification trial and certification of the Amplitude-LNG Loading System (ALLS), developed by Technip, for LNG transfer. In addition to GDF Suez and Technip, participants included Chevron, Conoco, BP, Hoegh and Total.

The K-FLEX Clad IN System was installed on 2 kilometers of pipe that was subjected to more than 6 months of demanding process tests and controls. At the end of the evaluation period, done in accordance to DNV RP-A203: Qualification Procedures for New Technology, Det Norske Veritas (DNV) granted a "Statement of Feasibility" for the K-FLEX Clad IN Cryogenic System, stating it is "feasible and suitable for LNG applications", including the insulation of LNG piping, valves and process equipment.

The certification is significant as it not only evaluated the suitability of the insulation when exposed to cryogenic temperatures, but also evaluated its performance within the complexity of an operational LNG system. Specifically, the K-FLEX system was determined to meet the functional requirements of an effective LNG thermal insulation, including 1) thermal performance sufficient to limit heat ingress and boil off, protect personnel against frost burns and prevent condensation or ice build up, 2) fire resistance to meet requirements for use in process facilities, 3) durability properties to prevent fracture or deterioration under normal loads and operations, vapor diffusion within the insulation lifetime, aging effects from weather and UV, or water ingress under the insulation, and 4) ability for repair, inspection and maintenance.

LNG TRANSPORT

LNG Carriers (Hull #2273 & 2277), Shell, DSME, Brunei

Insulated Areas:

- Cargo liquid lines
- Cargo vapor lines
- N₂ liquid lines
- Fuel gas lines from cargo compressor room to engine room
- Cargo vapor dome
- N₂ feed / exhaust pipe in trunk
- Cargo vapor / liquid pipes in liquid dome
- Filling pipe
- Main discharge pipe
- Stripping discharge / return pipe
- Emergency pump well
- Float level gauge pipe





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LNG EQUIPMENT

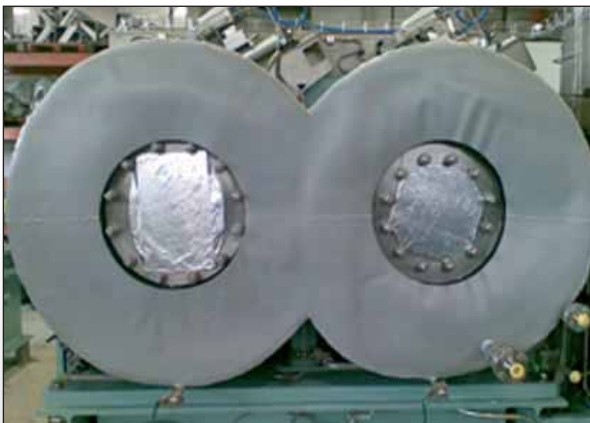
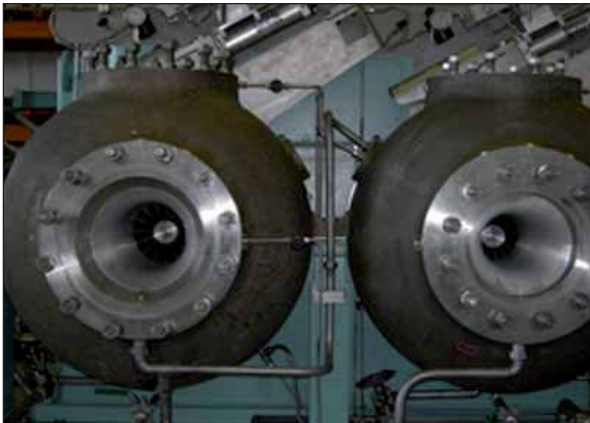
Cryostar: 29 Refueling Stations, 14 LNG Carriers
BOG Condensers / Compressors / Expanders / Flash Drum (-196°C)
Companers / Intercoolers / Interconnecting pipes (+135°C)
Liquid Nitrogen (LN₂) Equipment (-196°C / +80°C)

Application Difficulties:

Tight spacing, uneven surfaces, small pipes and gaps, glue forbidden against machines, equipment cannot function with condensation inside, access to equipment required for maintenance.

K-FLEX Solutions:

Flexible insulation for tight spaces / gaps, on-site fabrication for custom shape requirements, removable pieces fabricated on-site, glue-free design developed, installation complete in 8 days (LN₂ unit).



