FIRWIN FAQ – WHAT IS THE “R VALUE” OF YOUR INSULATION BLANKETS?

Insulation Insights

Firwin
We've Got You Covered

Firwin Corp is a leading manufacturer of custom insulation products for diesel and gas engines & exhaust systems, and industrial applications.

Many of us are familiar with the kind of insulation used in the construction industry – that pink fiberglass stuff that typically goes in your walls and attic. These insulations, typically fiberglass, come with **R values**, with are provided by the manufacturer as a measure of the effectiveness of the insulation. The **R value** is a relative number, meaning that the higher the **R value**, the more effective the insulation, so that an insulation with an **R value** of 30 will perform better, keeping my home warmer in the winter and colder in the summer, than an insulation with an **R value** of 20. Correct?

Well, if you're looking to insulate your home, then you would be right. An **R value** is determined by a material's "thermal resistance" at a given temperature. In the home and building industry it is generally calculated at 75°F (24°C). Since a typical building will hover around this temperature, the **R value** for building industry applications will give you a good idea of their performance. However, when it comes to insulating engines, exhaust systems, and other industrial applications, temperatures can vary and get extremely high. The **R value** of an insulator at 500°F (260°C) will differ from its **R value** at 750°F (390°C).

So when comparing insulation materials, or trying to determine how effective a given insulation is, for these type of applications one would need to know the **R values** over the temperature range. Knowing the **R value** at the temperature where building insulation is rated will have little if no use.

R VALUE AND *K VALUE* - DEFINITIONS

In order to get a better understanding of what an **R value**, and its inverse, the **K value** mean, it useful to look at their definitions. **K value** is a measure of a material's "thermal conductivity", which is defined as "the time rate of steady state heat flow through a unit area of a homogenous material induced by a unit temperature gradient in a direction perpendicular to that unit area".[1] In other words, the **K value** is the actual measurement of heat transferred through a specific material.[2] Its unit of measure is Btu-inch/hour per square foot per degree F (or W/(m.k)).

The **R value**, a measure of a material's "thermal resistance", is defined as "the quantity determined by the temperature difference, at steady state, between two defined surfaces of a material of construction that induces a unit heat flow though a unit area".[3] In other words, it is an indicator of a material's ability to resist heat loss.[4] It is the inverse of the **K value**, multiplied by the thickness of the insulation. For example, if a material's **K value** is 0.25, then the **R value** for 2" thick material would be 1 / 0.25 x 2, or an **R value** of 8. In short, the lower the **K value**, the higher the **R value**, and the more effective the insulation. A **K value** will be constant at a given temperature, while an **R value** will fluctuate based on the thickness of the insulation.

OTHER FACTORS TO CONSIDER

Ok, you might say, but once I know the **R value** in the temperature range of my application, does that mean that the higher **R**-rated insulation will be the more effective insulator for my application? Well, the answer to that would be only a partial 'yes'.

