Insulation Insights
Volume 5, Edition 2

Removable Insulation Blankets – from A to Z

At first glance, making up a removable insulation blanket seems somewhat simple – take some insulation, put some mesh on one side, a cover on the other, sew them together, add some rivets so that you can fasten it, and presto!

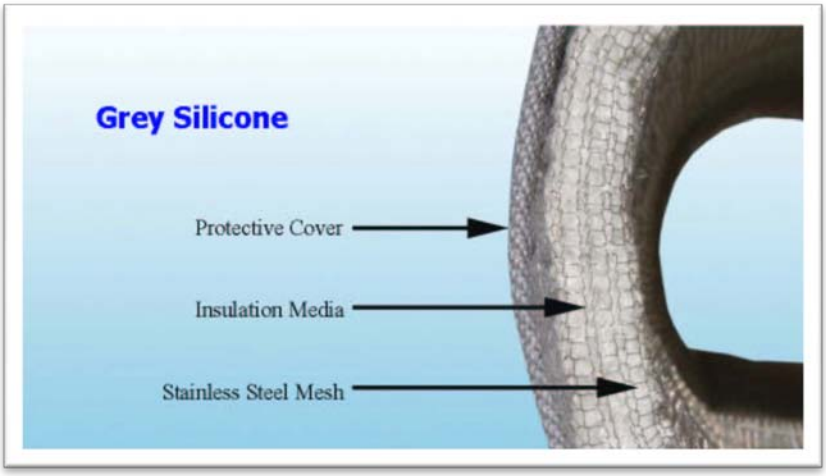
Of course, we know that in fact it is not quite so simple. Aside from the design aspect - that is ensuring that the insulation blanket fits the part properly, wrapping snugly around the part, and taking into account whatever brackets, screws, and other protrusions might be present - there is the aspect of choosing the appropriate materials with which to manufacture the blanket.

“When it comes to selecting the material makeup of an insulation blanket, there are numerous combinations of materials that are available”, notes Brett Herman, Firwin’s vice-president of Sales & Engineering.

“While we have a standard material makeup that we default to for ‘ordinary’ insulation blanket applications, we manufacture a wide range of material combinations on a regular basis”, said Brett. “A simple glance at our production line at any one time would show blankets of all shapes, sizes, and materials waiting to be assembled”, added Brett.

Removable Insulation Blanket Construction

As most of us know, a removable insulation blanket can be divided into 3 main components:



- An outer protective cover, also known as the “cold face”, designed to shield and protect the insulation from the environment in which it finds itself.
- The insulation mat itself, typically 1” thick fiberglass, which provides the actual heat containment. Thickness varies from ½” to up to 4”, depending on the amount of heat reduction the application requires.
- The inner liner, also known as the “hot face”, which helps to keep the insulation mat in place, and can also act as a barrier, protecting the insulation mat from fluid seepage.

Aside from these 3 components, there is the fastening system used to secure the insulation blankets in place.

All of these aforementioned components can vary according the application in question and the end user requirements. Some of the factors that the Firwin design team takes into account when deciding on the material makeup of an insulation blanket include:

- Maximum temperature range of the application in question.
- Location (i.e. indoors vs. outdoors).
- Exposure to elements (i.e. water, chemicals, debris, etc.)
- Ambient temperature
- Safety requirements (i.e. underground mining, marine, UL, etc.)
- Desired outer surface "touch temperature"
- Space limitations.
- Desired heat retention within the system (i.e. desired exhaust temperature)
- Regulatory requirements (i.e. Marine)
- Frequency of insulation removal
- Aesthetic requirements (i.e. look of blanket, color matching, etc.).

"Because of all the variables, it is important for us to know under what circumstances the blankets will be used, and what objectives the end-user is trying to achieve with the insulation, in addition to any constraints and design specifications", said Brett.

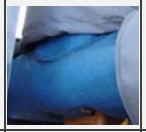
Materials Used in Removable Insulation Blanket Construction

As an educational resource to our customers, Firwin has put together the following table (beginning on the next page), which outlines the more common options available when constructing an insulation blanket. Note that while this table is quite comprehensive, it is not exhaustive, there being other insulation and cover materials available that are used in highly specialized applications. Please be sure to consult with a Firwin representative before finalizing any material choice.

