SUCCESS STORY….A004

Printed Circuit Board Laminating Resin Cure

Project Background

Epoxy-glass laminate constructions are used in the majority of rigid printed circuit boards. The epoxy resin cure and resulting mechanical properties are very dependent upon the accurate formulation of the glass laminate resin coating solution.

The Problem

A manufacturer of printed circuit board stock was experiencing batch-to-batch variability in the cure of its epoxy resin. Using extent of cure gel times as the metric, the process engineer noticed a trend based on which manufacturing shift made the resin batch even though the same lots of raw materials were employed and the same weight-percent solids were present in the final product.

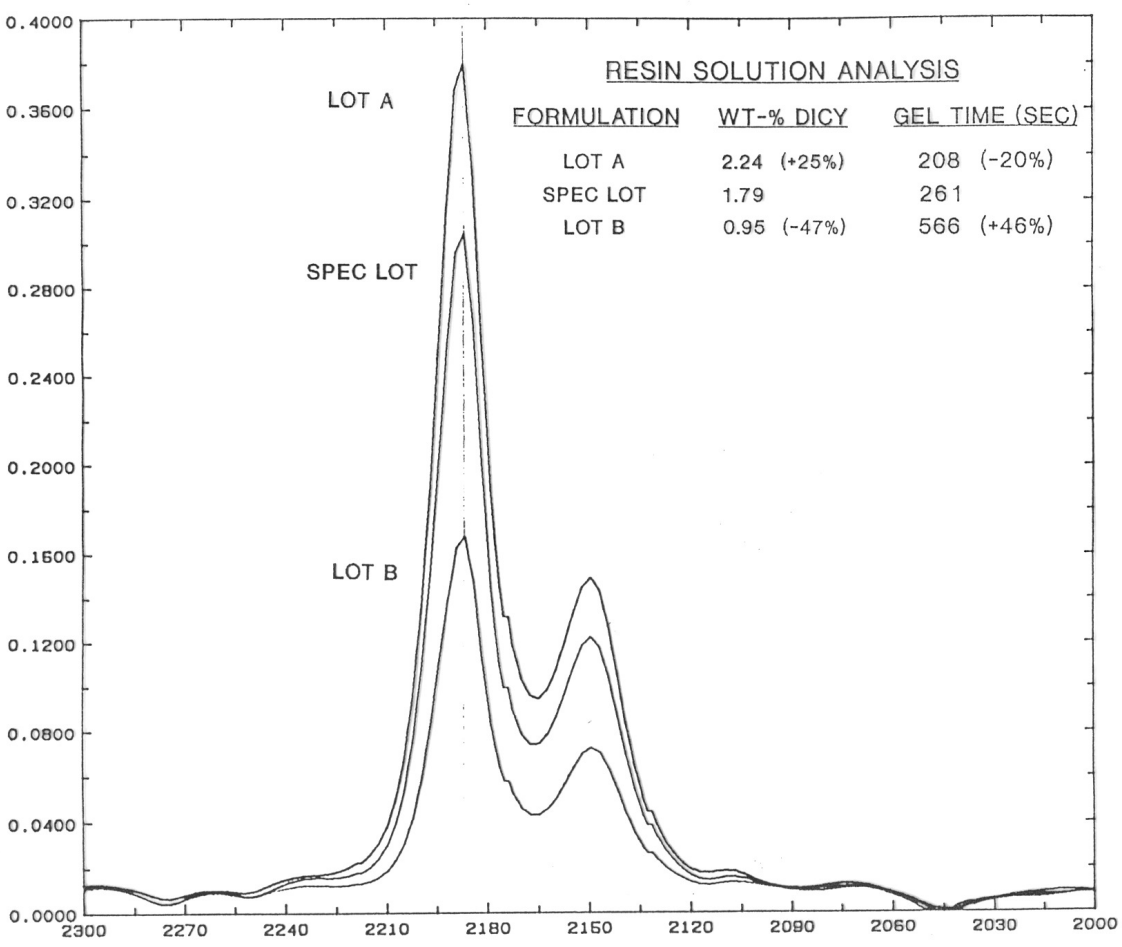
It appeared that weighing variances involving one of the ingredients present in relatively small amounts might be the root cause of the problem. The latent cure catalyst, dicyanamide ('dicy'), was the most likely candidate since small changes in the amount charged would have significant effects on the rate of the epoxy cure. ANALYZE was asked to develop a simple QC procedure for measuring the concentration of dicy using instrumentation present at the manufacturer's facility.

ANALYZE's Approach To Resolve The Problem

ANALYZE developed a Fourier Transform Infrared Spectroscopic (FT-IR) based assay method for the quantification of dicy in the laminating resin solution. Dicy has a strong absorbance band in the mid-IR region at ca. 2200 cm^{-1} where there are no interferences from the other components of the laminating resin solution; including the solvent. The laminating resin solution was sampled directly and analyzed by FT-IR in a solution cell having a solvent compatible construction and appropriate pathlength.

The Result

Representative IR spectra, dicy assay results and a comparison to cure gel times are summarized in the following graph.



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Conclusion and Benefit To The Client

The information resulting from this assay development was used to identify a manufacturing technician who did not know how to properly use the scale. Remedial training was provided and the laminating resin batches became consistent. The manufacturer continued to use the FT-IR assay as a 'second tier' QC method to more quickly identify the root cause when faced with material and process problems.