

Characterisation of stress induced ageing on short fibre reinforced thermoplastics

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Introduction

Short fibre reinforced (sfr) thermoplastics are a very common material for structural components with lightweight need. Since they are loaded cyclic most of their lifetime, this kind of load needed to be considered in the component design or lifetime assessment. For this the fatigue behaviour as well as the fracture mechanics behaviour needed to be investigated. Since also ageing influenced the lifetime of the material, this is an important factor. The aim of this thesis is to capture the influence of the stress intensity on the ageing of sfr polymers. This insights is relevant for the characterisation of the fatigue behaviour of ball bearings (Figure 1) of wind turbines (Figure 2).

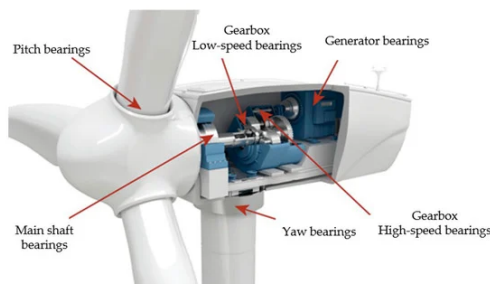


Figure 1: Wind turbine [1]

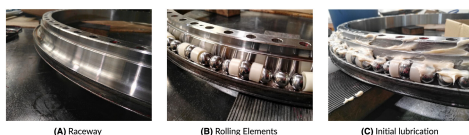


Figure 2: Example of a ball bearing [2]

Content

Basically composites are tested with different layups to get the bearable lifetime and the damage during the loading.

Tasks

- Literature studies fracture mechanics and ageing of short fibre reinforced polymers
- Test setup preparation
- Static test with media (SENT specimen)
- Cyclic tests (SENT specimen/micro tensile stage)
- Tests with CT-specimens and comparison of the SENT specimen results
- Raman and FTIR measurements and evaluation of the results also for CT-specimens
- Fracture surface analysis

Information

The work will be done in the Lab as well as on the computer.

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References

- [1] H. Peng, H. Zhang, L. Shangguan, Y. Fan, Review of tribological failure analysis and lubrication technology research of wind power bearings, *Polymers* 14 (15) (2022). doi:10.3390/polym14153041.
- [2] F. Schwack, F. Halmos, M. Stammer, G. Poll, S. Glavatskih, Wear in wind turbine pitch bearings—a comparative design study, *Wind Energy* 25 (4) (2022) 700–718. doi:10.1002/we.2693.