

Room Temperature Curing of Polyester and Vinyl-ester Based Composites

SUMMARY

Over time, several composite companies in British Columbia have noticed a strong correlation between product quality (evaluated by characteristics such as dimensional control, surface finish, and durability) and the season in which they were manufactured. For example, parts manufactured during the winter are often more prone to deform after de-moulding, particularly during transportation. In response, CRN developed a systematic approach to investigate the problem. Researchers were able to identify the main cause of deviations and revisit manufacturing workflows to limit the impacts. The industrial partners implemented practical tools for use during manufacturing to track product quality and to guard against or limit further occurrences. As a result, the companies have gained confidence through better understanding of the underlying science, and have been able to improve product quality and production rates.

CHALLENGE

Over time, several composite companies in British Columbia have noticed a strong correlation between product quality (evaluated by characteristics such as dimensional control, surface finish, and durability) and the season in which they were manufactured. Consistent production quality was a constant challenge and the source of variability was unknown. Identifying the root cause of quality variations and developing practical mitigations strategies were the key motivations driving CRN's involvement in this project.



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 fiberglass waterpark attractions.



Rhinokore Composite Solutions
Armstrong, British Columbia

Rhinokore produces sandwich panels for a wide spectrum of industries and sectors using a patented process.

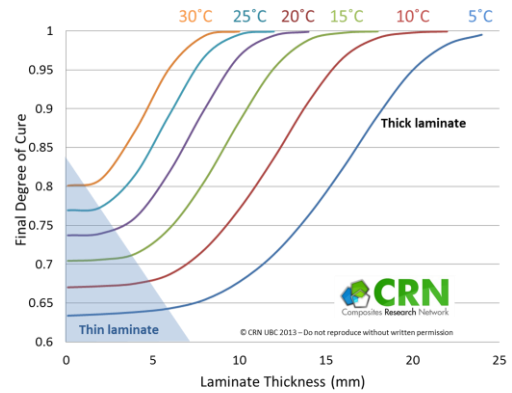


Bigfoot Industries
Armstrong, British Columbia

Bigfoot designs and manufactures truck campers and travel trailers for the North American RV market.

The major benefit of the project is (our) ability to rapidly adjust/build parameters for the wide variety of parts in daily production as the temperature changes day to day and even throughout the day. This leads to a reduction in scrap rates in the RTM line and a reduction in rework on the OM line, both of which lower our costs and ensure on-time delivery.

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



Process map developed by CRN for polyester resin.

APPROACH

CRN staff visited companies located in the Okanagan Valley and identified the effect of seasonal change in temperature on degree of cure as the principle cause of the identified quality issues. CRN staff characterized the cure kinetics of a wide range of polyesters and vinyl-esters and then conducted a parametric study to assess the effects of the design and process parameters (such as the ambient temperature) on the degree of cure during manufacturing.

OUTCOME

Families of manufacturing design tools and mitigation strategies were developed by CRN. These tools allowed researchers to revisit the manufacturing workflows, making appropriate changes to limit the impact of seasonal change in temperature. An on-site non-destructive Fourier transform infra red (FTIR) technique to measure degree of cure during manufacturing has also been developed, and is now available to CRN's industrial members.

This project and report has helped FormaShape focus (its) efforts on improving surface finish and state of cure. The report timing couldn't have been better. This very morning, it helped us solve a surface finish issue with a new product now in pre-production.

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

IMPACT

Armed with an improved understanding of the cure chemistry and kinetics of polyesters and vinyl-esters investigated in this project, the participating companies have gained confidence applying their improved knowledge. In practical terms, each has been able to improve product quality and production rates.

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