

Don't get stuck over which adhesive to use

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The use of engineering adhesives has enabled many companies to save time and money. Colin Chapman, a product manager at Loctite UK explains which type to use and how design concepts can save a great deal of money

For many people a glue is simply something that 'sticks' two things together. And, broadly speaking, that is correct. As far as general household uses of glue are concerned, you simply apply an appropriate amount (usually far too much is involved) of adhesive on to one or both surfaces and within a certain period of time they 'stick'.

The application of engineering adhesives is, of course, a little more sophisticated than that. Indeed, to make the two surfaces join successfully, it is essential to understand the type of adhesive to use.

First, comes industrial epoxies. These differ from the traditional DIY products in that they are often toughened (through the use of rubber) and have just a single component (the household versions have two). The benefit of toughened epoxies is that they have greater peel strength and impact performance than the consumer versions.

Next, there are the various types of acrylic adhesives. Toughened acrylics, for instance, are two part products which are suitable for bonding metals, some plastics and some woods. They develop handling strength at room temperature within 15 to 30 minutes, although some can subsequently be heat cured by, for example, passage through a paint bake oven.

These adhesives can be applied by means of an automatic mixing gun or, alternatively, by having the catalyst applied to one surface, the adhesive to the other, and the two parts mated.

Cyanoacrylates (better known as Super Glues) are normally single component products which cure in seconds at room temperature. This curing takes place through the reaction of slight traces of moisture on the component surface with the adhesive. Instant adhesives are excellent for bonding rubber, some fabrics and most plastics.

A recent development in this field has been the polyolefin primer which works with instant adhesives to enable so-called difficult substrates — polypropylene, silicone rubber, for example — to be bonded.

Anaerobics are single component materials that remain liquid in the presence of air and only cure when the joint has been mated. These adhesives are used on metallic components for locking and sealing threads, for providing

gaskets and for bonding components such as gears, pulleys and bearings on to shafts.

They can be applied directly from the bottle or by the use of automatic application equipment.

As the name suggests, UV acrylics are cured when exposed to an ultraviolet light source. They are used for bonding glass components, for coating printed circuit boards and for potting electronic products. Curing can take place within seconds of application by automatic equipment.

Polyurethane adhesives are available as both single and two part products. The single component type cure using atmospheric moisture, while the two part version cures when both elements are mixed together.

Although lower in strength than epoxies and toughened acrylics, they are extremely flexible. One of the major applications involves direct glazing of windscreens in motor vehicles, although they are also used when there are large gaps or where a high degree of flexing is expected. Polyurethanes are suitable for bonding most metals, woods, various plastics and rubbers.

Increasingly, adhesives are being used in preference to traditional methods of joining such as riveting, bolting, welding, interference fitting and keying. Adhesives are frequently used to replace rigid gaskets or thread sealing methods such as tape.

In fact, there is a relatively new concept known as DFMA (Design For Manufacture and Assembly) which has led many companies to change from traditional production methods to adhesive technology — with some outstanding benefits.

DFMA is all about simplifying design while maximising product quality and performance, and reducing costs.

The automotive industry is a classic example of where DFMA has worked!

