



IN THE SPOTLIGHT – Adhesive Bonding 101

WHAT'S NEW –

- The Difference is Clear – Loctite® Ultra-Clear Two-Part Silicones
- Faster, Stronger, Better – Loctite® Two-Part Silicones
- Loctite® Fast Cure 5452™ Thread Sealant

FOCUSED ARTICLE –

- Advancements in Light Cure Adhesive Technology for Medical Device Assembly
- Halogen-Free Bonding Solutions for Portable Electronic Devices

FEATURED PROMOTIONS – useloctite.com and LoctiteJobDone.com

FEATURED EQUIPMENT – The Loctite® Rotary Dispense System

IN THE SPOTLIGHT

Adhesive Bonding 101

Design and manufacturing engineers have many options when it comes to fastening methods. These options include mechanical fasteners such as nuts and bolts, tapes, welding and adhesives. Adhesive bonding is the fastest growing method for product assembly in many industries because it offers significant advantages over conventional fastening methods. The advantages include reduction of weight, bonding dissimilar materials, evenly distributing stress, sealing under pressure and improved appearance.

Adhesives are used in an extensive range of applications; therefore, there are many types of product chemistries available to suit a variety of product and process needs. Choosing the proper adhesive for an application can be a daunting task, especially when coupled with choosing the optimal substrate. As the worldwide leader in adhesive technology bonding, Henkel has devoted many resources and thousands of hours to evaluating the strength of adhesives on a wide variety of materials. This allows design engineers in search of the most appropriate substrate and adhesive combination to spend less time screening adhesive candidates, and more time focusing on introducing their product to the market faster and more efficiently.

Three comprehensive design guides created by Henkel present a detailed synopsis of the bondability of a variety of plastics, metals, rubber and thermoplastic elastomers. The Design Guide for Bonding Plastics and The Design Guide for Bonding Rubber and Thermoplastic Elastomers present bond strengths of a variety of adhesives. Henkel has evaluated 30 and 26 of the most common types of plastics and rubber or thermoplastics elastomers, respectively. The effects of surface treatments, common modifiers and fillers on the adhesion strength of various chemistries were also evaluated. In addition to adhesive performance, these bonding guides provide a brief overview of each chemistry as well as adhesive joint design principles that should be considered in the design stages of part development in order to increase the overall integrity of the product.



The Design Guide for Bonding Metals presents the bond strength of 6 common types of metals and describes the effects of environmental conditioning, such as salt fog, condensing humidity and heat aging. Other testing on metals substrates includes the use of activators, heat curing parameters and hot strength curves.

Please visit these substrate guides to aid in the design and adhesive qualification process of your product. Other Henkel resources include various marketing design guides, detailed Technical Data Sheets, as well as knowledgeable technicians and engineers who are available to discuss your specific application.

WHAT'S NEW

The Difference is Clear

For potting and sealing applications where bond line aesthetics are critical, Henkel Corporation has introduced Loctite® Ultra-Clear Two-Part Silicones. These ultra-clear, fast curing, flexible silicones are well suited for bonding dissimilar substrates – especially glass – and maintain flexibility at both high and low temperatures (-60 to 450°F/-51 to 232°C, continuous).

Loctite® 5620™ is a fast-curing silicone that cures in 30 minutes at room temperature. Loctite® 5623™ is a tack-free, tough silicone gel that cures in 24 hours at room temperature or in just one hour at 100°C (212°F). Loctite® 5625™ is a soft, re-enterable gel silicone that allows for repair of potted components and cures in 24 hours at room temperature or in one hour at 100°C (212°F). All three products can be manually or pneumatically dispensed.

Resistant to high joint movement, vibration, shock and/or frequent thermal expansion, these two-part formulations provide consistent, uncomplicated mixing, with simple 1:1 mix ratios.

Features & Benefits

- Ultra-clear appearance
- Fast curing formulation
- Re-enterable formulation
- Tack-free formulation
- Excellent temperature resistance
- Low viscosity
- Extremely low shrinkage

For more information on Loctite® Ultra-Clear Two-Part Silicones visit www.supersilicones.com

Faster, Stronger, Better

Loctite® has developed a new breed of high-strength, rapid curing silicones. No longer is there the need to choose between a bonding adhesive and a flexible sealant. Loctite® two-part silicones provide you the performance advantages of both.

