

K-Flex Contact Adhesive Properties

In below-ambient applications, it is important to select the correct insulation thickness to prevent condensation, use a suitable insulation material that will reliably prevent moisture from penetrating the insulation, and properly installing the insulation. K-Flex closed cell elastomeric insulation materials have excellent physical properties and are easy-to-install because they are flexible and bond well. Another critical factor to a proper installation is to use an adhesive with good bonding strength.

How does an adhesive stick?

An effective adhesive must have two properties: it must be able to moisten and stick to the bonding surfaces (adhesion), and it must have adequate internal strength (cohesion).

Adhesion

Adhesion occurs when the adhesive molecules are attracted to the surface to be bonded. Because most insulation surfaces are microscopically uneven with peaks and valleys, the percentage of the surface in contact with the adhesive is important. The more adhesive that flows into the valleys, the more molecule contacts it can create, and the better the adhesive sticks to the surface. This means that the surface must be clean, because if it is not, the molecules are not able to come close enough to each other for adhesion to occur.

Cohesion

The adhesion of the glue to the insulation surface alone does not constitute a good bond. Another critical element is cohesion, which binds the molecules within the adhesive to one another. Because the forces between the individual molecules increase as the adhesive hardens, optimal cohesion is only achieved when the adhesive sets.

The higher the cohesion, the stronger the adhesive. ***It is critical that the adhesive is applied thinly and evenly.*** Many installers believe that a good bond can only be achieved by applying a thick layer of adhesive. However, the opposite is true. The thicker the layer of adhesive, the less it withstands strain because the cohesive forces are not particularly strong.

Choosing the right adhesive

Good bonding results can only be achieved with an adhesive that is appropriate for the application. Most contact adhesives used with elastomeric insulation are solvent-based with resins and synthetic rubbers, and thus are suitable for bonding wood, metal, leather, plastics, rubber and foams. A key advantage of contact adhesives is that it is possible to bond non-porous materials.

Application process

The adhesive is applied to both surfaces to be bonded. After the tack-drying time is over, both sides are joined to each other using as much pressure as possible. Through the evaporation of the solvents, the adhesive molecules of the adhesive layer on the two surfaces settle close together and connect. Additionally, the pressure increases the adhesive forces between the adhesive layer and the surface of the substrate. To achieve a strong bond, it is not necessary to exert pressure for a long period of time. Bonds made with contact adhesives are immediately tacky and capable of load-bearing.

Tack-drying time and contact adhesion time

The tack-drying time is the period of time during which the solvent (or water) must evaporate from the adhesive film applied to both sides, thus enabling an immediate bond to be formed between the two pieces to be joined.

The tack-drying time depends on the amount of adhesive applied, the air temperature, air circulation and the relative humidity. The earliest point at which the two pieces can be joined can be determined by a simple “finger test”. The end of the tack-drying time has been reached when the adhesive applied feels dry and is no longer “stringy”.

The period of time during which the seemingly dry layers of adhesive can still be joined to each other is known as the contact adhesive time (open time). For solvent based adhesives, depending on the ambient conditions, it is around 10 to 15 minutes. However, the bond is only strong enough to take the strain after the curing time – around 36 hours – has elapsed. It is therefore necessary to wait this length of time before taking insulated systems into operation.

Application temperatures for the adhesive

Adhesives must be applied above +40°F. At temperatures below +40°F, the latent heat of the adhesive can lead to an increase in the formation of condensation on the surfaces to be bonded or the adhesive film. In these circumstances adhesion is barely, or not at all, possible. For optimum shelf life, adhesives should also be stored at +60 to 80°F.

Partition bonding / vapor dams

When insulating cold systems with elastomeric insulation materials, the insulation system integrity can be increased significantly by “partition bonding”. During this process, the ends of the tubes are bonded directly to the pipe at intervals of 6 to 18 ft. maximum in a width that corresponds roughly to the insulation thickness used. This creates a vapor dam and ensures that if moisture arises as a result of parts of the object (pipe, flanges, valves, etc.) leaking or insulation work completed incorrectly, it cannot spread to the entire pipe network. When partition bonding is carried out correctly, it is very easy for the installer to locate the damaged areas and rectify the damage at relatively little expense. Partition bonding is particularly important in areas where the insulation is penetrated. Here direct connections to the environment (thermal bridges) have been created, which are often the cause for moisture formation.

As a result of partition bonding, the insulation material is bonded directly to the pipe surface at all potential penetration areas and at intervals to limit the spread of moisture intrusion.

For more technical information, please contact K-Flex USA technical services at 800-765-6475.