

De-moulding and Surface Quality

SUMMARY

[Campion Marine](#) is the last remaining open-mould glass fibre reinforced polymer (GFRP) manufacturer of luxury boats in Canada, and has been active for over 36 years. It has released numerous product lines, ranging from closed-deck speedboats to open-deck pontoons, and now has an extensive catalogue of legacy moulds for each product; some have been in use for over 10 years. Each mould is a significant investment in terms of capital, and so maximizing usable lifespan is a high priority. Surface finish and surface quality are well known factors influencing overall mould quality. Mould maintenance is usually driven by degradation during storage and use, but how these factors manifest and change during manufacturing is not well understood. By applying previously established technical fundamentals with respect to how mould surfaces degrade in use, CRN developed a case study to better track and understand how to manage moulds during their use.

CHALLENGE

Little is known about the manner under which GFRP tooling degrades during use in composite processing. Currently, manufacturers use empirical approaches to predict regions of tooling degradation based upon factors including shape, materials used, and methods of de-moulding. Additionally, the rate of degradation is estimated using a combination of experience and trial-and-error on the tooling itself: generally, maintenance practices are reactive, rather than proactive. The result is higher risk in manufacturing and greater embedded costs.



Campion Marine

Kelowna, British Columbia

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



Axalta Coating Systems

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APPROACH

Using previously established technical fundamentals on the mechanisms of mould surface degradation during composite manufacture, CRN developed a case study to track the degradation of an industrial-scale GFRP mould in use at Campion Marine. By regularly analysing the surface with a TR110 handheld profilometer, the surface roughness and surface quality was tracked over many manufacturing cycles. Technicians can use this information to more accurately predict the rate of wear in subsequent cycles.



Bulk laminate is sprayed onto a boat hull and left to cure.

OUTCOME

Engineers tracked the degradation of tooling for a boat hull and boat deck over the course of five manufacturing cycles of mould preparation, bulk laminate deposition and cure, as well as de-moulding. The results revealed a definite trend of increasing surface roughness in all three geometric regions measured (horizontal, sloped, and vertical surfaces). For the mould considered, and with the materials used, the rate of degradation for the moulds was approximately an increase of 6nm for R_a in each cycle.



Boat deck being de-moulded after curing.

IMPACT

The information gathered using tools and methods suggested by CRN has provided Campion with a better understanding of the rate of mould degradation and how to better manage moulds. By understanding what constitutes a Class A surface finish, the rate of degradation of a tool's surface, and best methods for use, maintenance and storage, Campion can better manage its moulds. A workflow for these types of activity will be developed and implemented by the company in the near future.

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