OIL & GAS P R O J E C T S

PROJECT	OPERATOR	LOCATION
Arzew LNG Liquefaction Terminal	Sonatrach	Algeria
LNG Terminal	Shanghai Municipal Gas Company	China
Terra Nova FPSO	Suncor	Canada
Thebaud Platform	ExxonMobil	Canada
FPSO Sable	ExxonMobil	Canada
Yastreb Drilling Rig	ExxonMobil	Russia
FPSO Cidade de Vitoria	Petrobras	Brazil
FPSO Golfinho	Petrobras	Brazil
FPSO P43, P50, P54	Petrobras	Brazil
Kashagan Offshore Barges	Agip KCO	Kazakhstan
T-47 Drilling Rig	Agip KCO	Kazakhstan
Moliqpak Platform	Shell	Russia
FPSO Akpo	Total	Nigeria
Yadana Gas Field	Total	Myanmar
Scarabeo Semi-Sub Drilling Vessel	Statoil	Norway
Statfjord A Platform	Statoil	Norway
Central Azeri Platform	BP	Azerbaijan
Sangachai Gas Plant	BP	Azerbaijan
Nitrogen-Oxygen Plant	SIAD Group	Italy
Oil Terminal / Storage Tanks	LUKOIL	Russia
D-6 Platform	LUKOIL	Russia
Marevo Vasilevskii Oil Tankers	Novoship	Russia
Menzel Ledjimet East Field	Sonatrach	Algeria
Goliath FPSO	ENI	Korea

Oil Transshipment Terminal, Newfoundland, Canada





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TECHNICAL DATA

F E F



K-FLEX LS

NBR / PVC-based elastomeric insulation designed for maximum thermal and moisture resistance performance.



K-FLEX LS ELASTOMERIC INSULATION	
Main Composition	Flame-retarded NBR / PVC elastomeric foam
Service Temperature	-297°F (-182°C)* to +220°F (+104°C)
Fire	ASTM E84 25/50-rated (2")
	Euroclass B, s3, d0 EN 13501-1 (K-FLEX ST)
	Class 1 (I) (K-FLEX ST)
	B1 DIN 4102 (D) (K-FLEX ST) BS 476 Part 6, 7 (UK) (K-FLEX ST) IMO Res. A 653 (16) / MSC 61 (67) (K-FLEX ST)
Thermal conductivity (Btu-in/hr-ft²-°F)	75°F (24°C) = 0.245 (ASTM C177) -4°F (-20°C) = 0.221 -148°F (-100°C) = 0.159
Water Vapor Permeability	<0.01 perm-in (ASTM E96)
Water Absorption (% by volume)	0% (ASTM C209)
Corrosion Risk	pH neutral: 6.6±0.04 (DIN 1988)
Leachable Chlorides	<0.05% water-soluble chloride ions (DIN 1988)
Resistance to chemicals, oils and greases	Good
Resistance to fungus and parasites	Good (Product includes an EPA-registered anti-microbial agent) Pass (ASTM G21)
Ecological data	No HCFCs or CFCs
Density	3 - 5 lb/ft ³ (ASTM D1667)
Flexibility	Excellent: Pass Cold Crack Test at -40°F (ASTM D1056)
Hot Surface Performance (220°F)	No Cracking or Delamination (ASTM C411)
Ozone Resistance	Pass (ASTM D1171)
Odor Emissions	No Objectionable Odor (ASTM C1304)
Dimensional Stability	<7% Linear Shrinkage (ASTM C534)
Sound Transmission Class (1")	13 (ASTM E90)
Approvals	DNV (Det Norske Veritas) (K-FLEX ST)
	FM (Factory Mutual)
	Lloyd's Register (K-FLEX ST)
	Bureau Veritas CE Marine Mark Approved (K-FLEX ST)
Thickness Availability (Tubes and Rolls)	3/8" 1/2" 3/4" 1" 1-1/2" 2"

* For industrial applications, product can be applied down to -324°F (-198°C); for applications below -40°F (-40°C) please contact K-FLEX technical support.

K-FLEX ST is an NBR / PVC-based elastomeric foam designed and manufactured by K-FLEX outside of North America to meet International / European fire standards.

TECHNICAL DATA

F E F



K-FLEX ECO

Halogen-free, NBR-based elastomeric insulation designed to ensure any fumes given off during a fire are transparent and non-toxic.