These next generation silicones have greatly expanded the types of bonding applications suitable for silicone technology. Offering tensile strengths to 300 psi, these adhesives build strength rapidly and reliably support heavy components such as windows, skylights, solar panels, oven doors, and outdoor lights and displays.

Six unique formulations allow you to choose the appropriate fixture time – from 5 to 50 minutes – for either manual or automated assembly application. These rapid fixture times can eliminate the need for work-in-process inventories.

These non-corrosive Loctite® Two-Part Silicones resist temperatures up to 230°C (446°F), cure through large gaps and enclosed bond lines, require no primers and offer low odor dispensing. With elongations as great as 240%, these highly flexible materials withstand extreme vibration, flexing and thermal shock. They are designed to resist UV rays, water, outdoor temperature variations and most cleaning solutions. These two-part formulations provide consistent, uncomplicated mixing, with simple 2:1 and 4:1 mix ratios.

Features & Benefits

- High strength
- Variable fixture times
- Excellent temperature/environmental resistance
- Exceptional flexibility
- Primerless adhesion
- Large gap fill and depth of cure
- Extended shelf life

To find out more, go to www.supersilicones.com



What's New (cont'd.)

Loctite® Fast Cure 5452™ Thread Sealant

Loctite® Fast Cure 5452™ Thread Sealant is ideal for sealing the fine threads of hydraulic and pneumatic connectors. Like other Loctite® brand anaerobic sealants, this product seals and secures metal pipes and fittings, filling the space between the threads and curing to eliminate leak paths. The thixotropic nature of 5452™ is suitable for large diameter pipes and will seal on mating surfaces of flare style fittings – filling scratches and surface imperfections. This product is also useful with dry seal fittings, such as O-ring boss style connectors, by preventing the rotation that ultimately leads to leakage. After assembly, this product cures considerably faster than traditional anaerobic thread sealants. It does not contain any filler or particles that could contaminate system fluids, foul valves, or clog fine filters and screens.



Features & Benefits

- Hydraulic and pneumatic fittings
- Dry seal fittings or O-ring boss style connectors
- Large diameter pipes
- Flare style fittings

For additional information visit www.henkelna.com/industrial

FOCUSED ARTICLES

Advancements in Light Cure Adhesive Technology for Medical Device Assembly

Christine Salerni Marotta, Medical Market Development Manager for Henkel Corporation

Over the past four decades, the medical device market has experienced many changes in the types of devices produced, substrates chosen and sterilization requirements. In the early 1970s, devices such as syringes and surgical instruments were made of glass, rubber and metal, and were typically fastened, machined or molded to the appropriate configuration. The intricate and high performance medical device designs that evolved in the 1980s required different substrates and assembly methods. Due to growing concerns about contagious disease, single-use medical devices became the norm, a trend that forced engineers to evaluate engineering plastics such as acrylic, polycarbonate and PVC for their designs. Assembly was completed predominantly with room temperature curing cyanoacrylate, epoxy, polyurethane and silicones adhesives that were ideally suited for these early single use devices.

In the late 1980s, the adhesive industry introduced acrylic-based adhesives that cured or solidified on exposure to UV light, and UV light cure equipment became commercially available. By curing much faster, adhering to a wider variety of substrates and being easier to automate, this early UV technology offered distinct advantages over traditional room temperature curing adhesives. Over the last decade, additional light cure technologies have been introduced to assist medical device manufacturers with their assembly processes. Biocompatible light curing epoxies, cyanoacrylates and silicones, as well as acrylics that cure with pure visible light, are now available.

Recent Advancements in Light Cure Technology

High Wavelength Visible Light Cure Adhesives

The latest generation of light cure adhesives features new photoinitiators that react solely with light in the visible wavelengths that exceed 425 nm. These new adhesives cure in less than 10 seconds and are compatible with metals, glass and a wide array of plastics. They can be used on UV-blocking substrates and select colored materials, particularly translucent grades of purple, blue, grey and white. Currently available as point or spot sources, visible LED curing systems are predicted to have light output lives in excess of 10,000 hours and are typically built into solid-state housings that make them extremely durable and portable. This long life and durability translates to immediate and ongoing cost savings. These systems take up less space than UV cure equipment and are easy to automate. Safety is perhaps the most significant benefit afforded by higher wavelength visible light cure systems. With visible light output, UV-related system shielding and operator protective equipment can be minimized or eliminated. While safety glasses are often still recommended to protect from the brightness of the visible light sources, visible light systems do not require heat protective equipment or costly ventilation systems to protect from infrared and ozone.

