



Comments: Liquid Resin Molding Specifications

- Guidelines clearly indicate the critical importance of controlling composite materials and processes to achieve consistent repeatable structure with known properties
- Documents highlight the issues involved in controlling liquid resin molding
- Emphasis on real controls, particularly SPC & PCDs
- Progress in standardization of test methods
- Good specification architecture for controlling fiber, fabric, preform, resin, & cured composite properties.



Concerns: Liquid Resin Molding Specifications

- Quantity of testing recommended, particularly on an ongoing basis
- There's a basic difference between the following:
 - Understand & control Materials & Processes with limited verification testing
 - Extensive end-item testing to verify consistent properties
 - Understand & control M&P, but also do extensive end-item testing to verify consistent properties
- Cost increases due to one material / one spec approach
- Push for 2-sided strength limits - SPC can accomplish the same goals at lower cost



Concerns: Liquid Resin Molding Specifications

- Are the right organizations responsible for testing?
 - Do resin suppliers have the resources and expertise to take responsibility for all the items the guidelines assign them?
 - Many of the “part producer” tasks seem to be end-user or OEM responsibilities
- Equivalency baseline database testing has the implied purpose of recalculating allowables: “a larger database will result thereby providing the potential for higher allowables”
 - Also the potential for LOWER allowables
 - As you pool data from various sources, you tend to increase the spread.



Concerns: Liquid Resin Molding Specifications

- There is no industry consensus on preferred LRM processes. Different processes produce somewhat different properties. Different organizations may not want to publish their “latest & greatest” LRM process in an industry spec.
- Potential for delays as industry committees review specs & data and resolve issues dependent on engineering judgment such as equivalency
- Extent of equivalency testing required for each fabrication site. Processor qual should rarely require destructive test. Destructive inspection is more common, but should not be “typical” given the use of part families.



Concerns: Liquid Resin Molding Specifications

- While it is necessary to control potential defects,
 - Some are very difficult to create on demand to measure their effect
 - It is not feasible to eliminate use of all materials not detectable via NDI. In some cases, a robust control procedure is a better option.
- These recommendations show a significant increase in FAA involvement in (vs. oversight of) these materials and processes.
 - Does the FAA have the manpower to accomplish these additional duties without adverse effects on cost & schedule?
 - Or are the FAA references meant to include DER & DMIR activity?



Summary: Liquid Resin Molding Specifications

- Guidelines contain much good information about what needs to be controlled, with excellent emphasis on understanding & controlling the materials and processes (SPC, PCDs, etc.)
- There's significant fear that guidelines become or are treated as requirements – and the amount of testing recommended imposes some significant costs
- There's a basic disconnect between the one material / one spec approach (and related 2-sided limits) and the Boeing specification + QPL approach.
- How much testing is enough?
- Who should be responsible for testing?