

Designing light curing adhesives into your product

Description

Our great friends at [FAST \(Fastening & Assembly Solutions And Technology\)](#) were kind enough to give recent editorial space in their indispensable magazine to a piece we have written about how to design your product so that UV/visible light curing adhesives can be used – and to be able to take advantage of the process and financial benefits which can accrue.

It is based on our recently published white paper [Designing-in Light Curing Adhesives](#), which is [downloadable from our website](#).

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DESIGNING-IN LIGHT CURING ADHESIVES

The advantages of using adhesives over mechanical fasteners have been well documented. They include distribution of load and stress over wider surface areas, elimination of joint fatigue, improved impact resistance, reduction in finishing - and they can provide aesthetic enhancements. Peter Swanson explains.

Design engineers will soon be guided by their production engineers colleagues if they can specify or allow for a light curing adhesive. In addition to the performance advantages listed above, light curing adhesives also provide very significant process advantages. They are single part, which means that no mixing or mixing equipment is required, and there is less waste. They cure very quickly, typically in seconds, and are designed, in that they only start curing when exposed to light of the correct wavelength. This reduces the need for jigs and tools, and minimises RFP and inventory costs.

Light curing adhesive products form permanent bonds to glass, metal, ceramic and many plastics, including ABS, PC, PMMA, PA and PVC (as well as many less well-known polymers). They are used to assemble with multiple substrate types (ie glass/metal/plastic). With the recently chosen formulation, conductive and post-curable are high (2,500psi @ 6000psi at least). In general, they are solvent, tough and provide good impact strength. They are available in a hardness range of Shore A80 to Shore D60 (and in the Shore D60 range for light curable glass). There are viscosity variations, so suit wetting and film thickness, or to fill gaps, to be self-finishing, or to be applied to a vertical surface. Operating temperature may increase to typically 45°C to 150°C.

FRASURON, these materials more suited UV light, reacting to light in the near visible, long wave UV-A range (315-400nm). Since many plastics have UV blocking ingredients in them to help prevent the underlayment and substrate caused by ambient UV light, plastic bond

ing adhesive use a specific combination of UV and visible light to generate heat and effluvia cure. UV curing systems based on metal-halide lamps produce broad spectrum light suitable for curing most materials. The latest developments in curing technology include curing equipment based on LEDs, which produce a narrow spectrum light, centred around a specific wavelength (ie 385nm or 395nm), which is a deep-in requirement for broad spectrum lamps. UV LED curing lamps are becoming more popular, and adhesive formulations are emerging which are optimised to cure with these lamps.

This is the on demand cure, single component formulation and viscosity choice. Light curing adhesives are very easy to apply in automated processes. They can be applied with a wide variety of dispensing technologies and with

Flexible light curing adhesives

It would seem adhesive available from Intertronics to VDI and other light curing adhesive particularly suited to rapid bonding of glass with polyimide/ceramics (EPOCOR) which has become popular choice in the point of care device industry because of their many advantages, including high strength, hardness, low water absorption and excellent biocompatibility.

Intertronics has also introduced a 2 dimensional optically cured adhesive specifically designed for bonding EPOCOR film ceramic and other difficult to bond to substrates, but is also exclusively suited to a variety of other plastic widely used in the manufacture of medical devices. Typical applications include

needle assembly, reservoir assembly, multi component assembly, and multi component. Other bondable substrates include titanium steel, PE, PP, PVC, ABS, POM, PA, PC, PC/PE, PMMA, PET, PPS, PI, PPS/PA, PPS/SBS/TPU, CFR, AI, and glass.

Intertronics has LED curing lamps, which will cure in less than 10 seconds after exposure to 300- or broad spectrum UV light, thus enabling fast processing, greater output and lower production costs. It is soft and flexible with a diameter of 10mm, it has a quantity of 1,000 of the improved curing, making it ideally suited for multiple bonding requirements. The product is ISO 13485 CE (CE marking) approved.

LIGHT CURING ADHESIVES

reproducible precision. As the cure is, so fast, quality inspection procedures can be implemented immediately after assembly, or indeed immediately in-line at end of the process. Yields are high, since the process is readily controlled and repeat.

So what does a design engineer need to think about in order to specify a light curing adhesive?

• Substrates

As previously discussed, the adhesive can be used with many substrates, including a wide range of plastics. (In its common use with all substrates, low surface energy polymers like PTFE or polypropylene are not readily bondable with light curing adhesives. Fabricates may be surface treated in order to improve wettability and therefore adhesion, and so obtain adequate bond strength. Also, the technology has been adapted to rubber or silicone, so if possible, choose other substrates in your design.

• Bondline design

While the adhesive can gap filling or can work into tight bondlines, optimal bondline thickness is on the order of 0.125mm. With the correct viscosity choice, the adhesive can be very forgiving to toler-

ance variations in the fit of the parts. This can save money by being able to specify less accurate mould tools than if the assembly were designed to be formed and mated in press fit.

• Light transmission

The wavelength of light used is absolutely critical to the curing of the adhesive. The light must reach the adhesive in the correct wavelength in order to cure. Light must reach the adhesive in the correct wavelength, the light must not penetrate into undesirable areas by itself. This means that most suitable applications are where at least one of the substrates is transparent into desirable areas by itself. This means that most suitable applications are where at least one of the substrates is transparent into desirable areas by itself. This means that most suitable applications are where at least one of the substrates is transparent into desirable areas by itself.

There are many process applications in industries like electronics, automotive, medical devices, electronic displays, optics, glass and appliances - and all manner of plastic based assemblies. The technology brings with it inherent productivity gains which can save money and increase competitiveness.

Peter Swanson, MD (Central) is managing director of Intertronics

High performance UV curing system saves power

The Phoenix family is a high performance all-cured UV LED curing system now available from Intertronics as part of its LED adhesives and curing range. The Phoenix family is a range of compact solid state UV devices that provide high power output - in the 40Watt to 100Watt range with approximately 80% power and low heat-up compared with mercury based lamps. They are built as off-line using advantages of their compact, rugged and adherent to substrates, as well as medical device and other high technology manufacturing.

Peter Swanson, MD at Intertronics explained: "The Phoenix family is probably the most powerful of its type in the industry and offers both greater controllability and lower power usage than mercury arc lamp systems.

Given their small footprint and air cooling they are exceptionally easy to engineer into relevant equipment and very to control by an industry standard PLC interface."

The family LED system features compact and its smaller operating temperature makes it possible to use on heat sensitive substrates with the added benefit that no ozone is produced in its operation and it is mercury free.

Swanson again: "These UV cure units complement our range of UV curable adhesives and coatings which feature full cure curements. These materials have been a great success in applications in recent years because of their many advantages, forming high strength environmentally resistant bonds on materials as diverse as plastic, metal, glass, electronic equipment and medical devices." "Consequently we consider the Phoenix range as a significant enabler in helping manufacturers to implement their curing as a wide spectrum of assembly processes, from small scale PCB to large scale production lamp devices."



Light curing adhesive about water type of plastic



Curing lamp based on LEDs are becoming more popular

www.intertronics.co.uk

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