Introduction
Effective thermal management is key to ensuring consistent performance and long term reliability of many electronic devices. With the wide variety of applications requiring thermal management, the need for alternative thermal material solutions and innovative material placement methods continues to grow. In response, Bergquist has developed a family of dispensable liquid polymer materials with unique characteristics especially designed for ultimate thermal management and component assembly flexibility.

Two-Part Gap Fillers
Bergquist two-part, cure-in-place materials are dispensed as a liquid onto the target surface. As the components are assembled, the material will wet-out to the adjacent surfaces, filling even the smallest gaps and air voids. Once cured, the material remains a flexible and soft elastomer, designed to assist in relieving coefficient of thermal expansion (CTE) mismatch stresses during thermal cycling. Gap Filler is ideally suited for applications where pads cannot perform adequately, can be used to replace grease or potting compounds and is currently used in power supply, telecom, digital, and automotive applications.

Liquid Gap Filler Key Performance Benefits

Ultra Low Modulus: Minimal Stress During Assembly
Because Gap Filler is dispensed and wet-out in its liquid state, the material will create virtually zero stress on components during the assembly process. Gap Filler can be used to interface even the most fragile and delicate devices.

Excellent Conformability to Intricate Geometries
Liquid Gap Filler materials are able to conform to intricate topographies, including multi-level surfaces. Due to its increased mobility prior to cure, Gap Filler can fill small air voids, crevices, and holes, reducing overall thermal resistance to the heat generating device.

Single Solution for Multiple Applications
Unlike pre-cured gap filling materials, the liquid approach offers infinite thickness options and eliminates the need for specific pad thicknesses or die-cut shapes for individual applications.

Efficient Material Usage
Manual or semi-automatic dispensing tools can be used to apply material directly to the target surface resulting in effective use of material with minimal waste. Further maximization of material usage can be achieved with implementation of automated dispensing equipment, which allows for precise material placement and reduces the application time of the material.

Customizable Flow Characteristics
Although Gap Fillers are designed to flow easily under minimal pressure, they are thixotropic in nature which helps the material remain in place after dispensing and prior to cure. Bergquist Gap Filler offerings include a range of rheological characteristics and can be tailored to meet customer specific flow requirements from self-leveling to highly thixotropic materials that maintain their form as dispersed.
**Frequently Asked Questions**

**Q:** How is viscosity measured?

**A:** Due to the thixotropic characteristics of most Gap Fillers, special consideration should be given to the test method(s) used to determine viscosity of these materials. Because the material viscosity is dependent on shear rate, different measurement equipment testing under varying shear rates will produce varied viscosity readings. When comparing apparent viscosities of multiple materials, it is important to ensure that the data was generated using the same test method and test conditions (therefore the same shear rate). Bergquist test methods and conditions are noted in the individual product data sheets.

**Q:** How are Pot Life and Cure Time Defined?

**A:** Two-part Gap Filler systems begin curing once the two components are mixed together. Bergquist defines the pot life (working life) of a two-part system as the time for the viscosity to double after parts A and B are mixed. Bergquist defines the cure time of a two-part material as the time to reach 90% cure after mixing. Two-part Gap Fillers will cure at room temperature (25°C), or cure time can be accelerated with exposure to elevated temperatures.

**Q:** Can I use my Gap Filler after the shelf life has expired?

**A:** Bergquist does not advocate using Gap Filler beyond the recommended shelf life and is unable to recertify material that has expired. In order to ensure timely use of product, Bergquist recommends a first-in-first-out (FIFO) inventory system.

**Q:** How should I store my Gap Filler?

**A:** Unless otherwise indicated on product data sheets, two-part Gap Fillers should be stored in the original sealed container in a climate controlled environment at or below 25°C and 50% Relative Humidity. If stored at reduced temperatures, materials should be placed at room temperature and allowed to stabilize prior to use. Unless otherwise noted, all cartridges and tubes should be stored in Bergquist defined packaging with the nozzle end down.

**Q:** Do temperature excursions above 25°C affect the shelf life?

**A:** Short periods of time above the recommended storage temperature, such as during shipping, have not been shown to affect the material characteristics.

**Q:** Does Gap Filler have adhesive characteristics?

**A:** Although Gap Fillers are not designed as structural adhesives, when cured, they have a low level of natural tack, which will allow the material to adhere mildly to adjacent components. This aids in keeping the material in the interface throughout repeated temperature cycling and eliminates pump-out from the interface.

**Q:** Is Gap Filler reworkable?

**A:** In many cases, Gap Filler can be reworked. The ease of rework is highly dependent on the topography of the application as well as the coverage area.

**Q:** What container sizes are available for Gap Fillers?

**A:** Two-part materials are available in several standard dual cartridge sizes including 50cc (25cc each of parts A and B) and 400cc (200 cc each of parts A and B). Gap fillers are also available in kits of 1200cc (two stand-alone 600cc containers, one of each part) and 10-gallon (two 5-gallon pails, one of each part) sizes for higher volume production. Other special and custom container sizes are available upon request.

**Q:** How do I mix the two-part Gap Fillers?

**A:** Disposable plastic static mixing nozzles are used to mix parts A and B together at the desired ratio. Static mixers can be attached to the ends of cartridges or mounted on automated dispensing equipment. They are reliable, accurate and inexpensive to replace after extended down times. Unless otherwise indicated, mixing nozzles with a minimum of 21 mixing elements are recommended to achieve proper mixing.

**Q:** What is the tolerance on the mix ratio?

**A:** Two-part materials should be mixed to the stated mix ratio by volume within a ±1-5% tolerance to ensure proper material characteristics. If light colored streaks or marbling are present in the material, there has been inadequate mixing. Bergquist recommends purging newly tapped containers through the static mixer until a uniform color is achieved. In order to ensure consistent material characteristics and performance, Bergquist two-part systems are to be used with matching part A and B lot numbers.

**Q:** What options are available for dispensing material onto my application?

**A:** Bergquist can provide manual or pneumatic applicator guns for product supplied in dual cartridge form. Gap Filler supplied in high volume container kits can be dispensed via automated dispensing equipment for high-speed in-line manufacturing. Bergquist has aligned with several experienced automated dispensing equipment vendors to further assist our customers in creating an optimized dispensing process. For information regarding dispensing equipment, contact your local Bergquist representative. For some materials, screen or stencil application may be an option and should be evaluated on a case by case basis.

**Q:** Should I be concerned about Gap Filler compatibility with other materials in my application?

**A:** Although not common, it is possible to encounter materials that can affect the cure of two-part Gap Fillers. A list of general categories of compounds that may inhibit the rate of cure or poison the curing catalyst in Gap Filler products is available to help assist with material compatibility evaluation. Please contact your local Bergquist representative for more details.

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27