



Solutions for Adhesive Curing
An Application Case Summary

Structural Bonding

Ref: 02-301

Topic Reference:

Structural bonding of plastic components in a consumer electronics package assembly

Problem Statement:

Consumer electronic products may have plastic housing and electronic assemblies that require hermetic type sealing at critical joints. The materials at the joint areas may be of similar or dissimilar compositions. The sealing is typically achieved through high performing adhesives with appropriate adhesion strengths and mechanical compliancy. Such adhesives usually require long cure times and elevated temperatures. These conditions are often not compatible with cost effective plastic materials and/or product designs. Conventional oven cure causes low cost plastic to warp. Use of high performance plastics with low thermal expansions increase product material cost. Furthermore, the oven cure may also produce air-expansion in gaps that lower product yields. UV curable solutions limit the location of the seal to the surface, which can compromise design. Ultrasonic welding techniques do not work well when fusing dissimilar materials.

Proposed Solution:

Variable Frequency Microwave (VFM) technology provides solutions for curing high performance adhesives, utilizing cost effective plastics while meeting design requirements. Generally, microwave is well known for accelerating reaction rates such as needed to cure adhesives, by as much as 10 to 20 fold. VFM is a unique microwave technology that allows the benefit of microwave rapid curing without the associated side effects of fixed frequency such as arcing and non-uniformities. The hermetic sealing materials can be targeted by the VFM energy such that localized heating is achieved. The selective and localized heating circumvents air expansion within the assembly and limits the thermal expansion of the walls of the assembly; hence, enabling cost effective materials selection. Furthermore, VFM curing is volumetric which frees-up more design choices for the seal placement inside the assembly. This technology is applicable to joint made of similar or dissimilar materials.

Realized Benefit:

Major manufacturers of consumer electronic assemblies have adopted VFM for structural adhesive curing problems. VFM allowed rapid curing of a high performing adhesive, nominally 2 to 3 times faster than with convection heat. But, more importantly, VFM allowed the heating to be applied selectively to the bond joint only and, therefore permitting use of lower cost material for the product and improved manufacturing yields.

Summary:

- ~~///~~ **Reduced Process Cycle Time by 50% or More**
- ~~///~~ **Enabled Use of High Quality Adhesive Joint**
- ~~///~~ **Enabled Use of Lower Cost Plastic Materials**