



## **Solving Ultraviolet Curable Potting & Encapsulating Problems With Shadow Cure Technology**

*If you find it difficult to use UV Curable Potting & Encapsulating Compounds due to shadows or deep sections, a new class of technology products may be the solution you are looking for.*

### Purpose of Potting & Encapsulating

The Potting or Encapsulation of electronic components is a common engineering design tool to protect products from environmental exposure. Potting involves the covering or embedding of an electronic or electrical device. In most cases an assembly is placed in a case or shell and then a liquid potting compound is poured over the assembly. The term Encapsulation describes a molding or dipping process where there is no case or shell. The assembly is either coated or the compound is poured into a mold and the cured compound becomes the outside of the assembly. The terms Potting and Encapsulating are often used interchangeably and we will refer to both processes as Potting in this paper.

The main purpose of the Potting Compound is usually to protect an electronic assembly from moisture, chemicals, dirt or other contaminants. The Potting Compound may also provide other properties such as heat dissipation, flame retardancy, or vibration resistance. Epoxies, Etc... located in Cranston, RI USA, has designed new Ultraviolet (UV) Curing materials that offer many advantages over two component systems. These products are also different than most common UV Curable Systems that are currently available for Potting applications.

### Problems with Two Component Potting Methods

Traditional potting methods are accomplished with two component epoxy, urethane, or silicone materials. Most often these types of products accomplish the end result of electrical insulation and environmental protection, but they have inherent production processing problems. Two component potting compounds have the following processing issues:

- Two components require mixing
- Can be messy
- Have limited pot life (working time)
- Slow curing (sometimes 24 hours or more)
- Some require expensive thermal ovens
- Waste from unused mixed product
- Some are hazardous
- High volume production requires expensive Meter Mix & Dispense Equipment

### First Generation UV Curable Resins Have Disadvantages

UV Curable resins have been a desirable alternative to the two component epoxy, urethane, and silicone systems. This is largely due to the fact that they are single component, cure within seconds when exposed to UV light, and have unlimited working times. However, many of the “first generation” of UV Curable Resins has disadvantages. They are known to leave tacky surfaces due to oxygen inhibition. They have high degrees of shrinkage, are often unable to cure in deep sections, and will not cure if shadow areas exist within the potting area. To get shadow areas cured, many products allow for a secondary cure operation, such as heat curing in an oven. This secondary operation slows down the production assembly process and requires energy consuming ovens. There are also many electronic assemblies containing components that cannot be exposed to the required secondary cure temperatures.

### New Technology Overcomes Shadow Areas & Deep Section Curing Problems

Epoxies, Etc... has developed products that will solve many of these issues. A new series of UV Curable Resins have been developed that will cure in the absence of light after initial UV exposure. They do not require a secondary cure operation and provide a smooth tack free surface.



The 60-7170 is one example of a UV Curable Potting Compound and Adhesive that has the following benefits:

- Single component that does not require mixing
- Smooth non tacky surface because it is not inhibited by oxygen
- If enough UV exposure occurs then shadow areas cure without another operation



- Low shrinkage
- Excellent adhesion and electrical insulation properties
- Fast curing
- Low toxicity
- Depth of cure up to one inch

The 60-7170 and other similar products are a new alternative to the traditional UV curing systems. The first generation of UV curing materials utilized free radical acrylate chemistry. These are the UV materials that most electronic component and assembly companies are accustomed. As already mentioned, many of these products will leave a sticky or wet surface and will require a secondary cure operation if the UV light does not expose all of the UV resin. These products also have a limited depth of cure and therefore are not suitable for many electronic potting applications.

Epoxies, Etc's new generation of UV curable products does not have these drawbacks. The main advantages for potting or adhesive applications is the continuation of the curing process in the absence of light without any additional post curing, full surface cure in the presence of oxygen, and better deep curing capabilities of up to one inch.

#### New UV Curable Resins Work With Conventional UV Lamps

The 60-7170 is easily cured with most conventional UV Lamps. The peak absorption takes place at 360 nanometers (nm) in the Ultraviolet Spectrum. Epoxies, Etc... is able to recommend UV Curing Equipment based on the particular demands of the potting or bonding application. However, most commercially available Spot Cure systems, Conveyor Systems, and Black Light Lamps have effectively cured these types of products.

The new generation of UV Curable Resins provides many advantages to companies producing products in the electronic, medical, automotive, aerospace, decorative, and optical industries. Companies are now able to increase productivity due to cure times measured in seconds versus hours. There is a reduction in labor costs, inventory, energy costs, production floor space, and material waste. These products are also free of solvents and RoHS compliant.

Epoxies, Etc... technical service engineers are able to make product recommendations based on the Potting and production requirements of the specific application. When necessary, custom formulations are also developed at the ISO 9001:2000 certified Cranston, RI facility.

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