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Adhesive Suppliers Stick Closely to Changes in Medical Devices

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As the array of materials used in medical devices has grown, the available adhesive options have likewise expanded.

Frank Vinluan



This flexible tubing was bonded with a Henkel cyanoacrylate adhesive developed to offer flexibility, rapid fixture, and high bond strength.

Years ago, medical device makers had few choices when selecting adhesives for their medical devices. Adhesive companies focused on making large batches of off-the-shelf product, recalls Mark Conway, executive vice president, sales and technical, at Batavia, IL-based [Cyberbond](#). But as the array of materials used in medical devices grows, the available adhesive options have likewise expanded. OEMs can now choose from an array of adhesives suited to the materials in a device and the device's medical application.

[See Cyberbond \(booth #948\), Henkel Corp. \(booth #656\) and other suppliers of medical adhesives at the MD&M East expo, June 14–16, 2016, in New York City.](#)

Cyberbond's adhesives are typically used in disposable medical devices, such as catheters, tubing, and stopcocks. Adhesive selection typically starts with fact-finding as the medical device maker lists specifications, such as viscosity, heat resistance, chemical resistance, the substrates that will be bonded, and how the adhesive will be cured, said Jonathon Smith, a medical device assembly specialist at Cyberbond. Based on that information, the company determines which adhesive technologies best address the requirements. Cyberbond's core adhesive technologies are UV or LED-cured adhesives, cyanoacrylates, and epoxies.



The CL-25 is a Henkel LED curing system that offers long life, high output for rapid curing, multiple wavelengths to ensure maximum adhesive performance, and various configurations for a broad range of applications.

Similar to Cyberbond, Dusseldorf, Germany-based [Henkel Corp.](#) supplies adhesives used in disposable devices such as hypodermic needles, respiratory products, and catheters. In nondisposable devices, the company's adhesives are found in endoscopes, surgical instruments, and prosthetics, said Jason Spencer, business director, industrial assembly, medical devices. As device manufacturers select adhesives, Spencer said OEMs are looking for adhesives that are regulatory compliant, environmentally safe, single component, and have a long shelf life. OEMs are also looking for adhesives that cure quickly. Fast-curing adhesives allow manufacturers to improve their yields and cycle times, Spencer explained.

The technologies medical device makers request from Henkel include light cure acrylics, cyanoacrylates, and epoxies. Light cure adhesives offer high bond strength to a variety of substrates, cure on demand, and are most often used in medical devices where at least one of the materials is transparent, Spencer said. Fast-cure and high strength cyanoacrylates can be used to bond dissimilar materials and hard to bond substrates. To address the requirements of flexible medical devices, Henkel has developed flexible versions of cyanoacrylates to offer both increased strength and leak resistance.

Reusable devices can be challenging due to repeatable sterilization methods, Spencer said. Also, some OEMs struggle with difficult-to-bond materials, such as polypropylene, polyethylene, and polytetrafluoroethylene. For these materials, Henkel has developed surface primers used with instant adhesives to increase bond strength. Henkel stocks a wide range of

adhesives for medical device assembly, but the company develops custom adhesives as necessary.

Sometimes OEMs adjust their device designs without realizing the impact those changes have on their adhesive options. For example, a device maker may change the plastic used for the device, which in turn changes the adhesive best suited to the application, Cyberbond's Conway said. If OEMs want something in particular from an adhesive, he urges them to ask rather than settling for an off-the-shelf product. As much as 70% of Cyberbond's business is custom. These customized adhesives aren't new polymers or new chemistry, Smith said. As OEMs change the plastics they use or the requirements of their devices, Cyberbond modifies existing ingredients to customize the adhesive to the requirements of a particular medical device. Smith said Cyberbond can typically turn around a customized formulation within a week to 10 days.

Adhesives also play an important role in the electronics used in devices such as echocardiograms, transcutaneous electrical nerve stimulation units, and defibrillators. The electrode pads used in these medical electronics products are disposable, but they consist of layers that sandwich conductive and adhesive materials together, explained Todd Williams, director of global product management for Henkel Electronic Materials. With better diagnostic equipment available to clinicians and the disposable nature of the pads, Williams said hospitals are performing more tests using this equipment.

"A lot of the drivers for that market are higher sensitivity, better shelf life, more environmentally friendly packaging materials, and, of course, everything is always driven by the dollar—making things cheaper and cheaper," he said.

Adhesives figure into applications such as diabetes test strips, which basically function as electronic circuits. But adhesives are playing a growing role in wearable devices, whether the product is worn on the wrist, like a smart watch, or as a garment. Monitoring devices worn like a shirt while a patient is exercising, sleeping, or going about their day employ adhesives that affix flexible electronics to the fabric, Williams said.

Inside of a medical device, adhesives' role includes bonding electronic components to a circuit board. As devices get smaller, that task gets more difficult. Smaller sizes compound challenges such as thermal conductivity, thermal mismatch and conduction, and the overall compatibility of the adhesive with the other electrical components on the circuit board, Williams said. Henkel responds to those challenges through customization, adjusting the chemistry of the adhesive as necessary. Other factors that can affect adhesive selection include conductivity requirements, hermeticity of the device, and environmental exposure of the device when it is in use. If a part of the device will be in contact with the body or bodily fluids, Henkel can supply electronics adhesives that are biocompatible.

One way OEMs can make the adhesive-selection process more efficient is by bringing together crossfunctional vendors early in the design process for the medical device, Spencer said. Henkel works with device designers and manufacturers in the concept and feasibility phases of medical device design. The company also collaborates with plastics suppliers; the combined knowledge helps an OEM's early-stage design and development. Henkel has tested its adhesives on various substrates, which makes the recommendation and selection process more efficient and consequently shortens development times, Spencer said.

In some cases, the medical device company may make contradictory requests. For example, an OEM might ask for an adhesive that scores high in absolute strength but is also easy to repair quickly if necessary, Smith said. In other cases, an OEM might ask for an adhesive

resistant to both high heat and chemicals. Discussions with the customer narrow down what can be achieved with adhesive technology.

“The more forthcoming they are about the specifics of the application, the better we are able to help them,” Smith said.

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[images courtesy of HENKEL CORP.]