

FLEXIBLE HEATERS: SELECTING THE RIGHT MOUNTING METHOD FOR YOUR APPLICATION

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Industries around the world will experience cold interior operations or outdoor environmental temperatures that can impact the performance of equipment. For example, foodservice operations that have to keep finished meals at a set low temperature before serving to airplanes flying in winter weather, the equipment components and products must be maintained at a certain temperature to prevent equipment malfunctions, device failure or spoiled products.

[Flexible heaters provide heat](#) directly to the necessary components no matter their shape and size. It can be flexed and wrapped around the surface to provide heat to specific components. They are lightweight so as not to impact moving parts where the component's weight factors into how it functions and are rugged enough to withstand moisture and chemical exposure. There are various types of flexible heaters, such as [silicone rubber heaters](#), [Polyimide/Kapton® film heaters](#), and [polyester heaters](#).

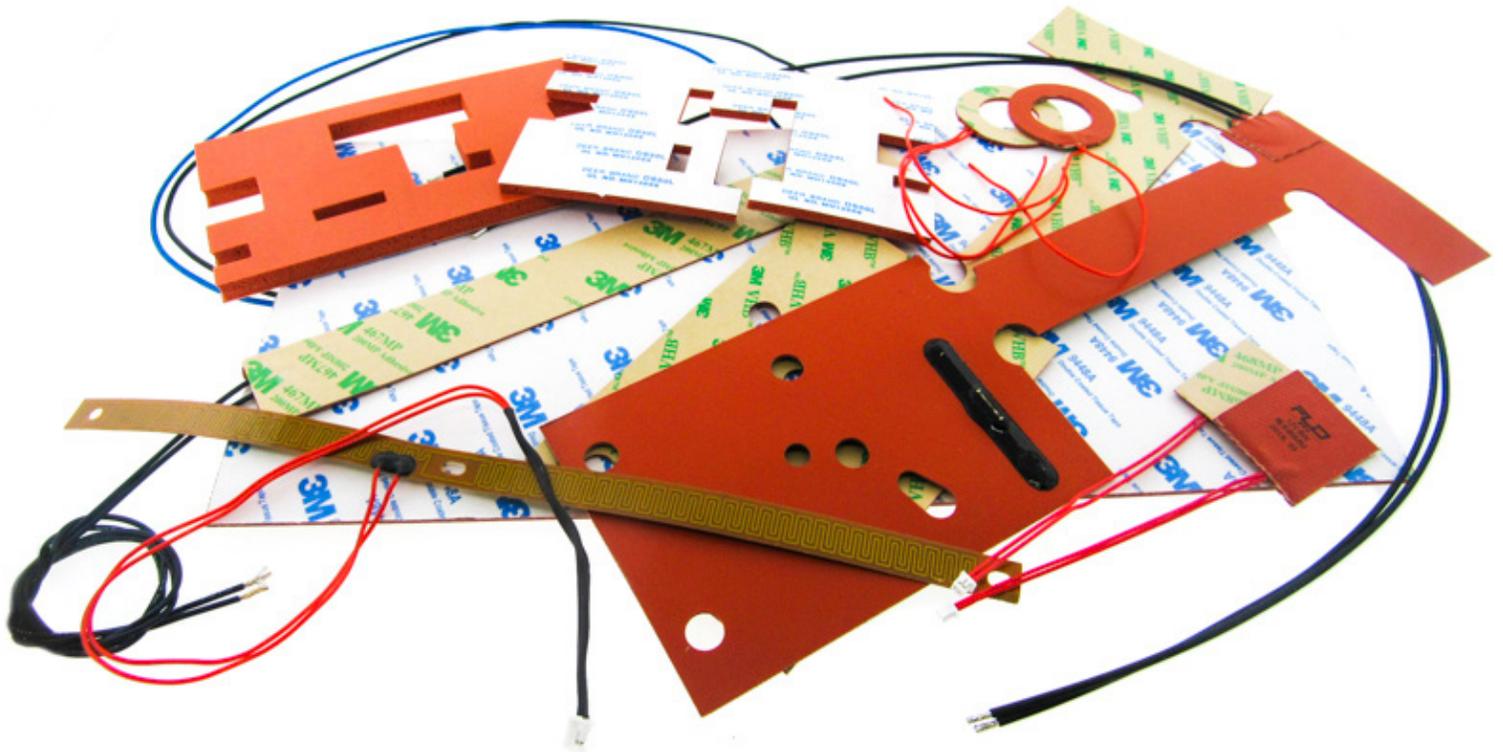


Figure 1: Example of flexible heaters with pressure sensitive adhesive (PSA).

