Dispensing of Abrasive Thermal Pastes and Adhesives

As in all applications, electronic components for e-mobility need to have smaller and more compact designs but with constantly increasing energy and power density. This trend demands precise temperature management to guarantee safe operation over the entire product life cycle.

In production of components for e-mobility, the thermal connection of electronic assemblies and also battery modules to the cooling element is crucial for dissipating the heat generated through the heat sink. This prevents overheating. Thermal pastes and adhesives with an increasingly high thermal conductivity are used here to eliminate the air gap. Until recently, standard thermal pastes only had thermal conductivity values of 0.8–2.0 W/mK. Thanks to a higher proportion of thermally conductive solid particles and special selection of particle size distributions and different filler types, values of up to 7–8 W/mK are now being achieved.

Most ceramic fillers, such as aluminum oxide or aluminum nitride, have very high thermal conductivity while simultaneously providing electrical insulation. However, because of their hardness – usually 9–10 on the Mohs scale – there are special requirements for the dosing technology in terms of wear and maintenance intervals. Wear cannot generally be prevented when dosing abrasive fluids. Nevertheless, precise selection of the most suitable system components – related to the relevant customer requirements – can significantly extend the product life of a dosing system.

The manufacturer of dosing technology and equipment Viscotec claims to have the perfect solution for handling highly abrasive materials, using special diamond coatings for the rotors in the dispensing pumps and offering an additional techni-

