

Current Trends in Conformal Coatings

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Conformal coating materials, to an equipment manufacturer, are a vital ingredient to your success or failure on so many different levels. The marriage of material and the correct application equipment invariably dictates everything from process implementation, line efficiency, quality, and customer satisfaction. This drives chemical companies and equipment suppliers to a unique relationship in that new product or process development is often dictated by the capabilities of each other. For example, new chemistries are always in development and while performance properties, reworkability, and cure mechanisms all contribute to the marketability of a product, ease of application can often dictate how widely a material is accepted by consumers. Further, does the technology even exist to process a chemistry per its intended application? Similarly, equipment manufacturers work diligently with formulators to assure they have products to meet the demands of material trends throughout the industry.

One of the most prominent examples of this relationship occurred in the early 1990s as formulators began to heavily market solvent-free, higher viscosity coatings (>100cps). These materials could not be processed well with non-atomized film coaters, the prevalent technology of that era. This problem quickly turned to opportunity as dispensing companies started to invest in researching atomized application solutions. The atomized spray valve would subsequently fill this niche while also allowing formulators the opportunity to sell these products to a larger potential market of end users. In the end, equipment manufacturers, chemical formulators, and the customer all benefitted as they were able to access their preferred material and process the chemistry in the most efficient way possible. This type of win-win scenario is very indicative of the relationship shared by equipment fabricators and chemical formulators.

As equipment fabricators and material formulators need each other to be successful, each entity often finds themselves on the forefront of developing technology for the other. This provides valuable insight into new technology and global trends within the industry.

Oftentimes trends in material usage will follow not only what is the new technology of the time, but also the industries that are investing in new equipment, researching new materials, and using higher volumes of coating. As a result of various physical properties represented in each chemistry many coatings generally follow the industry they are serving. For instance, as the global automotive industry has

	Acrylic (AR)	Epoxy (ER)	Silicone (SR)	Urethane (UR)
Chemical Resistance	Good	Excellent	Good	Excellent
Moisture Resistance	Good	Fair	Excellent	Good
Temp. Resistance	150 C	150 C	200 C	150 C
Abrasion Resistance	Good	Excellent	Fair	Good
Rework Ease	Excellent	Poor	Good	Good

recovered during the past two years we have seen an increase in demand for silicone coating products due to their excellent temperature and moisture resistance. Similarly, as aerospace, home appliance, and consumer electronics products are coated you tend to see more UV and moisture cure acrylics and urethanes due to their overall protection properties and ease of reworkability. That being said, it's not always the newest technology on the market that drives coating material decisions but also the industry and subsequent environment that the end product is exposed to as users identify the appropriate chemistry for their protection requirements. This translates to frequent fluctuations in what coating materials are being utilized in automated applications based on the profile of the customer.

Another factor that can trigger growth, in a specific chemistry, is the geography of the application. The type of materials utilized can vary greatly depending on the regional preferences, environmental regulations, application process, and market niche. While silicones have gained traction, solvent-based acrylics and urethanes remain very popular in Europe where they have historically dominated this market. Solvent-based chemistries have broad appeal but are even more popular in pockets of the US that sprout subcontractors that service the aerospace and defense industries. Take a region like Florida for example that seemingly has dozens of contract manufacturers all primarily servicing the same industry. In stark contrast, there are states that have very tight restrictions on solvent or VOC emissions such as California or Minnesota that drive coaters to more environmentally friendly formulations. Restrictions or simply personal preferences such as these have caused many chemical companies to revisit their formulations over the past decade and introduce more environmentally friendly versions of their coatings to open new markets for their products.

Silicones and UV products remain strong competitors in Mexico, Pacific Rim, Korea, and mainland China where production of automotive components remains strong. Here you'll see numerous moisture cure silicones for their physical properties, but also UV materials for their speed of cure due to high production volumes.

All of this segmentation in the coating industry has driven chemical companies to the most prominent current trend in the marketplace, customization. No longer is one coating chemistry versatile enough for the changing demands of the consumer. It is no longer unusual to take a long standing coating material and have 8-10 versions of the formulation on the market. Viscosity modifications, sometimes from 20 cps all the way to a non-slumping gel version, tend to be the most popular. If you are looking to modify the flow characteristics, limit wicking into keep out areas, produce a dam, or control the solvent to resin ratio, there is typically a product tailored to your requirements.

Maybe the appearance of the coating is of greater importance to the end user. This can be as radical as the physical color of the coating itself or maybe just the level of fluorescence under black light. Some end users do specify the coating needs to be visible to the operator from a predetermined distance from the application. Maybe your technology is proprietary to the point that an opaque coating protects your design in lieu of clear transparent materials. Such requirements may drive an end user to request a custom formulation with these properties.

No matter what the request may be, from appearance to viscosity, to the cure mechanism or even changing the solvent carrier to a VOC friendly alternative, customizing formulations has become the norm more than the exception and chemical manufacturers are marketing these products as standard solutions. End users should always work with formulators to assure that any modification to the original chemistry does not affect performance properties such as adhesion, protection, or curing. From an application standpoint, having your chemistry slightly altered may affect a variety of process parameters so always consult your material manufacturer and applications staff prior to making any formulation change. In an automated process the changes may be as simple as modifying the robot speed or adjusting the path spacing to compensate for the new flow characteristics but these factors can always be prequalified in a test laboratory.