Secure attachment of the flex heater is paramount. Some applications may require the flex heater to be detachable on demand. Other equipment requires a permanent bond and superior heat transfer capabilities so that the component stays at a constant temperature. Let's check out the different mounting methods, their

benefits, and the types of applications where a specific mounting will be used.

Types of Flex Heater Mountings

There are four main types of [mounting methods that manufacturers use for their flexible heaters](#): pressure sensitive adhesive (PSA), factory vulcanized mounting, silicone RTV bonding and removable mounting attachments. Some mounting methods are dependent on the level of heat generated, while others must provide heat transfer capabilities.

1. Pressure Sensitive Adhesive (PSA)

Pressure sensitive adhesive involves having a flex heater with an adhesive surface that is pre-attached. The protective backing is peeled away as the flexible heater is then placed onto the component. It may have a single side of adhesive or a double-sided coating.

Applications for PSA Mounting Methods: PSA mountings for flex heaters are more suitable for clean surfaces that are smooth or for slightly curved surfaces. It is the most economical and fast mounting method available. If used with a silicone rubber heater, a rubber roller should be used to prevent trapping air bubbles underneath that could cause the flex heater to experience hot spots or undergo premature failure. High temperature PSAs should be requested for applications that give off significant heat levels that exceed 300-400°F (150°C) for Polyimide/Kapton® heaters or 400-500°F (205°C) for silicone rubber heaters.

2. Factory Vulcanized Mountings

Factory vulcanized mountings involve taking the flexible heater and mounting it to the component using a vacuum oven. The flexible heater becomes adhered to the component as it is a suitable method for metal surfaces such as stainless steel, anodized aluminum, or black anodized aluminum. This mounting method provides a permanent bond due to the flex heater, such as silicone rubber type, filling into microstructure of the metal material. Most often the component mounting will be performed in-house before the finished product is sent to the company for further component installation into equipment.

Applications for Factory Vulcanized Methods: Factory vulcanized methods are appropriate when you want the best heat transfer capabilities as the flexible heater itself is fastened to the component without anything obstructing the contact point. The bond is also strong because it is permanent. This method can be used for an application where the heat will reach a maximum of 500°F (260°C) when using a silicone rubber flex heater or for a Polyimide/Kapton® flex heater that reaches a maximum temperature of 300°F (150°C).

3. Silicone Room Temperature Vulcanizing (RTV)

Silicone RTV involves adhering the flexible heater to the surface of the component by using a silicone adhesive that is both room temperature and ambient humidity cured. It consists of a one-part adhesive (or a two-part adhesive consisting of a resin and a catalyst that is mixed together) and is applied to the silicone rubber heater. Then the heater is positioned onto the part as a small roller runs across the heater to remove air pockets while securely adhering the heater.

Applications for Silicone RTV: Silicone RTV is suitable for components that are in field applications where

high temperatures will be produced during operations. It can be used for heaters that will provide up to 5 W/in² and temperatures of 500°F (260°C). This mounting type offers superior flexibility as it is also resistant to harsh weather, mildew, mold and humidity. When using the silicone RTV that is a two-part adhesive system, this mounting type is suitable for large flex heater applications.

4. Removable Heater Mounting Attachments

Removable mounting attachments allow for the flexible heater to be taken off easily when a permanent attachment is not viable or desired. These mountings may consist of:

- Velcro Fasteners
- Snap Grommets
- Nylon Straps
- Silicone Straps

Applications for Mounting Attachments: Mounting attachments are normally preferred for flexible heaters that will be attached to components that may have sharp cutouts or rough edges. These attachments prevent the heater from chafing against the component's surface, so the heater doesn't become damaged or slips off. These attachments are perfect for applications where the flexible heater can be attached quickly as mounting attachments are easy to use. One thing to keep in mind is that some mounting attachments with straps may become elongated after repeated use. In addition, foreign dirt and debris such as hair, clothing fibers or dust can become attached to Velcro fasteners.

Benefits of Using the Right Mounting Method

Using the mounting method that best suits the application can prevent a failure in working components and operations. A company must also take into account the working environment where the flexible heater will be used. Sudden temperature changes, rain, snow and extreme sun can all impact how the flexible heater will be attached and whether the mounting method will give the suitable lasting bond. Look over the following scenarios and the mounting types that would be best suited for the application.

Heat Transfer Capabilities

There may be applications where a company requires the maximum amount of heat to be transferred from the flexible heater to the component. In these instances, you want the flex heater to have as much contact as possible with the surface area. The mounting method that is selected should offer unlimited heat transfer capabilities based on the desired temperature that is required.