K-FLEX ECO ELASTOMERIC INSULATION	
Main Composition	Flame-retarded, halogen-free NBR elastomeric foam
Service Temperature	-297°F (-182°C)* to +250°F (+120°C)
Fire	ASTM E84 25/50 (3/4") EB 4013: Pass Class 1 (I) B2 DIN 4102 (D) BS 476 Part 7 (UK) IMO Res. A 653 (16) IMO Res. MSC 61 (67)
Thermal conductivity (Btu-in/hr-ft²-°F)	75°F (24°C) = 0.27 (ASTM C177)
Water Vapor Permeability	<0.10 perm-in (ASTM E96)
Optical Smoke Density	<150 (ASTM E662)
Corrosion Risk	pH neutral: 7.2±0.02 (DIN 1988)
Leachable Chlorides	Suitable for use on austenitic stainless steel (ASTM C795): Cl (<.001%), F (<.001%), Na (<.005%), Si (<.005%)
Oil Resistance	No change in apparent softness or color, no swelling (ASTM D471)
Resistance to chemicals and greases	Good
Resistance to fungus and parasites	Good (Product includes an EPA-registered anti-microbial agent) Pass (ASTM G21)
Ecological data	Free of halogens, dioxin, carbon black (EB 4013) Free of PVC, CFC, HCFC
Density	3 - 5 lb/ft ³ (ASTM D1667)
Flexibility	Excellent: No cracking at 28°F (EB 4013)
Hot Surface Performance (220°F)	No Cracking or Delamination (ASTM C411)
Ozone Resistance	Excellent (ASTM D1149)
Odor Emissions	No Objectionable Odor (EB 4013)
Dimensional Stability	<7% Linear Shrinkage (ASTM C534)
Sound Transmission Class (1")	13 (ASTM E90)
Approvals	Bureau Veritas CE Marine Mark Approved US Navy (EB 4013) ABS Lloyd's Register
Thickness Availability (Tubes and Rolls)	1/2" 3/4" 1"
* For applications below -40°F (-40°C) please contact K-FLEX technical support.	



K-FLEX HT

EPDM-based elastomeric insulation, properly designed for medium-hot applications and for flexibility at low temperatures.

K-FLEX HT ELASTOMERIC INSULATION	
Main Composition	Flame-retarded EPDM elastomeric foam
Service Temperature	-297°F (-182°C)* to +300°F (+150°C)
Fire	ASTM E84 25/50 (1")
Thermal conductivity (Btu-in/hr-ft²-°F)	75°F (24°C) = 0.263 (ASTM C177)
Water Vapor Permeability	0.2 perm-in (ASTM E96)
Corrosion Risk	pH neutral (DIN 1988)
Leachable Chlorides	<30ppm (EN13468)
Resistance to Oils and Greases	Fair
Ecological Data	Free of PVC, CFC, HCFC
Density	3 - 6 lb/ft ³ (ASTM D1667)
Flexibility	Excellent: Pass Cold Crack Test at -65°F (ASTM D1056)
Dimensional Stability	<7% Linear Shrinkage (ASTM C534)
UV Resistance	Pass: No Change after 2000 exposure hours (EN 13859-1)
Thickness Availability (Tubes and Rolls)	1/2" 3/4" 1"
* For applications below -40°F (-40°C) please contact K-FLEX technical support.	



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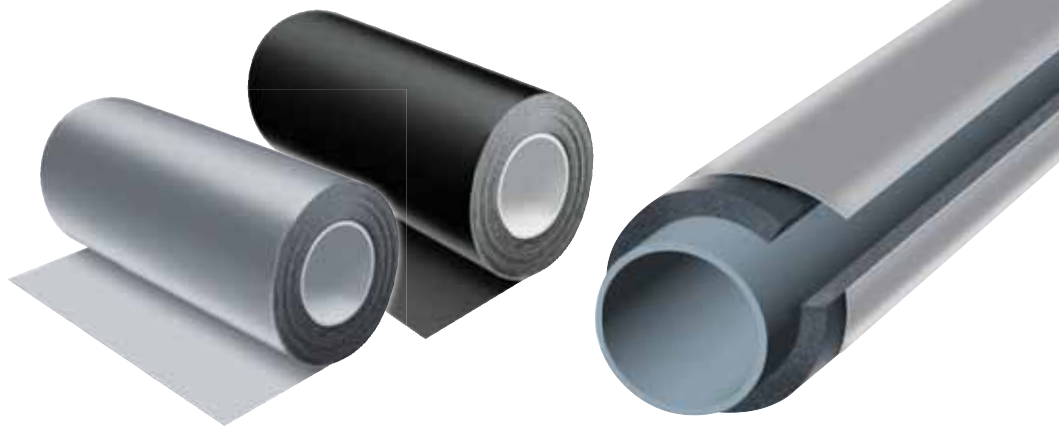


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TECHNICAL DATA JACKETING

K-FLEX CLAD IN

Flexible, non-metallic, polymeric (CPE / PVC) jacketing for all insulation types that provides excellent resistance against UV, high humidity, salt spray, aggressive chemicals, impact and CUI, and allows for non-destructive insulation inspection (accurate thermal imaging). Matching fitting covers (segmented and thermoformable) available.



