

Qualification of Composite Materials at General Motors

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CATAGORIES OF COMPOSITES

- _ Structural**
- _ Cosmetic ... (Class "A")**

BASIC PRODUCT REQUIREMENTS OF ANY TYPE OF COMPOSITE

- _ Capable of being molded at rate to meet production requirements (2,000 to 100,000)**

- _ Must be bondable with either epoxy or urethane adhesives**

- _ May require paintability**

- _ Must meet crashworthiness**

- _ Must meet environmental durability (solvents, lubes, fuels, road salts, and etc.)**

- _ Must meet all automotive and government regulations for**
 - Performance**
 - Toxicity**
 - Durability**

- _ Must be dimensionally stable in the temperature range of -40 to 200 C.**

STRUCTURAL:

- _ These materials are typically much stiffer than cosmetic or body panels.**
- _ There are very few surface appearance requirements.**
- _ The shapes of these part are generally much more complicated than body panels.**
- _ These panels may be molded in color (typically Black).**
- _ The mechanical properties of structural materials are significantly higher than body panel materials.**

COSMETIC: In addition to the requirements listed above, cosmetic (body) panels have these property requirements as well.

- _ Mechanical and physical properties to meet the specifications.**
- _ Smoothness (<85 using a Loria Surface Analyzer).**
- _ Paintability (exterior body paints).**
- _ Bondability (No detrimental effects on the surface of the assembly).**
- _ Fastener compatibility and adequate strength).**
- _ Porosity free.**
- _ Wide processing window.**
- _ Non Staining.**
- _ Low CLTE.**
- _ Weatherable (may require paint).**
- _ Repairable**

TYPICAL COMPOSITES USED IN AUTOMOTIVE INDUSTRY

Unsaturated Polyesters and Vinylesters

SMC (Compression or injection molded)

Wet pour on directed preforms

Wet mat (squeeze molding)

RTM

Chop and spray

Epoxies (rare)

Wet mat (squeeze molding or vacuum bagging)

Wet pour over directed preforms

Prepregs (very rare)

Phenolics very rare mostly ash trays

SRIM Polyurethane or polyurea

RIM process on directed preform

RIM process on woven mat lay-ups

RRIM Polyurethane and Polyurea

STATISTICAL DATA

- **Six Lots of Data :**
- **Use X bar data to make statistical calculations for mean and standard deviation and six sigma values**
- **Record the data as indicated on the Templates included in the certification package.**

SAFETY

- _ Completed Material Safety Data Sheets.**
- _ Restricted and Reportable Chemicals per GMW3059**