Other Articles: Firwin's New Canada West Office · New Online Product Catalogue

Materials Used in Removable Insulation Blanket Construction

Outer and Inner Covers

		Usage	Temperature Range	Fluid Barrier	Relative Cost *	When Used	Special Properties
Silicone Impregnated Fiberglass		Outer Cover; Inner Liner	-67°F (-55°C) to 500°F (260°C)	Yes	$$	Typical outer cover used in most standard insulation blanket applications. Also used as inner liner for applications < 500°F (260°C) where a fluid barrier or insulation fiber containment is desired.	Flexible; flame retardant; water and oil resistant; mold resistant; chemical resistant. Typically grey or red, but other colors also available.
Teflon Coated Fiberglass		Outer Cover; Inner Liner	-50°F (-45.5°C) to 550°F (287°C)	Yes	$$	Used interchangeably with Silicone. Used in place of Silicone in Paint, Food, and other chemical applications due to broader chemical resistance.	Flexible; flame retardant; water and oil resistant; mold resistant. Broad spectrum chemical resistance. Typically grey or red, but other colors also available.
Aluminized Fiberglass		Outer Cover	-20°F (-28°C) to 450°F (230°C)	Yes	$$$	Used in place of silicone / Teflon when one wishes to shield components from nearby heat source (i.e. insulate the "cold" component and reflect heat away, rather than insulate the hot component to retain heat). Also used for aesthetic reasons.	Aluminized high reflective radiant barrier. Flame resistant, shows resistance to water and oils, mold resistant. Due to construction even when the aluminum coating breaks down (450°F/230°C), the fiberglass substrate maintains it's integrity up to 1000°F [538°C].
PVC		Outer Cover; Inner Liner	-40°F (-40°C) to 180°F (82°C)	Yes	$	More economical alternative to Silicone and Teflon where high temperature rating is not required.	Water and oil resistant; mold resistant, UV resistant
Heavy Duty Silicone		Outer Cover	-67°F (-55°C) to 500°F (260°C)	Yes	$$$	This (Heavy Duty) silicone impregnated fiberglass fabric is often used in more severe outdoor applications, and in larger size applications where increased strength and resistance to wear and tear is needed.	Similar characteristics to silicone Impregnated glass fabric. Provides superior resistance to abrasion, flexing, tear and puncture. Flame retardant; water and oil resistant; mold resistant.
Fiberglass HT		Outer Cover; Inner Liner	-20°F (-28°C) to 1300°F (700°C)	No	$$	A non-coated fabric used both as an outer cover and inner liner in high temp exposure conditions(>500°F / 260°C) where Silicone and Teflon fabrics are unsuitable.	Excellent resistance to high temperatures; mold resistant. Typically in blue or beige color. Good for containing insulation fibers.
Silica		Outer Cover; Inner Liner	-20°F (-28°C) to 1,800°F (982°C)	NO	$$$$	A non-coated fabric used both as an outer cover and inner liner in extreme high temp exposure conditions(>1300°F / 982°C) where silicone and Teflon fabrics are unsuitable.	Fireproof; Excellent Insulating Properties; mold resistant. Good for containing insulation fibers.
Stainless Steel Laminated Fiberglass		Outer Cover	-20°F (-28°C) to 500°F (260°C)	Yes	$$$$$$$$$	Used in place of coated fabrics (such as silicone and Teflon) where a high level of oil , chemical and fire resistance is required. Used together with a mesh outer cover for applications where strong puncture and tear resistance are needed.	Unlike Aluminized Fiberglass where coating breaks down at high temperatures, laminated foil retains its integrity and can continue to act as a fluid barrier. Excellent puncture and tear resistance. Flame retardant; water and oil resistant; mold resistant.