K-FLEX CLAD IN JACKETING	
Material Type	Flexible Polymeric Barrier (CPE / PVC)
Color	Gray (RAL 7001) and Black (RAL 9011)
Thickness	.045" (1.2 ± 0.2 mm)
Water Vapor Permeance	0.08 perms (ASTM E96) μ > 90,000 (moisture resistance factor: EN 12086)
Specific Weight	1.8 +/- 0.1 g/cm³
Hardness	≥80 ShA (ISO 7619, ASTM D2240)
Tensile Strength	≥6.9 MPa (ISO 37: Typical value 7.5 MPa)
Modulus 10%	>1.5 MPa (ISO 37)
Elongation to Break	>100% (ISO 37: Typical values: elongation 70%, elongation to break 300%)
Peel Adhesion	>50 Kpa (ISO 2411)
Shear Strength	>20 N / 25 mm (ISO 34-1)
Ozone Resistance	Extremely Good: No oxidation after 72 hours of 50pphm and 20% elongation (ASTM D1711)
UV Resistance	Extremely Good: No change in color, pitting, cracking or blistering after 2 years of exposure in Arizona (ASTM G7)
Salt Spray Resistance	Extremely Good: No color shade change, scaling or blistering after 480 hours (ISO 3768, ASTM B117)
Aging Resistance	Extremely Good: Elongation to break and modulus conformance to specification after 360 hours of 72 MJ (ISO 4982)
Oil Resistance	Extremely Good: Elongation to break and modulus conformance to specification after 72 hours of immersion in oil IRM 903 (ISO 1817)
Chemical Resistance	Excellent resistance to broad spectrum of chemicals (hydrocarbons, alcohols, acids, oils, etc.). Full compatibility data, including chemicals to avoid, is available on request.
Impact Resistance	Extremely Good: Resistant to 20mm diameter punch of 1 Kg mass (EN12691)
High Surface Temperature Limit (continuous)	175°F (80°C): temperature of ambient air and outer insulation surface
Cold Temperature Flexibility (for installation)	-4°F (-20°C) (ISO 812)
Emissivity	0.90
Corrosion Risk (CUI)	Protects against corrosion under insulation: 100% sealable, high emissivity, resistant to moisture vapor transmission, puncture and tear No Risk of Galvanic Corrosion
Flammability	ASTM E84 Class A (<25/450) BS 476 pt 6, 7: Pass NF 92501: Pass IMO 61/67 part 2 & 5: Pass
Approvals and Supervisions	CE Marine Mark Approved (MED, module B) Norsok standard R-004 ed 3 (par. 5.9 non-metallic jacket) ABS (American Bureau of Shipping) DNV (Det Norske Veritas) Lloyd's Register

TECHNICAL DATA

A C C E S S O R I E S

K-FLEX 420 GLUE

Solvent-based, one-part high performance contact adhesive that has excellent initial bond strength and high heat resistance.

K-FLEX 420 CONTACT ADHESIVE	
Base Material	Polychloroprene
Solvent	Petroleum Distillate, Acetone, MEK, Toluene, N-Hexane
Dry Time	10 minutes (varies dependent on conditions)
Viscosity (approximate)	200 - 450 cps
Solids Content (by weight)	23 - 27%
Color	Gray-Green
VOC Content	≤ 674 g/L
Net Weight (approximate)	6.6 - 7.0 lbs/gal
Flash Point	-14°F (-26°C)
Coverage (approximate)	300ft ² /gal (@2.5 grams (dry weight) / ft ²)
Suggested Application Method*	Spray, Brush, Roll or Flow
Storage Temperature	+60°F to +80°F for maximum storage life
Application Temperature	+65°F to +100°F
Shelf Life	12 months

* For spraying, air pressure of 80 psi and fluid flow of 6 ft. oz/min should be used.

K-FLEX ALU

Multi-layer foil that serves as an anti-abrasive protective barrier, additional vapor barrier and gas-tight barrier to prevent liquefaction of oxygen.

