

Graduation assignment: “RIM of UD – investigation into RIM of high-thickness UD lay-ups”

Introduction

Modern wind rotor blades are made of composites (or: fibre reinforced plastics) through a manufacturing process called Resin Infusion Moulding (RIM - also known as vacuum infusion). Part of the composite blade structure is composed of Uni-Directional (UD) glass reinforcements; for example, the main girders that form the blade’s back bone are made of glass UD. Other examples are glass UD Trailing & Leading Edge girders. Usually these girders are produced as prefabs because of the complexity/risk of infusion if infused simultaneously with the blade’s shells. With ever increasing blade lengths, glass UD for prefabs is slowly but steadily being replaced by carbon to overcome weight and stiffness issues.



Problem definition

With glass UD prefabs becoming thicker with increasing blade length, the infusion of such prefabs is also becoming more difficult. Two major issues are reasons for concern: 1) girders having to be scrapped because of dry spots, and 2) fibre-volume-fractions and part-thickness cannot be properly controlled causing poor part performance or even a scrapped part.

In the case where glass UD is replaced by carbon UD, successful infusion is even more of a challenge; with currently known RIM-technology (resins and/or RIM-strategies) thick parts (>10mm) cannot be successfully infused.

Objectives of this graduation thesis:

- Perform a literature study on:
 - o RIM of blades
 - o RIM of UD girders – glass and carbon
 - o Fibre-volume fraction and part thickness – thin versus thick laminates (2mm versus 60mm)
 This literature study shall lead to project plan
- Identify the critical aspects in RIM of glass UD girders
- Identify the critical aspects in RIM of carbon UD girders
- Set-up a test plan for RIM-experiments on thick glass UD laminates
- Set-up a test plan for RIM-experiments on thick carbon UD laminates (glass & carbon)
- Perform RIM-experiments to identify flow and impregnation in glass and carbon spar cap lay-ups
- Measure fibre-volume fractions and relate to part thickness
- Improve current GBT specifications for RIM of glass girders
- Explore new infusion strategies for thick carbon UD girders (and potential other thick carbon lay-ups in a blade)
- Create a list of preferred suppliers for raw and aiding materials used in girder manufacturing
- Update and expand the GBT database on girder specifications, material specifications, process specifications.

GBT expects of the student:

- Bachelor-degree level of education (HBO)
- Pro-active and independent work attitude
- Ability to report in English
- Interested in wind industry, and in particular composites manufacturing
- Signing of Non-Disclosure Agreement

The student can expect:

- to be part of a fast growing and developing industry
- to be part of an international team of highly motivated colleagues
- professional guidance
- Opportunity to start a career within GBT after a successful completion of the graduation assignment
- Intern salary of €400,-/ gross month

Contact person Global Blade Technology:

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