Light and Moisture Curing Silicone Adhesives

Room temperature vulcanizing (RTV) silicone adhesives and sealants have long been the choice for medical device manufacturers using silicone substrates or with applications requiring extremely flexible bond lines. RTV silicones are available in a wide variety of formulas that offer various viscosities, cure times, durometers and appearances (from clear and colorless to opaque and colored). In an effort to reduce the cure time of traditional RTV silicone adhesives, light curing silicones and light/moisture curing silicones have been developed that offer significant benefits to

Focused Article (cont'd.)

device manufacturers. Both of these categories of silicone adhesives maintain high adhesion to silicone substrates and offer significant flexibility while delivering cure times of approximately 60 seconds. As neither technology contains corrosive by-products, they do not require ventilation to dissipate any residues or strong odors. The silicones are tested to and meet strict ISO-10993 biocompatibility requirements.

Flexible Light Curing Acrylic Adhesives

Traditional UV/visible light cure acrylic adhesives are available with a wide range of physical properties – from rigid, high modulus polymers to materials offering moderate flexibility. These traditional light cure adhesives are often selected due to their high strength bond to a wide range of plastics, metals and elastomers. However, assembly applications requiring high adhesion and high levels of flexibility presented problems for UV/V technology. Recent advancements in formulating UV/visible acrylic adhesives have resulted in extremely flexible acrylic-based polymers. With hardness values on the Shore A scale and elongations greater than 100%, these flexible light cure acrylics are ideally suited for medical device applications that undergo extreme flexing and bending. They are also an excellent choice when substrates with varying coefficients-of-thermal-expansion (CTE) are being joined and must undergo thermal cycling. Flexible light curing acrylics cure on exposure to low-to-moderate UV/visible light sources and will fluoresce under black light for inspection purposes. Because they are acrylic-based, their high adhesion to a wide variety of materials is a key advantage over silicone adhesives.

Conclusion and Coming Attractions

Light cure technology continues to be the fastest growing adhesive category selected by medical device manufacturers worldwide. With its rapid cure and wide product offering, there is a category and product to suit most device applications. Recent advancements –including high wavelength visible acrylics, light and light/moisture curing silicones, and flexible acrylics – have further broadened the applicability of light cure adhesive technology for medical device assembly challenges.

New product development of both adhesives and associated cure systems is ongoing. New versions of LED-based spot curing units are on the horizon, offering high intensity output in 365 nm, 405 nm and >450 nm wavelengths. Wider area LED curing systems, which are expected to hit the marketplace in mid-to-late 2009, offer cure areas of approximately four square inches. Adhesive development continues as well with alternate fluorescent agents for pre- and post-cure adhesive detection, additional high wavelength visible curing adhesives and light curing epoxies that meet ISO-10993 biocompatibility requirements.

Halogen-Free Bonding Solutions for Portable Electronic Devices

In applications ranging from networking & computer equipment and mobile phones, to industrial and household machine controls, industry initiatives and legislation aimed at protecting the environment are driving the new offerings of alternative “halogen-free” products. While halogens do not cause harm to humans or the environment in the form contained in electronic devices, the irresponsible disposal or recycling of electronic waste (electronic devices after or at the end of their service life) containing the halogenated material creates environmental and safety concerns.



The halogens are five non-metallic elements found in Group VII of the periodic table: Fluorine, Chlorine, Bromine, Iodine, and Astatine. Brominated flame retardant (BFR) and polyvinyl chloride (PVC) materials used in PCB laminates, component mold compounds, cable insulations / jackets, connectors and other plastic parts are some of the major sources of halogens in electronic devices and assemblies. Some of the adhesive used in assembly of these devices can also contain halogenated base materials and add to overall halogen levels of the device.

The International Electrochemical Commission (IEC) defines halogen-free based on chlorine and bromine levels in ppm or parts per million: less than 900 ppm each of Bromine and Chlorine and less than 1500 ppm of total halogen contents. IPC – a global industry association – is also finalizing a draft standard defining halogen levels for electrical and electronic devices.

Adhesives in Portable Electronic Devices

Adhesives play an important role in assembly of portable electronic devices such as laptop computers, mobile phones and hard disk drives. As in many other industries, designers and manufacturers of these devices are turning to structural and engineering adhesives to join metal and plastic parts instead of using traditional fastening methods such as rivets, screws, brazing / welding etc. There are a number of reasons for doing so, including improved product performance, improved aesthetics, reduced overall assembly time and lower production costs.