** Costing is not to scale, and is for comparative purposes only.*

Materials Used in Removable Insulation Blanket Construction

Inner Covers

		Usage	Temperature Range	Fluid Barrier	Relative Cost *	When Used	Special Properties
Stainless Steel Mesh 304		Inner Liner	1200°F (649°C)	No	$$	Typical inner liner used in most standard insulation blanket applications > 500°F (260°C), where limited fiber containment is required.	Also used as a reinforcement for outer covers where rocks , debris and damage resistance is needed.
Stainless Steel Mesh 309		Inner Liner	1,800°F (982°C)	No	$$$	Used in place of stainless steel 304 for temperatures between 1200°F to 1800°F.	
Stainless Steel Mesh Inconnel		Inner Liner	2300°F (1260°C)	No	$$$$$$$$$	For extremely high temperature applications > 1800°F.	
Stainless Steel Mesh 316		Inner Liner	1,600°F (871°C)	No	$$ş	For marine environments	Good resistance to sea water.
Stainless Steel Foil with Mesh Cover		Inner Liner	1200°F (649°C)	Yes	$$$	Used primarily in high temperature (> 500°F (260°C)) applications where a fluid barrier to insulation is desired.	Exhibits high strength at elevated temperatures. Flame proof; water and oil resistant; mold resistant.

Insulation

		Insulation Material	Temperature Limit	Relative Cost *	When Used	Properties
FW1200		Fiberglass	1200°F (649°C)	$	Typical insulation used in most standard insulation blanket applications with temperatures < 1200°F (649°C).	Odorless, does not contribute to metal corrosion, and resists decay, mold, and vermin. Excellent sound absorption properties
FW PLUS		CMS Wool	2192°F (1200°C)	$$	Enhanced thermal properties, ideal for very high temperature (> 1200°F (649°C)) applications, or for lower temperature applications where superior insulation value is required.	Firwin Plus offers the equivalent thermal properties as ceramic insulation, without the health concerns the accompany ceramic insulation. Odorless, does not contribute to metal corrosion, and resists decay, mold, and vermin. Excellent sound absorption properties.
MW1200		Mineral Wool	1200°F (649°C)	$ş	Ideal for applications where moisture is an issue. Water repellent, fire resistant and sound absorbent. Also has good vibration absorption.	Low moisture absorption; Fire resistant; Excellent thermal resistance; Does not rot or sustain vermin; Does not promote growth of fungi or mildew. Good sound and vibration absorption.
AHQ9233		Aerogel	1100 °F (600°C)	$$$$$$$$	Superior insulation material to both fiberglass and CMS Wool. Ideal for limited clearance applications or where blanket weight is a concern.	Due to it's unique thermal conductivity qualities ½" thick will have similar insulation properties to 1 .5" of fiberglass insulation.

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Materials Used in Removable Insulation Blanket Construction

Fastening Systems

		Temperature Limit	Relative Cost *	Remarks
Stainless Steel Lacing Wire with Rivets		1200°F (649°C)	$	Standard lacing system; rugged, stands up to high heat, provides good fasten; long lasting. Most economical.
Silicone Straps with Buckles / Rings		500°F (260°C)	$$	Quicker install/removal than lacing wire; lower temperature; not as rugged
Kevlar Straps with Buckles / Rings		700°F (371°C)	$$$	More rugged than silicone straps ; stands up better to frequent use.
Stainless Steel Mesh Straps with Buckles / Rings		1200°F (649°C)	$$$	Rugged and high temperature straps.
Springs		1200°F (649°C)	$$	Easy assembly and removal. Ideal when quick blanket assembly / disassembly is required. Minimum labor.
Snaps		1200°F (649°C)	$$	Easy to put on and take off; can seize up with high heat. Not recommended on curved surfaces and low volume applications.
Velcro (polyester)		200°F (93°C)	$$	Simple on / off. Low temperature limitation. Can be combined with straps. Not suitable in high temp.& dirty environments. Care should be taken not to wipe hooks over hot surfaces.
Nomex Velcro		280°F (138°C)	$$	Slightly higher temperature limit than standard Velcro. Can be combined with straps. Not suitable in dirty environments. Care should be taken not to wipe hooks over hot surfaces.
Stainless Steel Velcro (hooks) with Nomex Velcro Fastener		450°F (232°C)	$$$	High temperature Velcro, but somewhat expensive. Can be combined with straps. Less sensitive to dirty environments than standard and Nomex Velcro's.

This document is for educational purposes. Final choice of materials, insulation, fasteners, etc. should be done in consultation with Firwin Representative.

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