Reducing the Expense of Servicing Diaphragm Dispensing Valves

By Can La, Product Manager, Techcon Systems

An exponential increase in the availability and use of two-part epoxy adhesives is providing valuable benefits for a growing number of manufacturing applications. Often enabling

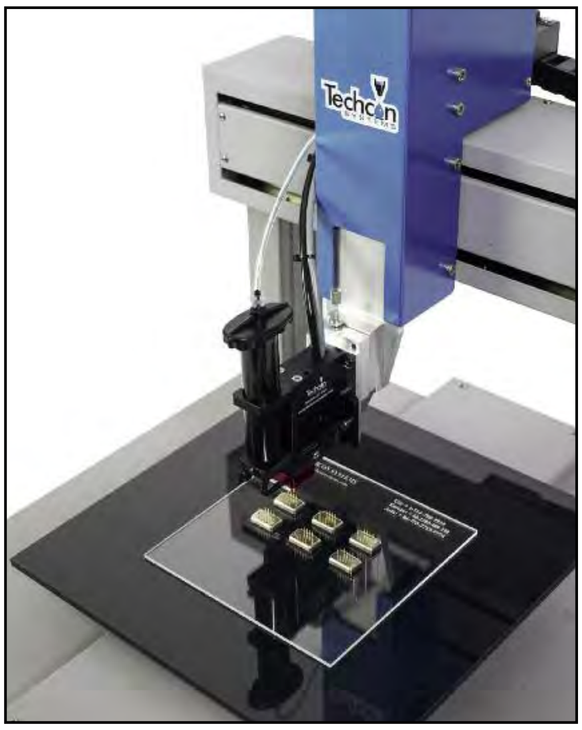
Techcon Systems DMP diaphragm valve.

significantly faster and more dependable bonding than conventional adhesives, two-part adhesives are able to create tight bonds between components with small surface areas, replace rivets or screws at lower weight and greater strength, and deliver a number of other substantial production throughput efficiencies.

However, the expanding use of two-part adhesives has also exposed an unfortunate gap in the existing product lines offered by manufacturers of automated dispensing valves. This deficiency has excluded many manufacturers from benefitting fully from the advantages of these materials. An advancement in dispensing systems, disposable materials path (DMP) technology, will enable nearly any manufacturer to take full advantage of the potential of two-part adhesives, as well as gain even greater benefits from materials such as cyanoacrylates and UV-curable resins.

Fast-curing Adhesives — a Double-Edged Sword

One of the most desirable properties of two-part adhesives is their rapid bonding speed. Indeed, many of these products advertise a working life of only a few minutes. But, what this also means in real world practice is that if production lines are unexpectedly stopped, even briefly, for any of a multitude of common reasons — from a need to clear a product collision to a technician taking a break — the immobile mixed epoxies can cure very quickly in the dispensing valve. This can destroy an expensive valve, or at least lead to the need for a repair costing several hundred dollars, not to mention the cost of the line downtime needed to remove, clean or replace the valve. Downtime can easily extend up to 30-60 minutes or more, and if sufficient replacement parts or standby repair resources are not immediately available, it can run into a loss of production of hours or days. Many operators justify shouldering the inventory carrying costs of several valves for this reason, or maintain the expense of an in-house or nearby repair infrastructure.



Robotic fluid dispensing system used for bonding applications.

It should also be noted that while most of these types of issues occur with two-part adhesives, there are also similar risks associated with cyanoacrylates and UV-curable resins. While, the-

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oretically, these materials are "always" protected from air, moisture and light by proper valve selection and proper workplace procedure, many operations find that, in the real world, a technician forgetting to put a cap on a valve after the shift can lead to a valve full of hardened adhesive in need of repair or replacement.

Risk and Expense in Routine Maintenance

Even during more routine circumstances, such as the end of each regular shift, operators must take the fast-curing properties of their dispensed materials into account when developing standard maintenance procedures.

For example, in many operations, immediately upon scheduled stoppage of the line between shifts, technicians must quickly perform a flush of every dispensing nozzle to remove residual adhesive and ensure that it does not have a chance to harden.

This procedure can be especially risky for production lines that have numerous valves, or use particularly fast-curing materials. Sufficient manpower must be provided to ensure that the flushing of each valve can be completed within the brief working life of the material. Getting to a valve "a little too late" is not an uncommon scenario, and is another avenue that can create the need for the repair or the loss of a valve.

Along with the risk, the costs relating to these commonplace maintenance procedures can likewise be significant. Sufficient solvent for several rounds of flushing per day must be purchased and inventoried. Also, depending on the solvent used, proper disposal procedures must be followed — with the threat of regulatory issues and fines a possibility. Proper equipment, often a minimum of gloves and face masks, must be provided for each technician, and health and safety risks to personnel on the line and in adjacent areas are always a concern. And, there are the added expenses of technician training and labor, and the time it takes to conduct the flushing procedure itself, which eats into the productive manufacturing time of each shift.

The Hidden Cost of Avoiding Automation

In addition to all this, there is a hidden cost attributed to this current state of the dispensing industry, and while it doesn't show up on ledgers, it is nonetheless significant. Seeking to avoid the risk and expense of periodically losing valves to hardened material, thousands of manufacturers are continuing the use of manual dispensing processes long after the volume of their operation would otherwise dictate that they upgrade to automated dispensing systems. That is, instead of high-speed operations, many operators are using rows of technicians dispensing adhesives with a syringe and a foot pedal, incurring avoidable labor costs that can be considered significant even in areas that have lower labor costs. Furthermore, not only do speed and productivity suffer by this methodology, but so do quality and repeatability. The ability to maintain consistent size and placement of material beads is severely limited in a technician-dependent process.