Consider this: Metals such as aluminum, magnesium, stainless steel; plastics including polycarbonate, ABS, Ixef; glass and rubber are commonly used substrates in portable / mobile devices. The variety of materials used in these devices makes adhesive bonding an ideal assembly method – unlike welding, brazing or other thermal joining methods, adhesives can join a variety of dissimilar substrates. This allows designers to use a variety of materials that can increase both the visual appeal and functional strength of the assembly. Adhesives also offer significant cost savings compared with these joining methods.

Focused Article (cont'd.)

Small form factor and aesthetic appearance are very important design considerations in the portable electronics and this limits the use of mechanical assembly methods, such as threaded fasteners.

Adhesives allow smaller, lighter and thinner assemblies. Adhesives allow manufacturers to build thinner and compact enclosures around the electronic assembly, instead of using heavy fasteners to accomplish the same task. A structural adhesive is compliant when dispensed and fills gaps (small and large) across the mating parts and cures to a strong, rigid bond when cured thereby maintaining the structural integrity of the device.

Since adhesives are applied inside the joint, they are invisible within the assembly, resulting in a more cosmetically appealing product. Furthermore, adhesives bond and seal – filling the gaps between mating parts and distribute the load evenly over the bonded area resulting in a stronger joint. Adhesives can be integrated in the automation systems resulting in higher productivity benefits.

These considerations have made adhesives an increasingly preferred method of assembling parts in portable electronic devices. In a mobile phone, for example: structural and light cure adhesives are used to bond the glass display window to the casing or housing – typically made plastics; the exterior case itself has combination of metal and plastic parts – for protection and decoration – bonded with structural adhesives; the keypad is bonded with light cure acrylic and instant adhesives; and other components such as camera lens, switches, ports, microphones and speakers, nameplates and decorative parts and the battery compartment are bonded with a variety of adhesives. Additionally many adhesives are used to assemble parts on the printed circuit board itself.

Light, strong, reliable, and environmentally responsible: With Halogen-Free Adhesives

Adhesives used assembly of mobile electronics need to meet several demanding challenges:

- Performance – the adhesives need to offer excellent strength on variety of substrates with generally very small, thin bondlines
- Durability – portable devices are subjected to shocks, impacts, bending, humidity and thermal variations and adhesives used need to resist these forces
- Speed – most of the electronic devices are mass produced and adhesives should not create a bottleneck in the process
- Low outgassing – adhesives used in electronic devices need to have lowest possible outgassing as to not affect the transparent parts and sensitive electronic parts

Trend driving minimization of halogen contents in electronic devices has also raised the need for halogen-free adhesive formulations. Responding to these needs, Henkel has introduced a new line of Loctite® adhesives and sealants that meet the halogen free requirements per IEC #61249-2-21. Used primarily in handheld electronics such as cell phones, PDAs, notebook/laptop computers and hard disk drives, these adhesives are formulated to contain less than 900 ppm bromine and chlorine, and 1500 ppm total halogens. Often halogen levels in these products are undetectable.

The full line of Loctite® halogen-free adhesives includes more than 30 products in a range of technologies including cyanoacrylates, light cure cyanoacrylates, epoxies, urethanes, light cure acrylics, silicones, hot melts, two-part acrylics and anaerobics. For more information on Loctite® halogen-free adhesives, visit the company's website at www.loctitehf.com.

FEATURED PROMOTIONS

useloctite.com

Your guide to reducing downtime and extending equipment life



LoctiteJobDone.com

The Ultimate Garage Contest and Loctite's Premiere Social Community

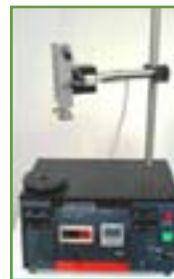


FEATURED EQUIPMENT

The Loctite® Rotary Dispense System is used for dispensing adhesives onto a customer's part in a circular or arc pattern. It is a fully integrated system that will control a syringe system, cartridge or dispense valve (no separate valve controller is required). Internally synchronized operation of an advancing slide, turntable and dispense timer makes for easy and repetitive placement of the adhesive. The set-up is simple, using only a timer and motor speed adjustment (no complex programming).

