MODELLING OF WIND TURBINE BLADE TRAILING EDGE CORE DESIGNED AND OPTIMIZED FOR RAPID PROTOTYPING

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ABSTRACT

Siemens Gamesa Renewable Energy (SGRE) is amongst the world-leading companies within the design and manufacturing of wind turbines, both for onshore and offshore use. SGRE uses the patented IntegralBlade® technology, which allows the blades to be casted in one single piece, introducing different production and structural challenges with respect to other manufacturing methods used in the wind turbine industry, such as gluing. Using this technology, a solid trailing edge (TE) core is to ensure single cast manufacturability.

As the industry is moving forward, more efficient, thus larger blades are needed. In order to increase the efficiency while still managing to reduce overall costs of electricity production, the design of the blade should be optimized – herein the TE core, which is subjected to complex loading cases.
The core is currently produced using reaction injection moulding, which is a fast and easy method of mass-producing finished shapes. However, a new cast takes up to 6 months to produce, which significantly increases lead time when new core shapes are introduced as a result of change in the cross-section.

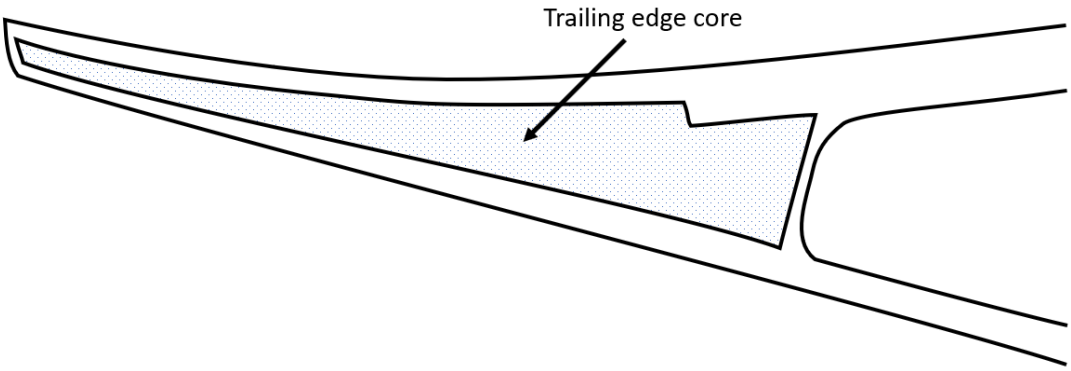

Figure 1: Trailing Edge reinforcement. Courtesy of Siemens Gamesa Renewable Energy [1].

The objective for this project is to investigate possibilities for manufacturing methods which allow for rapid prototyping of the TE-core. This includes analyses of the current core in order to verify any design changes, and a weight optimization process in order to accommodate material changes which increases weight.
The TE core should be optimized while still maintaining the geometrical constraints of the outer shell, as these serve the function of separating the upper and lower faces of the shell.

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[1] Siemens Gamesa Renewable Energy; https://www.siemensgamesa.com/en-int, 2022