

Effect of Manufacturing Workflow on the Moisture Resistance of Polyester and Vinyl-ester Based Composites – Phase 1

SUMMARY

For a wide range of applications, composite materials are exposed to high levels of humidity or are directly in contact with water during use. In composite materials, absorption of moisture leads to degradation of mechanical properties and eventually to blistering, reducing service life. Therefore, an understanding of how manufacturing parameters can improve moisture resistance is critical to reduce failures and associated warranty claims. For this purpose, a versatile blistering tank was designed and built, to facilitate the correlation of manufacturing practices with the moisture resistance of the produced component. CRN's members are also using the blistering tank to explore new materials configurations that offer improved performance.

CHALLENGE

For a wide range of applications, composite materials are exposed to high levels of humidity or are directly in contact with water during use. Absorption of moisture leads to degradation of mechanical properties and eventually to blistering, reducing service life. The aim of this project was to build a blistering tank to facilitate the correlation of manufacturing practices with the moisture resistance of the produced component. Ultimately, users should be able to identify optimum process conditions.



Campion Marine
Kelowna, British Columbia

Campion Marine is Canada's premier and largest independent builder of fiberglass power boats.



**Formashape, a division of
WhiteWater Composites Ltd.**
Kelowna, British Columbia

FormaShape, with parent company, Whitewater Composites Ltd., is the world's largest manufacturer of fibreglass waterpark attractions.

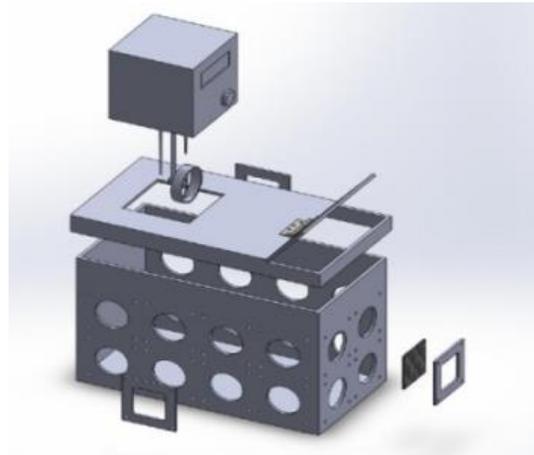
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The project clarified and quantified process relationships with blistering resistance. This will enable FormaShape to confidently deliver quality product without the cost of over-building.

*Steve Binks, Manufacturing Technologist,
FormaShape/Whitewater Composites Ltd.*



CRN designed blistering tank.

APPROACH

CRN staff first researched the mechanisms leading to blistering of laminates and the current best practices in the design of blistering tank. CRN staff then designed and built a blistering tank and developed a methodology to track material moisture-based degradation.

OUTCOME

A versatile blistering tank has been designed and built and is now available to CRN's industrial partners. A procedure to catalogue moisture absorption and correlate blistering formation with degree and cure and sample thickness has also been developed.

Formashape has been performing blister tank tests on its laminates for a number of years but the testing was only a relative test between one laminate or another. The work of the CRN ties this to resin chemistry and cure; Something that we were not able to do without assistance.

Tim Boothman, Vice President and General Manager, FormaShape/Whitewater Composites Ltd.

IMPACT

The blistering tank is now used to draw correlations between the degree of cure at interfaces during processing and the final degree of cure of polyester laminates with their blistering resistance. These correlations will be used to determine the optimum process conditions and to support manufacturing workflows developed at CRN. In the near term the blistering tank is also being used by CRN's members to explore new materials configurations

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