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# Adhesives Fast-Track Innovation in Solar Power Technology

Solar is one of the fastest-growing energy technologies in the world today, and for good reason. The fuel is “free,” and systems for converting and collecting solar energy get more efficient all the time. Installations are scalable to function in vast arrays, on individual rooftops, in community installations, and even in portable form for use in disaster recovery or other temporary applications. And because the sun delivers its energy across the entire globe, solar power does not depend on the complex supply chains – trucks, trains, and pipelines – that fossil fuels require.

Solar power is inherently “clean,” a concern that is driving both legislation and public opinion. It doesn't disrupt the land like extractive processes. It doesn't have to be transported, eliminating the possibility of spills. And it doesn't require burning, eliminating pollution and the costs of cleaning up emissions. Best of all, solar technology is growing more efficient and cost-effective with time; in some places it is now the low-cost option. This growth and evolution of the technology is great news for consumers, but along with opportunities presents challenges for developers of solar power systems.

## **The Market Challenge**

As in any growing technology, competition in the solar market can be fierce. Today's top-performing systems can be challenged tomorrow by newer offerings, so development has to be an ongoing process. New technologies have to be ever-more efficient, reliable, and cost-competitive. And to add to that pressure, offerings have to get to market as quickly as possible to stake a claim in the market space, to extend product life in the evolving market, and to maximize profit margins before competition turns an innovation into a commodity.

Solar draws on many fields for innovation – electronics, chemistry, materials, and more – but bringing multiple components together in a finished product depends increasingly on sealants and adhesives. And users are recognizing that the cost of solar installations doesn't end with the purchase of panels, but includes the cost of maintenance and of installation, which must be amortized over the life of the installation. Adhesives and sealants can impact these as well as costs of manufacturing.

## The Environment

There's no getting around the physical challenges facing a solar installation. By definition it takes place outdoors and, intentionally, in places where it will face maximum heat and radiation. But weather issues don't end there. In most locations, the system will face rain and moisture as well as seasonal changes in temperature. Depending on the location, even daily temperature swings can be significant. And like any power plant, a solar installation has to withstand all these extremes and still last for decades in order to amortize its initial cost.



The checklist for effective solar installations is a long one. In order to compete effectively with fossil fuels, solar has always been challenged to increase efficiency. That means new materials, and new materials typically require new assembly processes. Systems keep getting lighter which means that every component has to do more, while at the same time, modules have to be tough enough to withstand shipping, the rigors of handling and installation, and years of exposure. And, of course, cost is an ongoing issue, not just to compete with incumbent fuels like coal and gas but also to remain competitive with other solar options.

## How Adhesives Can Help

For manufacturers already using adhesives and sealants in the production of solar panels there are several issues to consider. First, are the adhesives and sealants currently being used the most effective choices or, as in so many high-tech areas, are there new and better option? Second, could the innovative use of adhesives and sealants open the door for new materials and technologies to improve the performance of solar panels? And

third, are there areas in which adhesives and sealants could replace other connective technologies to simplify assembly and increase reliability and longevity?

Today's solar panels are different from those of just a few years ago. Within panels, individual cells are being connected with adhesives and encapsulated with adhesive films for protection from the elements. Architecture is changing with the use of back contact cells. Double glass is being used to produce more robust modules and reduce degradation due to time and exposure to the elements. Modules are becoming lighter through use of thinner glass and lighter frame components. In some cases frames are being eliminated entirely through innovations in glass and sealing technology. Manufacturing is being streamlined with the replacement of solder by conductive adhesives. And structural adhesives are increasingly being used to simplify and speed up on-site installation of completed panels.

## The Right Tool

Taking advantage of adhesive technology can help throughout the solar value chain, from component development to module production to installation; but it isn't as simple as just replacing one technology with another. First, production methods have to change along with processes. This may actually help control costs as adhesive and sealant technologies will, in many cases, reduce labor requirements and extend product life. But both to evaluate the change and to implement it, you will need expertise along with the material.

Second, there are many adhesive and sealant technologies to choose from, often several that could suit a particular application. There probably isn't, however, a single ideal technology that will meet all your needs. There are many different adhesive/sealant technologies and many variations within each. Partnering with an experienced provider will help identify and fine-tune the right "tool" for each aspect of your design and production process. With potentially dozens of options for any single application, choosing the best option means balancing compatibility with materials to be joined, all aspects of processing – cure speed, real estate requirements, storage, cleanup, performance – and more, not to mention cost to find the ideal material for each application.



## The Right Partner

- In choosing partners, look for providers with a broad range of offerings. This will help ensure that you are getting “technology agnostic” advice based on your needs rather than the provider’s possibly-limited capabilities.
- Consider all aspects of any recommended solution, from material cost to process changes. Look at issues like shelf-life, storage, and mixing requirements.
- Consider the material’s field-proven capabilities; new can be good, but you want a solution that will last, and a 25-year product lifecycle is a long time.
- Check the provider’s experience; the best material is only as good as the provider’s ability to match your needs and support the necessary processes before, during, and after implementation.
- And make sure that you can count on both delivery and support when and where you need it. Material in a warehouse half-a-world away is useless, and a production line that is shut down waiting for support produces no revenue.

H.B. Fuller has been a leading provider of adhesives, sealants, and specialty chemicals for over a century and serves customers in engineering, electronic and assembly materials, hygiene, construction, automotive, packaging and other consumer businesses. With the purchase in 2014 of TONSAN Adhesive Inc., the company has become a major player in the market for solar products worldwide. With a global presence and broad range of products including hot melt, solvent based, water-based, urethane, epoxy, and other reactive chemistries, the company is ideally positioned to partner with manufacturers in the growing solar market.



For more information about our company, visit [www.hbfuller.com](http://www.hbfuller.com).



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