Henkel Adhesive Technologies

APPLICATION
USE CASE

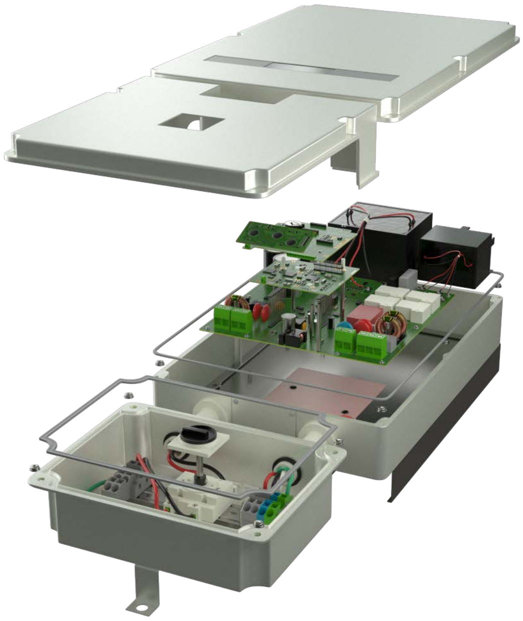
Thermal Management for Alternative Energy Conversion Systems

Market Situation

- The use of solar as an alternative energy source continues to grow globally, with ***system deployments increasing in nearly all geographies***.
- The solar array, which is comprised of the solar module, optimizer, and inverter, captures photovoltaic energy, optimizes the power efficiency generated by the solar panel, sends the direct current (DC) power to an inverter for conversion to alternative current (AC) power, and then to a battery storage system or the grid.
- Enhancing function and protecting every component is important for operation and system lifetime to ensure the dependable performance of all solar array elements.
- As the power conversion system, the inverter is particularly vital, and their use life requirement is long. By some estimates, solar inverters are ***expected to last for as long as 25 years***. (warranties of 10yr for residential systems)

