METAL TO COMPOSITE: IMPELLER REDESIGN OF GRUNDFOS CENTRIFUGAL PUMP

M. Søndergaard Adelstorp, H. C. Corpuz Breum, K. Reif Hill-Madsen, C. Kaalund Siig, M. Żurowski, F. Balser

Department of Materials and Production, Aalborg University Fibigerstraede 16, DK-9220 Aalborg East, Denmark Email: {<u>madels16, hbreum15, khillm16, csiig16, murows19, fbalse19</u>}@student.aau.dk Web page: <u>http://www.mechman.mp.aau.dk/</u>

Keywords: Redesign, Discontinuous fibre reinforced plastic, Injection moulding, Composite, Fatigue

ABSTRACT

The project covers the redesign of the impeller of the NB-65-200 centrifugal pump in collaboration with Grundfos. The pump is to be used for sea water application which is a highly corrosive environment. The redesign aims at changing the material from cast iron to fibre reinforced plastics. The current metal solution will be analysed w.r.t. stresses and strains with load cases provided by Grundfos. The principle stresses in the metal solution are used as a guideline for determining a first estimate for fibre orientation. Based on the obtained solution a redesign process is started. Determining the fibre orientation is done with a CFD program which simulates the injection moulding process. The resulting fibre orientation is then used in a subsequent FE analysis to determine the usability of the design. The main objective of the redesign process is to obtain a solution which fulfils the requirements regarding stresses, efficiency and lifetime. The latter will be investigated using fatigue and viscoelasticity considerations.

The current metal solution is a compromise between efficiency and manufacturing restrictions, therefore a more efficient solution, with regards to the water flow in the pump, might be possible. With different manufacturing restrictions the possibility of using a more efficient design will be examined in the project. This design change is primarily focused on the orientation and geometry of the fins that make up the inner section of the impeller.

Acknowledgement

The authors of this work gratefully acknowledge Grundfos for sponsoring the 8th MechMan symposium.