

Epoxies, Vinylesters and Polyesters

Epoxies, Polyesters and Vinylesters represent two resin families. Epoxies belong to a family of resins, which are epoxy functional, and can be cured with amine curing agents at room temperatures to form excellent adhesives and composite resins. Polyesters and vinylesters belong to a family of resins containing an unsaturated polyester or hybridized vinylester backbone which is catalyzed with a peroxide (normally Conap and MEKP) to condense into a cross-linked solid resin.

RESINS AND ADHESIVES

Resins (liquid plastics, i.e. epoxies, polyesters and vinylesters) are commonly used by the marine industry when wetting out fiber reinforcing in order to saturate the fibers and form an FRP (fiber reinforced plastic) part. Whether the part utilizes fiberglass fibers, carbon fiber, Kevlar aramid, or wood fibers adhesions to and wetting of the fibers is a critical step in the production of a quality part.

EPOXIES

Epoxies represent some of the most versatile resins available to the composite manufacturer and marine repairer. Generally in all categories, the builder/repairer will realize the greatest degree of bond strength, and toughness with well formulated epoxies. **MAS Epoxies are VOC free and have curing systems which have no free phenols** (representing a safe step forward for all resin users). Humidity is of little concern as blush free MAS systems allow the builders and repairers to laminate with little or no preparation between applications as long as mix ratios are followed and mixing is adequate. Shrinkage of MAS Epoxies is below .03% eliminating pre-release. In the case where a part, originally manufactured utilizing polyester or vinylester, has yielded to strain and cracked, a well-reinforced epoxy repair will tenaciously hold to the substrate with 1500-2000 psi (vinylester 500 psi). Many high strain repair areas and light-weight parts must flex and strain without micro fracturing. MAS resins have the ability to strain with the fibers while maintaining permanence and adhesion. Whether a part or repair is made of wood, carbon, Kevlar, fiberglass, core material or hybrids of the above, MAS Epoxies will wet

and permanently stick with and to the composite. When MAS Epoxies are used for a chemical resistant barrier (barrier coating) the finished coating system has excellent resistance to water uptake (below .5%) and the applicator can be confident that subsequent finishes will stick to the new epoxy and the epoxy will stick with the hull. New generation epoxies feature many of the advantages of low viscosity and accurately tailored gel and cure times. Permanent repairs and the highest quality custom aerospace construction have been enjoying the advantages of epoxies since the sixties. MAS brings these advantages the builder and repairer at ambient temperatures.

VINYLESTER

Vinylesters represent a step in the right direction of structural resin development. The down side of the vinylesters include sensitivity to mixing, handling, high VOC's (in the form of styrene), atmospheric moisture and temperature sensitivity (sometimes it just will not cure). Good tough vinylester is also quite pricey when compared to polyesters, in fact the dollars per pound approach that of epoxies. Many vinylester hulls suffer similar massive delamination of the hull skins from core and bulkhead substrates due to shrinkage and poor secondary bond strength. Additionally, Vinylester resins only show good fiber adhesion to standard glass fiber, and low adhesions to more exotic fibers (Kevlar/carbon fiber) and wood.

Open surface curing of both vinylesters and polyesters require surfacing agents. Subsequent applications require careful surface preparation if reasonable adhesion is to be achieved.

POLYESTER

Polyesters are one of the least expensive resins available to the FRP boat builder. The down side includes poor adhesions, high water absorption, high shrinkage, and high VOC's. Polyester resins are only compatible with fiberglass fibers. Polyester is best suited for applications insensitive to weight and do not require high adhesion or fracture toughness. If shape accuracy is not critical, resistance to water is of no concern, and ventilation of the workspace is excellent, then polyester's a great candidate.