Product Features

- Integrated solution – plug and play with Loctite® valves, reservoirs and syringe systems.
- Precision digital timers with accuracy to 0.01 second.
- Turntable RPM control with digital read-out tachometer.
- Advancing slide stroke adjustment of 0" to 2".
- Adjustable height, position and angle of dispense point.
- Dispense valve and syringe mounting hardware available.
- Rugged, all-metal enclosure.
- Adhesive reservoir low-level detection with direct interface to Loctite® Bond-A-Matic® reservoirs and visual indicator light.
- Adjustable speed controls for advancing slide and turntable.
- Part position sensing allows orientation of adhesive bead start and end.
- Manual mode for easy valve priming.
- Turntable has threaded mounting holes for attachment of part fixtures.
- Operator lock-out panel for supervisory control of settings.



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\$2,495.00	1 Business Day	1176443
Visit http://equipment.loctite.com		

ENGAGE OUR SERVICES

Loctite® offers line surveying and cost benefit analysis for clients on-site as well as on-site training around our technologies.

QUICK TIP

Just nine drops of Superglue were sufficient to qualify for a new Guinness World Record™ as the strongest glue in the world! What was the weight of the car that the Superglue held? (see last page for answer)

- A. 1000 pounds
- B. 1 ton
- C. 3 tons
- D. 5 tons

NEW LITERATURE (SUMMER 2009)

2009 Adhesive Sourcebook

(LT-3355) Your source for Loctite® products for design, assembly, manufacturing and maintenance. To view click here.

Loctite® High-Strength Flexible Bonding Silicones

(LT-5258) Loctite® has developed a new breed of high-strength, rapid curing silicones. To view click here.

Loctite® High-Performance Light Cure Silicones

(LT-5339) Ideal for potting, encapsulating, bonding and gasketing, these flexible, solvent-free, one-part silicones cure tack-free in seconds with either ultraviolet UV or high-power visible light sources. To view click here.

Loctite® Elastomeric Adhesives and Sealants

(LT-5146) Elastomeric adhesives and sealants are the newest Loctite® product line. To view click here.

Loctite® Halogen Free Bonding & Sealing Solutions

(LT-5346) Applications ranging from networking/computer equipment and mobile phones to industrial and household machine controls, industry initiatives and legislation aimed at protecting the environment are driving the new offerings of alternative “halogen-free” products. To view click here.

Wind Energy Solutions, Adhesives, Sealants, Surface Treatments & Specialty Chemicals

(LT-5469) As the wind energy market continues to grow at a breathtaking pace, Henkel is ready to support you with our many proven manufacturing and maintenance solutions provided under leading brands, such as Loctite®, Frekote®, Teroson®, Bonderite® and P3®. To view click here.

To order literature, e-mail us at literature.marcom@us.henkel.com or call (888) 427-3676.

UPCOMING EVENTS

Assembly Technology Expo

September 22-24, 2009
 Booth #115
 Donald E. Stephens Convention Center
 Rosemont, IL

COMMUNITY ENGAGEMENT/SUSTAINABILITY

Team Building with a Twist in San Diego

When a group of regional managers in Henkel’s ASL (Loctite®) division were planning their latest sales meeting, they decided to do something a little out of the ordinary for their team building session. Rather than plan a traditional activity like golf, they decided to pitch in and volunteer at the Ronald McDonald House of San Diego.



“We thought it would be a good idea to do something for others rather than ourselves,” said John DaVirro, Region 5 manager, who planned the activity along with fellow regional managers Alphonso Garcia and Mike Fausett. The Ronald McDonald House provides a home away from home for children and their families while the children are being treated for serious illnesses at San Diego hospitals.

On February 12, a group of 30 enthusiastic Henkel volunteers arrived at the Ronald McDonald house and spent half a day helping out with various tasks. The volunteers helped pack up holiday decorations and put them into storage, baked cookies for that evening’s meal, washed the home’s cars, and delivered gift bags to the staff at local hospitals who are instrumental in working with the Ronald McDonald House.

In addition to their volunteer time, the Henkel group also made a donation to the Ronald McDonald House. At the suggestion of the staff, Henkel donated gift bags for the parents that contained soaps, shampoos, writing journals, books and little “extras” to help make their stay more pleasant.

All the volunteers were enriched by the experience, and several employees who spoke Spanish were able to communicate with the Spanish-speaking families staying at the house. The group agreed that the day was a satisfying and worthwhile team building activity!

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Quick Tip Answer
 D. 5 tons



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