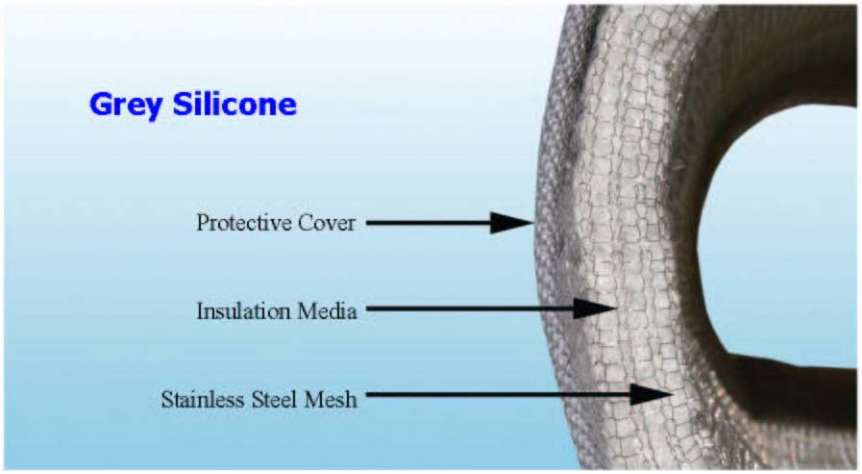
Insulation Insights
Volume 8 Edition 1

Firwin FAQ – How do I know what the outside blanket touch temperature will be for my application?

Users of removable insulation blankets often would like to know what the outside, or cold surface, temperature will be once the insulation blankets are installed on their system. This is especially true where personnel safety is of concern, where the surface temperature of the blankets must be below a certain level to be considered safe for personnel working in the area.

Background:

A typical insulation blanket is made up of 3 sections:



An inner (hot) surface: Typically a stainless steel mesh, the inner liner rests directly on the hot component. Its function is to keep the insulation material in place.

Insulation material: The middle layer of an insulation blanket is the actual insulation media. Typically fiberglass, but other materials can be used, particularly in very high temperature applications (>1200°F).

Outer (cold) surface: The outer cover protects the insulation from being damaged. There are various materials that can be used, but most common is silicone impregnated fiberglass.

When we speak of ‘touch temperature’, this refers to the temperature of the outer protective cover. While no specific standard for safe touch temperatures exists, the *UL2200 specification for stationary engine generator assemblies* lists safe temperature limits for both metallic and non-metallic surfaces.

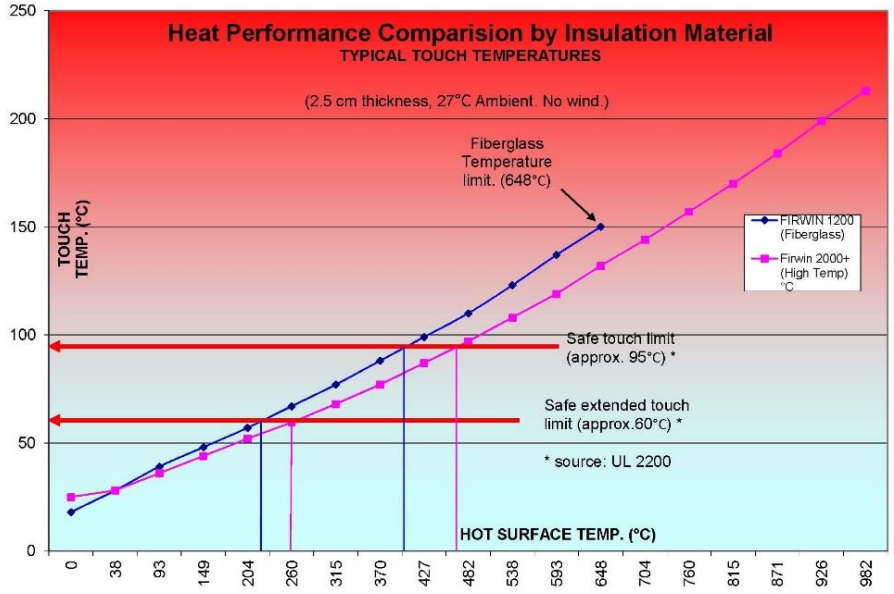
UL2200 Specification for Stationary Engine Generator Assemblies		
Contact Surface	**Metallic**	**Non-metallic**
Handles or knobs grasped for holding	50° C (122° F)	60° C (140° F)
Handles or knobs that are contacted but do not involve holding; other surfaces subject to contact and user maintenance	60° C (140° F)	85° C (185° F)
Surfaces subject to casual contact	70° C (158° F)	95° C (203° F)

As you can see from the above table, non-metallic surfaces, such as standard insulation blankets, can reach temperatures as high as 95° C (203° F) and still be considered safe for casual contact.