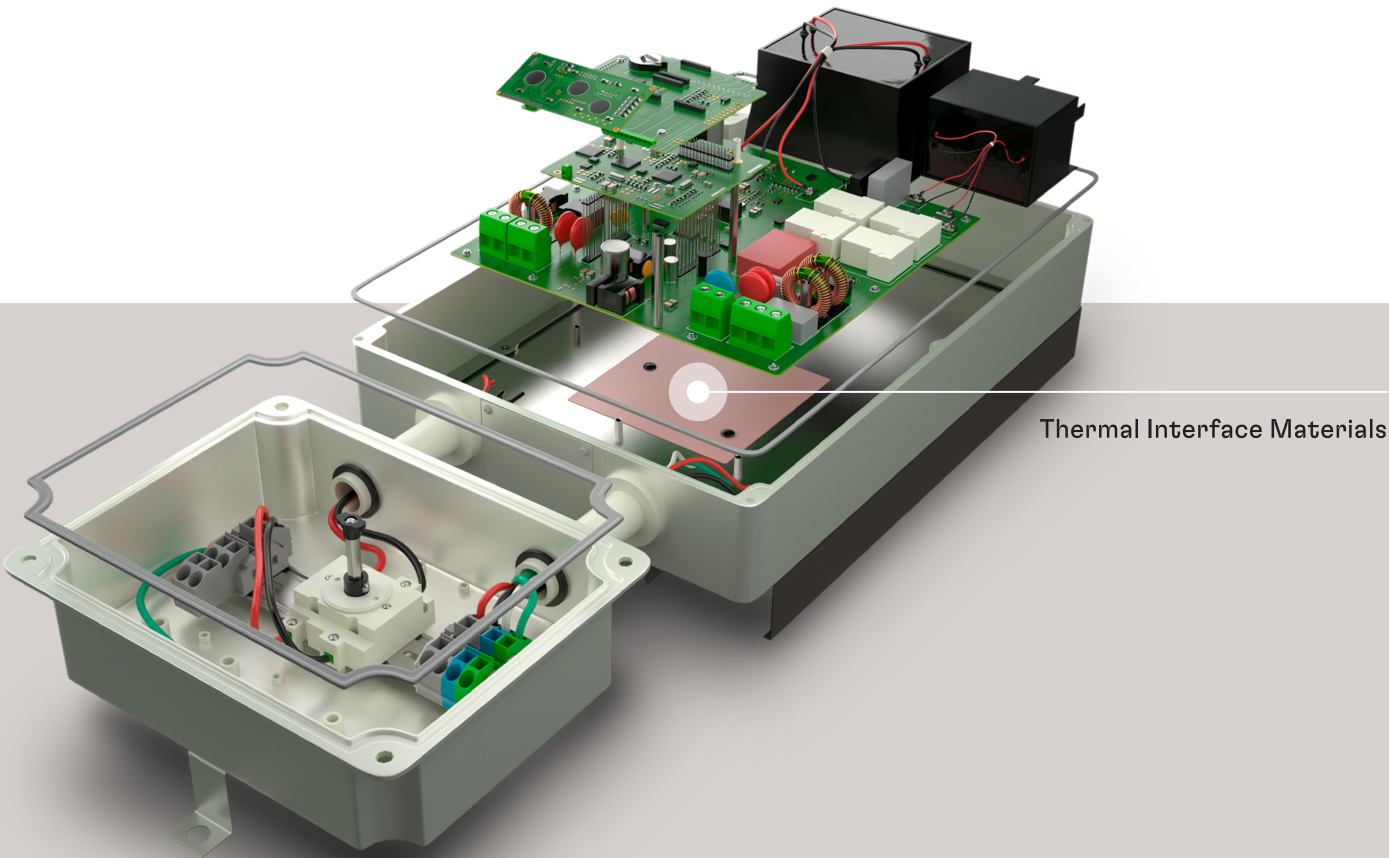
Application Challenges

- While the panels capture photovoltaic energy, the workhorse electronics inside the inverter convert and then deliver robust AC power.
- Positioned outdoors either near the solar panel itself or close to the power meter, inverters are often in locations that may not be easily serviceable and are exposed to weather variations.
- There are multiple inverter types and configurations: large central inverters that support Megawatt solar farms, string inverters that service a set of connected solar panels, and microinverters placed on every panel. Maximum ambient temperatures for each type of inverter vary but can range from 45°C to 60°C. In addition, environmental temperatures can add thermal stress from external heat – the electronics board temperatures can reach as high as 130°C.
- Securing performance and preventing system overheating through thermal management is essential to maximizing inverter function and lifetime.



Solutions

- Depending on the inverter type and design, various thermal interface materials (TIMs) may be used for robust heat dissipation, optimized function, and operational longevity of the inverter system.
- For large central inverters with hundreds of sizeable coils and components, a liquid gap filling TIM offers the most effective heat dissipating option. Henkel liquid gap fillers, which are also automation friendly for mass production scenarios, can conform to challenging and varied dimensions to effectively fill the interface to allow for thorough heat control.
- In other designs in which inverter part geometry and interface surface roughness are less extreme, GAP PAD thermal interface materials provide a proven solution. In addition to thermal management, GAP PAD materials can deliver electrical isolation that meets UL requirements, which is necessary for some high-voltage scenarios. These materials are also easy to integrate into manual operations and have a comparatively long storage life.
- In all cases, Henkel's expansive portfolio of pad, phase change and liquid gap filler TIMs offers multiple chemistry platforms, thermal conductivities, curing profiles, and viscosities (in the case of liquids), delivering application and process flexibility no matter the inverter type, power level, or environment.
- Qualified by numerous global power conversion leaders, Henkel TIMs enable the most advanced thermal control for inverter designs of all types.



Relevant Links

Explore more about the significance of power conversion technologies, energy storage reliability, and the pursuit of sustainability in the field of solar energy ***in this podcast session***.

Watch this video to discover material solutions that enable next generation solar power conversion systems.

Learn more about material solutions for alternative energy conversion and storage.

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