K-FLEX ALU 4-LAYER FOIL	
Main Composition	Multi-layer film: LPDE (30 µm) / Aluminum (20 µm) / PET (23 µm) / Aluminum (20 µm)
Tensile Strength	>100 N / 15 mm (DIN 53354)
Ultimate Elongation	>15% (DIN 53363)
Tear Strength	7 N (DIN 53363)

K-FLEX SEALANT

Marine-grade sealant, designed for making elastic joints, that has excellent UV- and moisture-resistance and aging properties. Sealant is used on Clad IN seams.

K-MASTIC 55	
Base Material	Silyl Modified Polymer (SMP)
Curing Method	Moisture
Specific Gravity	1.4 g/mL
Skin Forming Time	10 minutes
Open Time	<15 minutes
Cure Rate after 24 hours	3mm
Hardness	55 Shore A
Tensile Stress (100%)	1.7 MPa
Tensile Stress at Break	2.6 MPa
Elongation to Break	250%
Shear Stress	2.2 MPa
E-Modulus (10%)	3.3 MPa
High Temperature Limit	+250°F
Application Temperature	+40°F to +100°F
UV and Weather Resistance	Excellent
Color	Gray

Additional materials could include high density pipe supports, K-FLEX ALU tape, K-FLEX elastomeric anti-condensation tape and compressible contraction joints (K-FLEX crushed foam). Reference K-FLEX Installation Manuals for details.



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THERMAL-ACOUSTIC SYSTEM

Sound control systems designed to minimize risk of CUI and reduce noise generated by pipes, valves, compressors, pumps and flanges.



ISO 15665 Class	System (Nominal Pipe Diameter: 300mm to 650mm)	Weight (kg/m ² / lb/ft ²)	Thickness (mm / in)	Reduction (dB) at Frequency (Hz)						
				125	250	500	1000	2000	4000	8000
A2	HT (25mm) + Clad IN (2mm)	5 (119)	27 (1.1")	-0.3	4.1	6.7	13.9	19.5	31.2	37.9
A2	Mineral Wool (50mm) + Metal Jacket (1mm)	11 (252)	51 (2")	-4	-4	2	9	16	22	29
B2	HT (25mm) + AB (25mm) + Clad IN (2mm)	12 (285)	52 (2")	-3.5	7.6	14.4	24.2	34.1	44.7	49
B2	Mineral Wool (100mm) + Metal Jacket (1mm)	18 (432)	101 (4")	-9	-3	6	15	24	33	42
C2	HT (25mm) + AB (25mm) + GK (2mm) + GK (3mm) + Clad IN (2mm)	24 (570)	57 (2.2")	-0.7	8.0	17.0	27.6	40.6	51.1	53.1
C2	Mineral Wool (100mm) + Metal Jacket (1mm)	22 (522)	101 (4")	-7	4	14	24	34	38	42
D2*	HT (25mm) + AB (25mm) + AB (25mm) + GK (5mm) + HT (25mm) + Clad IN (2mm)	31 (735)	107 (4.2")	-3.2	15.4	26	42.1	51.2	54.2	53
D2*	Mineral Wool (50mm) + Metal Jacket (1mm) + Mineral Wool (50mm) + Metal Jacket (1mm)	26 (615)	102 (4")	-3	4	15	36	45	45	45

*D2 Class - Shell DEP31

System Benefits:

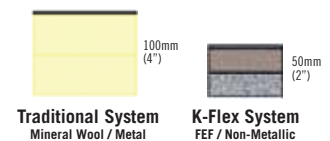
- Eliminates hazards to personnel and neighboring communities
- Reduced insulation thickness = weight savings and reduction in overall plant foot print, steel needed for pipe racks and supports due to closer spacing of the pipes
- Reduced insulation weight = reduced load on pipes
- Greater integration between thermal & acoustic systems
- Increased CUI Protection / No risk of galvanic corrosion
- More efficient installation and use of materials
- Non-metallic / all elastomeric system eliminates acoustic "re-radiation" effects associated with metal cladding
- Compliant to ISO 15665 (Class A, B, C, and Shell DEP 31 Class D); NORSOK R-004 (Class 6, 7, 8); ASTM E1222

Installation Tips:

- K-Flex[®] HT: Seal at longitudinal & butt seams with K-FLEX 420 Adhesive.
- K-FONIK[®] AB: Seal at longitudinal & butt seams with K-FLEX 420 Adhesive.
- K-FONIK[®] GK: Allow for 2" overlap on seams and joints and seal overlaps with K-FLEX 420 Adhesive. Fasten with stainless steel bands (every 1 foot section).
- Clad[®] IN: Allow for 2" overlap on seams and joints and seal overlaps with K-FLEX 420 Adhesive. Seal seams with K-FLEX Sealant (marine-grade).

