

Investigation of Cause of Uncured Resin in Carbon Fiber Razor Cables

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This research project investigates a mechanical failure of razor cables manufactured by a leading carbon fiber boom, rigging and spars manufacturing company in Sri Lanka. This project was aimed at detecting the cause of failure of razor cables when subjected to coiling for transportation. In preliminary studies, it was apparent that the localized variations in the curing process could be a possible cause for the failure. Also, other factors such as the presence of moisture, the behavior of the epoxy resin, curing method could affect the outcome of the curing process. Through this project, authors attempted to establish the most probable cause for the failure and to determine a method to identify the areas susceptible to failure to minimize the production of potentially defective products.

It was hypothesized that the uneven curing of the razor cables could be a major reason for failure. To test that, eddy current and di-electrometry techniques were used as the test methods for monitoring of the degree of curing. However, it was observed that eddy current method did not give any useful indications about the degree of curing. The di-electrometric technique showed different dielectric capacitance values for cured and uncured resins. Therefore, using dielectric capacitance theory, a test probe was designed to distinguish the cured product from the non-cured product.

A combination of experimental and theoretical study was carried out to verify whether the curing cycle used is sufficient to complete the curing process. The mathematical model shows that, the curing cycle time was sufficient for complete curing of the epoxy resin. Therefore, it is suggested that the cause of failure could be either a material or pre-curing process related.

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