■ Save time, save money

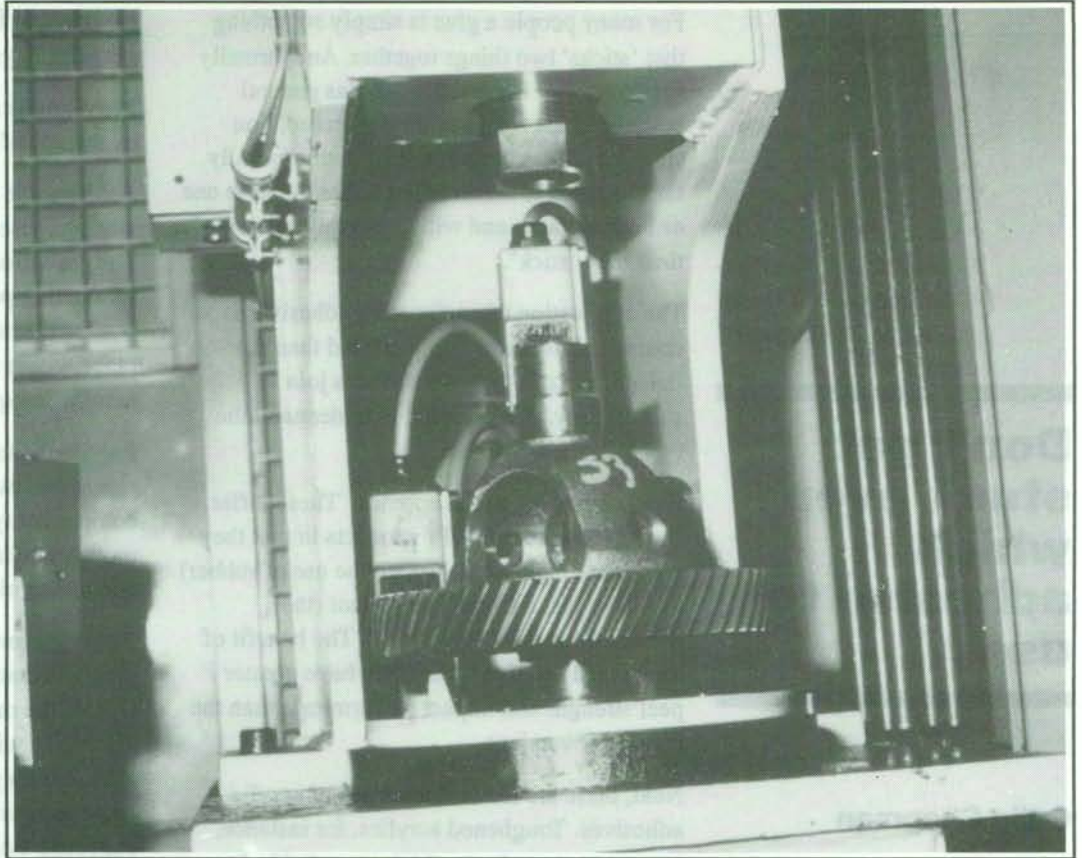
Take the case of a manufacturer who needed to attach a fluid pressure sensor manifold housing to an engine block.

Previously bolts had been used, but when a new engine was to be developed the design team looked at an alternative assembly method.

DESIGNED TO BE MORE EFFECTIVE

The shrink bonding of machine-turned crown wheels to differential housing for Rover gearboxes is completely automatic. By designing the process in association with adhesive manufacturer, Loctite UK space was saved in the gearbox and assembly time was cut.

Without the use of adhesives the components could have been either bolted together, or machined out of one block. Both would have been costly and time consuming, and in the case of the former, would have resulted in considerable weight increase.



The original design used a cut gasket to seal the interface between the manifold and the block. Once in place, lock washers were used to maintain gasket clamp pressure. Tape was used to seal threaded hose tubes in to the manifold.

The DFMA method sees a liquid gasketing adhesive being used instead of the cut gaskets. The lock washers are eliminated by the use of a pre-applied threadlocking adhesive, and a press fit tube is bonded and sealed with a high strength anaerobic retaining compound — doing away with the need for threading the parts and using tape.

Carried out manually, assembly time using the new adhesives design was cut from 137 seconds to 91 seconds. In addition, assembly costs were reduced by 33 per cent.

The use of multi-station robotics reduced costs even more. In fact, the total cost is 50 per cent lower when using DFMA techniques.

■ The way ahead

In effect, Design For Manufacture and Assembly calls for adhesives to be treated as another component.

DFMA makes a great deal of sense. And more and more designers are coming to see that adhesives are one way of getting on the right side of their financial directors! DFMA reduces part counts and makes assembly easier.

Loctite has produced an educational booklet that contains a more in-depth look at the use of adhesives in design and manufacture. Copies are available from Industrial Marketing, Loctite UK, Watchmead, Welwyn Garden City, Herts AL7 1JB.