1 Gordon Hart, Insulation Outlook, March 2009, "Understanding the Value in All These Values", p10.

2 David South, The Monolithic Dome, "**R** Fairy Tale – The Myth of Insulation Values", p 1.

3 Gordon Hart, Insulation Outlook, March 2009, "Understanding the Value in All These Values", p12.

4 David South, The Monolithic Dome, "**R** Fairy Tale – The Myth of Insulation Values", p 1.

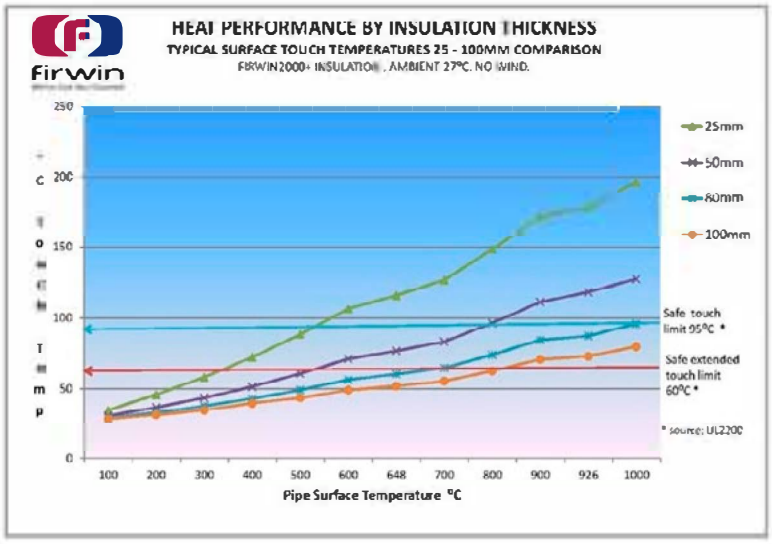
"The problem with using **R value** to rate an insulation material's effectiveness is that the **R value** is just one of a number of critical variables to consider that can affect insulation performance", said Brett Herman, Firwin's Vice President of Sales and Customer Service. "For instance, how does an insulation material perform when it gets wet? Some insulation materials will stand up well to moisture over time and retain their integrity, while others will deteriorate. For applications where insulation blankets may come into contact with the elements, choosing an insulation with a high **R** rating but which does not perform well when wet is obviously not the correct solution no matter how high is its **R** rating", added Brett.

Resistance to compression is another variable that can effect insulation performance. "The geometry of the components we insulate are often complex – elbows, silencers, catalysts, SCRs, valves, flanges", said Joash Katsivo, Firwin's Sales and Design Engineer. "Because of this we use dense insulation that resists compression even when formed to the shape of the component, thus retaining its insulation value.
A low-density insulation may have a high **R value**, but is easily compressed. If we were to wrap such an insulation around some of the exhaust components we cover, it would compress to very thin and lose its insulation value", added Joash.

Other variables that may effect an insulation's effectiveness are:
Temperature rating – What is the temperature range within which a given insulation is effective? Obviously, a high rated **R** insulation will not be effective if the application's temperature falls outside the accepted temperature range for that insulation.
Vibration resistance – Some insulation materials are better at withstanding vibration than others.
So an insulation with a high **R** rating which does not stand up well to vibration would not be the best choice for a high vibration application.

PUTTING IT ALL TOGETHER

"We find that when a customer is asking about an **R value**, what he really wants to know is what material will meet the goals that he is trying to achieve by using insulation blankets. For instance, often the customer is concerned with personnel safety, and wants to ensure that the outside touch temperature of the insulation blanket will be within safe-touch limits", said Brett.



"What we will do in this case is gather the variable information that is necessary to formulate this calculation. This information includes not only the material's **K** / **R value**, but also other variables that can affect the insulation blanket's performance - i.e. ambient temperature, air flow, and pipe diameter. We can then provide the customer with the outside temperature he can expect using certain insulation materials and thicknesses. This can also be illustrated graphically using Heat Flow Charts, so the customer can get a visual representation of how the outside surface blanket temperature will be affected by various material and thickness combinations", added Brett.

So what, if any, use do **R** and **K values** have in industrial settings where Firwin removable insulation blankets are typically found? "I would look at **R** and **K values** as indicators to be considered along side others when trying to determine the appropriateness of an insulation", said Brett. "Ultimately, the customer needs to inform us what it is they are trying to achieve, and then we can advise them accordingly".

Other Articles:

Custom Steel Boats – A Family Affair | **Smoking Blankets – Not Necessarily a Cause for Concern.**

The Firwin Corporation team is available to review your insulation blanket needs and inquiries.
CONTACT US NOW >>

The Firwin Corporation has ebooks and White Papers on a variety of topics.
VIEW OUR RESOURCES NOW >>

About Us

Firwin Corporation is a leading manufacturer of custom insulation products for diesel and gas engines & exhaust systems, and industrial applications. Our two main product lines are removable and reusable insulation blankets (also known as removable insulation covers and removable insulation jackets) and permanent Hard Coat™ composite insulation. We also stock a wide range of off-the-shelf high temperature tapes and sleeves.

We service a diverse range of industries, providing insulation solutions for applications such as diesel and gas powered generating stations, gensets, on-road and off-road vehicles, as well as industrial applications such as process and steam line valves, flanges, and piping.

Request information about Firwin's Insulation Solutions

REQUEST INFORMATION >>

Firwin Corporation
1685 Flint Road, Toronto, ON M3J 2W8
Toll Free: 1.877.347.9467 **Tel:** 416.745.9389 **Fax:** 416.745.0782
Email: firwin@firwin.com www.firwin.com