Reference Installation Manual for Details

Class B2 Comparison



TECHNICAL DATA

A C O U S T I C S



K-FONIK GK

Flexible, non-reinforced, resilient mass-loaded elastomeric noise barrier.

K-FONIK GK	
Material Type	High Mass Elastomeric Material
Temperature Resistance	-40°F (-40°C) to +158°F (+70°C)
Fire	ASTM E84 25/50; ASTM D5132: No Ignition ASTM E162 : 7 / ASTM E662: 60 (GV only)
Surface Finish	Smooth
Mass	from 0.5 lb/ft ² to 1.5 lb/ft ²
Thickness (in)	0.10 (1.0 lb/ft ²)
STC (Sound Transmission Class)	21 dB (0.5 lb/ft ²), 26 dB (1.0 lb/ft ²), 29 dB (1.5 lb/ft ²)
Water Vapor Diffusion Resistance (μ)	20,000 (DIN EN 12086)
Tensile (psi) min	300 (1.0 lb/ft ²) (ASTM D412)
Elongation (%) min	25 (1.0 lb/ft ²) (ASTM D412)
Tear Die C (lbs) min	50 (1.0 lb/ft ²) (ASTM D412)
Ozone Resistance	Pass at 50 pphm (ASTM D1171)
Certifications	GV only: IMO A653 (CE Marine), IMO FTP Code Part 5, Wheelmark MED 96/98/EC
Halogen-Free K-FONIK GV also available (gray color).	



K-FONIK AB

Flexible, open cell elastomeric sound absorber.

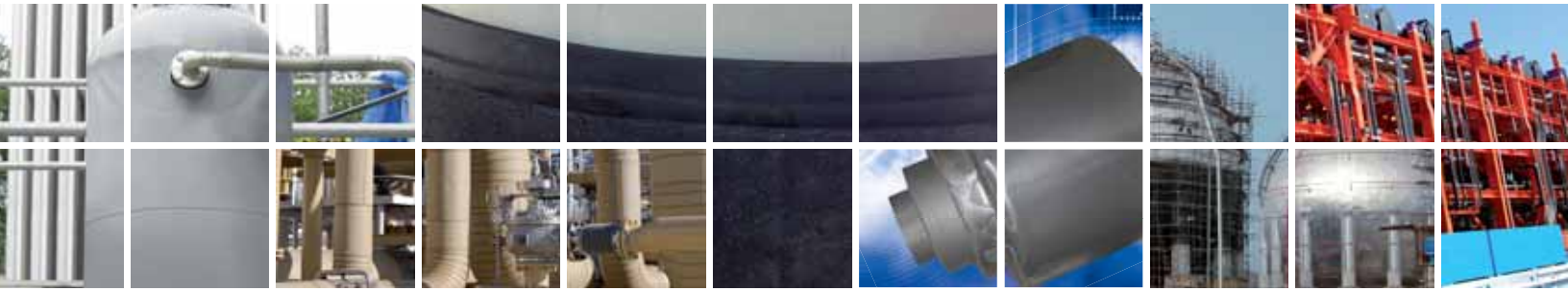
K-FONIK AB OPEN CELL	
Material Type	Open Cell Flexible Elastomeric Foam
Temperature Resistance	-40°F (-40°C) to +185°F (+85°C)
Fire	UL 94-HB (pass, not listed); CS ₂ d0 (EN 13501)
Density	15 lb/ft ³ (240 Kg/m ³)
Thermal conductivity (Btu-in/hr-ft²-°F)	75°F = 0.30 (ASTM C177)
Thickness	from 0.5" to 2"
NRC (Noise Reduction Coefficient)	0.75 (1") (ASTM C423)
Sound Insertion Loss (Rw)	14 dB (1") (UNI EN ISO 717-1:2007)
Tensile (psi) min	10 (ASTM D412)
Elongation (%) min	25 (ASTM D412)

THERMAL-ACOUSTIC

A P P L I C A T I O N S

Pearl GTL Terminal, Shell, Al Jaber, Qatar: Insulation of 2000mm (80") Pipes:
K-FLEX HT + K-FONIK AB OPEN CELL + K-FONIK GK + CLAD IN





L'ISOLANTE K-FLEX

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