ELECTRONIC ENCAPSULATION

Why is it necessary to encapsulate?

Populated electronic circuit boards and the components themselves can benefit from a polymeric encapsulant (also called potting) material for several reasons. Fragile components and assemblies become stabilized and cushioned by the potting. By choosing the correct potting for the application, the assembly achieves **mechanical integrity**. In order to have longevity of a device, it must be protected from outside environmental factors that it will experience. These can range from humidity, harsh chemicals and fumes, high or low temperatures, temperature shock, particulates and gases. These factors will dictate which potting will provide the best **environmental protection**. Some electronics generate significant heat while in operation. Therefore, it is beneficial to dissipate and conduct the heat energy from components to prevent potential damage or increase operating efficiency. Choosing a material that will have good **heat conductivity** can mitigate this problem.

What kind of material is best?

When one designs an electronic assembly, many times the end use and function will dictate architecture and topography of the finished device. These can vary in complexity and features. This is why there is a need for many and various types of encapsulants. For instance, a control module with fine pitch wired components may need a soft, forgiving **polyurethane** or **silicone** to impart low stress on these fragile wires and solder joints. An ignition coil for an internal combustion engine however may need a robust, high temperature resistant **epoxy** to give the best performance. Sometimes the encapsulant must be transparent, such as protecting a Light Emitting Diode and a clear **acrylate** would be appropriate. A thorough review between the electronic designer and material formulator can create the best product to meet all of the product requirements.

How can I encapsulate my part?

Generally speaking, there are a few standard ways to go about encapsulating. One can pot into a shell (generally molded plastic) that hold the electronics which becomes an integral part of the product, cast the potting around the electronics in a reusable mold, or pour/spray/dip to produce a coating over the device or area of interest. There are other specialized techniques within these methods. For instance, if it is imperative that there are no voided areas within your part, **Vacuum Potting** may be required. Fast, high-temperature curing of large devices may use a technique known as **Pressure Gelation**. For rapid, or high volume production, a **UV/Dual Curing** method could be chosen. The material formulator can customize the material parameters such as the viscosity, gelation, curing time, final hardness, and other mechanical and processing features to meet the end-user's production goals.