Tape offers strength and versatility

Adhesive tapes have a number of industrial bonding applications. Paul Fanning takes a look at the technology.

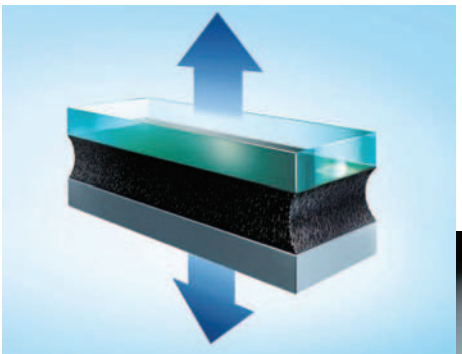
The common perception of adhesive tapes is of them as a temporary measure. Fit only as a placeholder rather than a permanent bond. This is understandable, of course, based as it is on the domestic application of tape, where it is very much as the poor relation to glues. However, in the industrial environment, there are a number of applications in which tapes can provide a valuable and long-term solution.

Of course, different substrates exhibit very different properties under changes in operating conditions such as temperature, humidity or exposure to U/V light. As general guidelines however, designers need to consider three main factors; surface energy, surface characteristics and potential expansion / contraction associated with temperature change.

Surface energy is the 'excess' energy at the surface of a material and is important for any adhesive technology because the surface energy of a substrate influences the ability of an adhesive to 'wet-out' i.e. spread out evenly on the surface. If wetting is inhibited by a low surface energy then it is only possible for a weak bond – if any – to be formed. Ideally, the surface energy of the adhesive should be (appreciably) lower than the surface energy of the substrate to which it is applied, typically between 2 to 10 dynes/cm. However, an acceptable bond can still be achieved if the surface energy of the adhesive is equal to the surface energy of the substrate.

With regards to surface characteristics: it's important to know if the surface(s) are rough or smooth as it will influence the choice of adhesive tape. For example, if both surfaces are smooth, such as glass or metal, then a tape with a filmic carrier is ideal. If however, the surfaces are rough or uneven, or if there is a discernible gap between the substrates when they are placed together, a double sided tape with a thicker carrier such as a foam tape should be used.

Expansion and contraction at temperature is another factor. Solids expand or contract as temperature varies, with this change in dimension occurring in all directions. However as they don't all expand and contract at the same rate, then depending on the difference, increased stress can be placed on an adhesive bond. This means that the type of carrier must then be taken into account when choosing a tape, and in such cases a foam tape has often been preferred as in construction it is able to accommodate such dimensional changes.



ACXplus is specially developed for long-term bonding

The potential of adhesive tapes in industrial applications can be seen in one of the newer products on the market. This comes from tesa, which recently showcased a radically new range of acrylic adhesive tapes with optimum viscoelasticity for constructive bonding applications – tesa ACXplus. This technology enables a new functional combination of its chemical components while acting as a solvent-free coating of high capacity acrylates especially developed for constructive long term bonding.

Key performance benefits of stress dissipation are available through the product's viscoelastic properties. Viscoelasticity embodies both elastic and viscous characteristics which allow the tapes to dissipate extreme physical stress. When two materials, for example glass and aluminium, are bonded with it, an optimal high strength bond is achieved even where extreme temperature conditions and high wind loads are experienced.

The product's high performance acrylic adhesive system provides optimal wetting and chemically adapts to bonded surfaces, giving a powerful bond on materials with different surface characteristics. In addition, tape thicknesses can be adjusted to compensate for rough and uneven surfaces. Decades of bonding can be confidently predicted as a result.

Double-sided foam tapes are ideal for bonding dissimilar materials

Jeremy Smith of tesa UK, says: "[It] offers a viable alternative to traditional mechanical fastening methods, taking constructive bonding to the next level in offering significant advantages which can be seen in its bonding strength, stress dissipation and resistance to the elements. With this technology, not only can we offer solutions for all known adhesive application areas, we can also start to embrace application areas where no adhesive bonding solutions have previously been available."

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