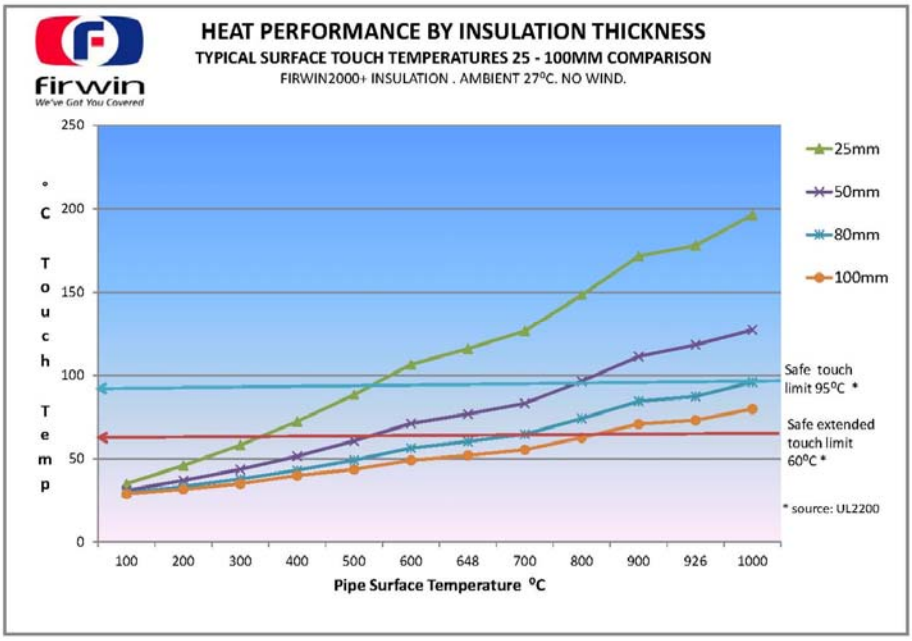
What determines the outer surface touch temperature?

While there exists are large number of variables to be considered when calculating the outside temperature of an insulation blanket, the following are the most quantifiable and critical:

Insulation Material: The effectiveness of an insulation blanket is, of course, greatly determined by the type of insulation material used. Some materials are superior insulators, and thus the touch temperature will be lower for those materials for a given exhaust temperature.



Insulation thickness: The thickness of insulation material used has arguably the most profound effect on the resultant touch temperature of an insulation blanket. Intuitively, the thicker the insulation, the more effective it will be and the lower the outside surface touch temperature. It is important to note, however, that insulation thickness is one of diminishing returns - as one increases the insulation thickness, the added insulation value gets lower. In other words, going from 1” thick to 2” thick insulation will not double the insulation value.



Ambient temperature: The temperature in the area where the insulation resides, known as the ambient temperature, will also affect the temperature of the outer

cover. The higher the ambient temperature, the higher the temperature of the outer blanket.

Air flow (wind speed): Air flow cools off the blanket surface temperature by increasing the rate of heat escape from the surface. Therefore a faster air flow will reduce the touch temperature.

Outer cover material (emittance): The *emittance* of a material refers to its ability to release absorbed heat. Outer materials with a high emissivity value will release heat away from it back into the environment, and thus produce a lower temperature than materials with a low emissivity value. For example, a silicone impregnated fiberglass cover has a higher emissivity and will produce a lower surface temperature than a mirrored aluminum fiberglass cover, whose lower emissivity causes it to retain more heat.

Once equipped with this information, our engineers can quickly calculate what outside surface touch temperature a user can expect for his particular application. Conversely, if a customer has a target touch temperature in mind, Firwin engineers will be able to determine what insulation material and thickness will be required to achieve this goal.

“Customers should realize that these results are approximations, as actual site conditions will vary”, said Brett Herman, Firwin’s Vice President of Sales & Customer Service. “For most cases, using these variables suffice to give the customer a good estimate of what outer temperature he can expect. However, if a more precise analysis is desired, Firwin can perform a more sophisticated and time-consuming *heat flow analysis*. (For more information, see our article in an earlier newsletter titled “Heat Flow Analysis”.)

Other Articles: · How Many Insulation Blankets are Needed for a Particular Application? · Firwin Alberta Corp.