Fortunately, these manufacturers will soon have little impediment to upgrading their dispensing operations to a fully automated solution. Thousands more will be able to significantly reduce the risks and the ongoing maintenance costs of their current dispensing operations.

Disposable Material Path Technology

At one time, operations dispensing high-viscosity materials of roughly 30,000-1,300,000cp, utilizing rotary (auger) dispensing valves, faced very similar problems to those outlined above, but, for most rotary valve users, this situation has long been a thing of the past.

A solution to these difficulties is a patented micro-valve technology developed by Techcon Systems, an OK International company that specializes in the production of precision liquid dispensing equipment. The company reimagined rotary dispensing valves and created a highly effective valve with a low-cost wetted path insert that is removable, disposable and replaceable, in a matter of seconds. Thousands of these valves have been proven in use, forever changing the economics of dispensing for many operations.

A significant investment in R&D allowed the company to create a similar solution for operations that use low-to-medium-viscosity materials of 1-50,000cp and are dispensed using diaphragm valves. The disposable material path (DMP) diaphragm valve has helped thousands of operations to reduce their dispensing costs, and has helped many more to take advantage of automated dispensing of low-viscosity two-part adhesives without fear of damage to costly equipment.

In operation, the DMP diaphragm valve operates similarly to standard top-of-the-line diaphragm valves. Air pressure forced through the air inlet port drives a piston assembly back, opening the material path and allowing fluid to flow from the material inlet to its outlet. Relieving the input air pressure allows the piston return spring to close the diaphragm, ensuring fast cut-off of fluid and the dispensing of an accurate, repeatable bead — down to 0.002ml in size. Also, an external stroke control adjuster makes it easy to fine-tune bead sizes with a high degree of precision.

However, in the design of the material path, similarities between the DMP valve and standard diaphragm valves end. The wetted parts of the DMP valve are designed to be self-contained, easily removable and disposable. Manufactured from black, high-density polyethylene, these durable inserts provide long life, are compatible with a wide range of chemicals, and cost only a few dollars each. They can be

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Futuristic Trends in Battery Charging Technology

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oped a charging method powered by rubbing two pieces of material together. One piece is metal and the other is a specially developed plastic. Both are coated with nanoparticles to increase the surface area and create more friction. The resulting material can be worn in clothing or shoes and generates electricity without any additional effort beyond normal movement.

Friction charging has tremendous implications for the real world. The everyday actions of interacting with our devices — swiping, clicking and scrolling — could potentially be harnessed to charge the battery. The friction of the device rubbing against our clothing in a pocket or purse could keep devices fully charged. Medical implants would have permanently charged batteries from the normal motions of daily life.

Tribostatic charging, which is the term for building an electric charge through friction, is used in industrial applications such as painting. A negatively charged surface attracts positively charged paint molecules, resulting in a faster and more even coating when compared with traditional paint application. The same principle holds true for powder coatings such as dry lubricants.

Earlier this year, AMPware introduced a hand-cranked smartphone charger. About five minutes of cranking the foldout handle powers a phone for about an hour. The crank is built into a special case, which makes it convenient to carry and use.

The AMPYMove uses the motion of daily activity to generate electricity that is stored for later device charging. The device is also a technically advanced fitness tracker with a built-in incentive system. The more one moves, the more energy is stored to power devices.

Our dependence on the devices we use every day is not about to change, but the technology we use to keep them powered is evolving rapidly. Epec works closely with technology leading companies, such as Texas Instruments (TI) and Linear Technologies, as they begin to develop the next generation of integrated circuits. Energy harvesting with breakthrough TI technology allows the development of systems that extract and manage nano power from a variety of sources, including solar, thermal-electric, electromagnetic, and vibration energy. From solar powered sensors for wireless monitoring of factories or farms to using body heat to power sensors on medical and fitness equipment, a complex ecosystem is now available to designers.

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accessed quickly by two Allen screws in the valve housing without removing the valve from the line. The estimated time to remove the old insert, replace it with a new one and be ready to restart the line is about 30-45 seconds.

Users can analyze their labor and maintenance costs and decide on an optimal cleaning schedule — choosing to continue to flush the valves each time, do so periodically or not at all — or instead, simply replace the inserts at the rate they prefer. This leads to significant cost savings on the purchase of solvent and its associated labor, equipment and disposal.

Even more valuable to most is the fact that the technology brings the risk of expensive damage to valves due to material hardening down to nothing.

With DMP technology, the worst-case scenario becomes the need to take less than a minute to replace an inexpensive part, as opposed to shutting down for hours to repair or replace a costly valve.

Can You Benefit?

DMP diaphragm valve technology, ubfortunately, is not for every user. While the valve is compatible with most commonly dispensed materials, users of particularly abrasive or caustic materials incompatible with polyethylene will need to continue to make do with conventional valves, which include metal or another appropriate wetted path. Techcon offers potential users a complimentary service for testing the compatibility of their dispensed material with a DMP valve. For those who are able to use it, the savings in materials and labor, and the potential boost in productivity are significant.

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