



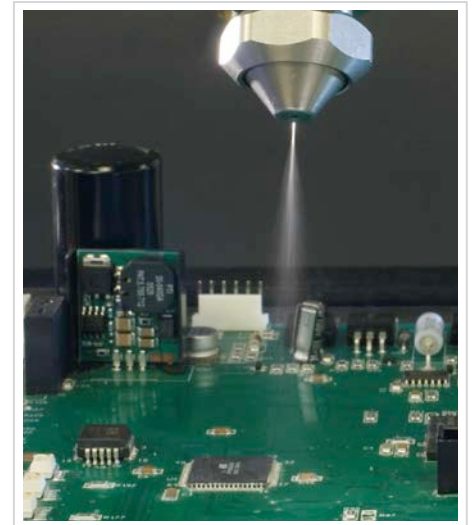
**SPECIALTY COATING SYSTEMS™**  
A KISCO Company

## Conformal Coating Application Methods

Conformal coatings are applied to the surface of circuit boards and devices to insulate and protect them during use. Coatings not only improve device performance but are especially valuable for their functional tolerance to harsh working environments.

Traditional liquid coatings include acrylic, epoxy, silicone, ultra-thins and urethane resins. Material selection is largely dependent on the type of circuit board or device being coated and its function. Selecting the wrong coating material inevitably leads to product malfunction or breakdown.

Equally as important as material selection is identifying the most suitable coating method; a poor application method can cause poor coating performance, which may lead to device failure. Liquid coatings are so-termed because they are applied to components by means of wet methods; brushing, dipping (component immersion) and spraying are the most common methods.



### Brush Application

Brushing a coating is fairly straight forward; the selected wet coating is manually applied onto the PCB or device with a brush. Benefits of brush application include:

- relative ease applying the coating to designated regions of the PCB surface
- cost effectiveness for small-batch production.

Manual brush coating has several disadvantages, however, which can emerge regardless of the operator's experience or level of skill. The surface of some circuit boards may be complicated or irregular, making it difficult to apply an even coat across the designated area. Coatings that are too thin may provide inadequate protection, leaving the component vulnerable to infiltration from external agents (e.g., moisture, oil, etc.). On the other hand, coatings that are overly thick are prone to cracking – especially during thermal cycling; similar to coatings that are too thin, cracking can also expose the circuit board to external elements. Finally, brushing only allows one side of a substrate to be coated at a time, which can greatly slow production.

### Dipping Methods

Dipping processes immerse a circuit board in a fluid conformal solution; the coating film forms around the assembly while submerged. The dipping process can be done manually, but use of automated equipment is becoming more common. Typically, circuit boards are attached to a mechanical arm and then lowered into a dip tank that contains the

liquid coating. How fast the part is lowered into the coating (i.e. the immersion rate) is determined based on the coating type, size of the substrate, number of parts to be coated, etc.

Advantages of dip coating methods include:

- reliable coating penetration under components
- faster coating times compared to brush coating methods.

Disadvantages of dip coating processes include erratic edge/tip coverage (despite thorough immersion in the dip tank) and inconsistent coating thickness. In addition, any areas that should not receive coating must be manually masked, a process that can slow the production time. Finally, coating challenges can emerge if an assembly's components are situated close together on the circuit board, as tight spacing can limit how far the coating can reach into hidden or compact areas.

## Conformal Coating Spray: Automated & Manual Spraying

Spraying liquid coatings onto circuit boards or devices can be exceptionally cost-effective. A well-trained operator can provide superior coating surface quality, especially in comparison to other liquid application methods. At the same time, robotics have become a key component of high-volume spray applications. Automated spray procedures generate enhanced project accuracy, resulting in better coatings that produced faster. For applications that require coating of more moderate volumes, dedicated spray booths may be the most efficient application method. For low volume applications or touch-up/re-work jobs, manual or benchtop spraying is recommended.

Spray coating provides numerous advantages, including:

- high-volume production capabilities
- enhanced edge/tip coverage
- reduced masking due to selective nature of automated systems
- more consistent film uniformity

Like brush and dip coating methods, spray coating processes also have their drawbacks. Over application of the coating is one such drawback; thicker coatings may negatively impact device performance. In addition, sprayed coatings may not penetrate as far under components as other methods. Finally, sprayed coatings carry more of a risk for undesired blooming or cobwebbing.

## Innovative Solutions from the Leader in Conformal Coatings

With 50 years of experience in engineering and applications, Specialty Coating Systems (SCS) is a world leader in conformal coating technologies. A direct descendant of the companies that originally developed Parylene, we leverage expertise on every project – from initial planning to process application.

SCS employs some of the world's foremost coating specialists, highly experienced sales engineers and expert manufacturing personnel, working in state-of-the-art coating facilities in 12 countries worldwide. Our extensive, proactive approach to production and quality requirements gives our customers peace of mind and minimizes the resources they need to meet even the most challenging requirements and specifications.



7645 Woodland Drive, Indianapolis, IN 46278 United States  
TF 800.356.8260 | P 317.244.1200 | W [scscoatings.com](http://scscoatings.com)