For this application, factory vulcanized mountings are superior attachments that have the best maximum heat temperatures of up to 500°F. They also do not rely on any bonding adhesives or mounting attachments to be put into place. Another method that offers good heat transfer capabilities is a PSA mounting.

High Temperature Capacity in Outdoor Applications

Outdoor applications will experience an abundance of moisture that can cause mold or mildew. A company may also desire a mounting method that is not negatively impacted by the ultraviolet sunlight and that can

withstand temperature fluctuations or humidity. In addition, the mounting needs to offer more thermal stability during high temperatures as well as flexibility.

A silicone RTV is the perfect solution for outdoor applications with fluctuating temperatures and high generated heat. This mounting method is also suitable when the component will be stored for long periods of time. The room temperature bonding adhesive has a lifespan of up to 40 years.

Rough and Sharp Surface Edges

Certain flexible heaters will need to be attached to edges that are irregular in shape and have sharp edges. When looking at mountings, a company needs to consider a mounting where it will not adversely affect the flexible heater when attached to the rough surface. They must also consider the amount of space available for the mounting to be successfully attached.

Mounting attachments such as Velcro fasteners, grommets and straps can help a company attach the heater at the right location even for sharp edges. The heater will not chaff against the rough surface that could damage the heaters components. In addition, certain attachments, such as nylon straps, can withstand pushback pressure of up to 35 pounds.

Uniform Surfaces and Lightweight Applications

There will be applications where the weight of the flexible heater can impact how a component works in operations. Even the slightest added weight from a separate mounting attachment could significantly hamper the part. In these instances, PSA mountings offer ease of use where a lightweight and flexible attachment is desired. The adhesive is placed on the heater with a uniform thinness, unlike a silicone RTV where the curing bond adhesive is applied using a brush as it may have thick and thin spots of adhesive.

The one thing to keep in mind is that PSA mountings must be applied to smooth and clean surfaces. If the environment generates a lot of dirt, oil, grease or grime that cannot be removed, then the adhesive may not attach fully.

Permanent or Detachable Mountings

One of the last things that a manufacturer wants to do is attach a flexible heater with a permanent mounting to a component when a detachable mounting is more suitable. Knowing which are permanent and which are detachable will allow a company to select the right mounting for the appropriate length of time.

Permanent Attachments: Factory Vulcanized mountings, PSA mountings, and Silicone RTV mountings

Detachable Mountings: Velcro Fasteners, Silicone Straps, Nylon Straps and Snap Grommets

Industry Preferences for Flexible Heater Mountings

Industries in the aerospace, medical device production and foodservice market segments will use flexible heaters on products and equipment of varying shapes, sizes and operations. The type of mounting method

is important to ensure a tight bond that will not have the heater prevent the full use of the product or component. Here are some of the common types of mounting methods seen in these industries.

Medical Device Manufacturing

Flexible heaters with sensors are used extensively in the medical industry in a wide range of devices. Surgical tools, small catheters, blood analyzers, incubators and hemostasis equipment contain silicone rubber heaters, transparent heaters and Polyimide/Kapton® film heaters. Mountings often used in the medical device industry include PSA as well as factory vulcanization.

Aerospace Industry

The aerospace industry relies on flexible heaters to prevent electronics and probes from becoming damaged due to moisture, humidity and environmental temperatures. The heaters are commonly used for instrument panels to dry out the electronics, to de-ice probes, and to defog infrared and security devices. PSA heater mountings and removable mounting attachments are commonly used based on the specific application.

Foodservice Industry

When it comes to the foodservice industry, keeping food at an optimal temperature to provide hot meals at the optimal temperature is desired. Flexible heaters will be used in places that require low to medium temperatures that are constant during the work period while offering chemical and moisture resistance. PSA mounting is commonly used for these flexible heaters to ensure a tight seal.

Customized Flex Heater Solutions

When an application or product will experience damage or failure due to cold temperatures or humidity, a flexible heater will provide the desired amount of constant heat in the right location. Here at Epec Engineering Technologies, we provide flexible heater solutions that can be customized for a company's application. Our flex heaters can be designed based on weight, size, and configuration for the part or application. In addition, we offer a range of different formats and mounting options so the flex heater will be manufactured using the materials and specifications that best suit operations.

Epec Engineering Technologies offers both design and manufacturing services under the same roof. So, we can engineer and build the flex heater project without sending certain parts off to other contract manufacturers. Instead, we ensure that superior quality design and reliable manufacturing services are used throughout the entire project. To learn more about our flex heating solutions, contact our technicians today.