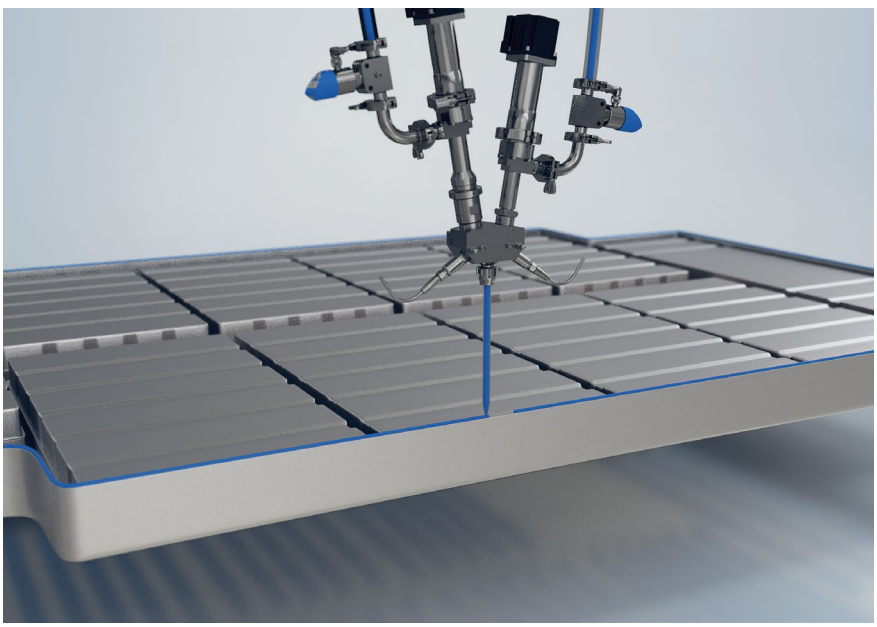

Figure 1 > Housing seal on a battery pack

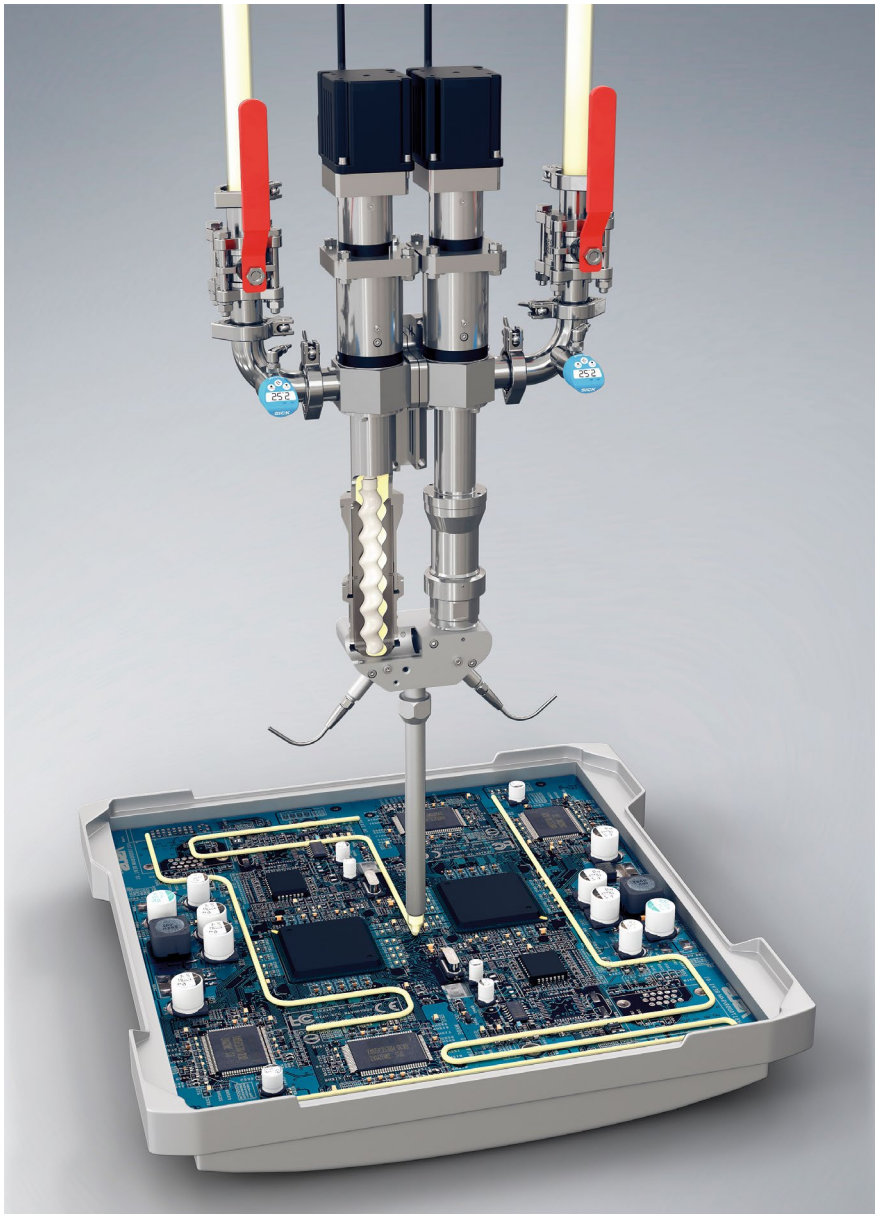

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Figure 2 > Dispensing of thermal paste in a control unit

cal all-ceramics rotor version. Numerous internal endurance tests and field tests in existing customer systems have demonstrated significant optimization. The special coating can double or even triple the service life of the core components. In particular, however, the most recent experience suggests that the ceramic rotor solution can extend the service life of the core components by between 3 and 6 times, depending on the material and process. According to Viscotec, these solutions enable the 'cost in use' to be significantly reduced, process reliability to be increased, and setup and downtimes to be kept to a minimum.

Example application – battery modules

To generate the necessary power from battery modules and battery packs, individual cells are combined into a module and electrically connected. One of the process steps for circular cells, for example, is the application of 1- or 2-component adhesive to the cell holders. By contrast, prismatic cells are stacked and can be stuck to one another or secured on component mountings. Thermally conductive materials are used in both cases. As well as thermal conductivity, these fluids have to meet other requirements in terms of robustness and impact resistance, in order to absorb vibrations, oscillations and production tolerances.

For batteries to function effectively and also retain their performance, it is essential to operate them in a particular temperature window. The heat generated during operation must be safely discharged: During the assembly process, heat-insulating air bridges in the form of gaps are therefore eliminated by the use of gap fillers. The gap filler materials used, known as TIMs (Thermal Interface Materials), are high filled 1- or 2-component fluids. They are generally characterized by a high content of largely abrasive solids in order to achieve the required thermal conductivity, over 3.0 W/mK in some cases. This makes considerable demands on the dispensing equipment.

Example application – housing seals

Another challenging application of dosing technology in the field of e-mobility is sealing the housing in battery systems (*Figure 1*) or control units (*Figure 2*). Moisture inside the system or device can cause damage due to corrosion and can significantly reduce the power or even completely destroy the system due to short circuits. Reliable sealing is therefore a must. The sealing material is applied directly to the housing or the cover. The generally high viscosity 1- or 2-component materials have to be applied completely evenly and with no gaps - especially on more complex structures. According to Viscotec, the solution for both of these example applications is continuous dosing that achieves excellent repeat accuracy and is gentle on the materials themselves - totally automated, easy to control and optimized for abrasive materials. This requires the individual components of the dosing system to be perfectly synchronized with one another and tailored to the specific application. //

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