

Project 10: Anti-ice Blade Structural Temperatures

Student Project Proposal

Background

Embedding electrical elements in the structure of the turbine blade to heat the outer surface and prevent ice formation has the danger of overheating the inner structure of the blade. The blade materials all have different temperatures that must not be exceeded if the blade is to last the lifetime of the turbine.

The structure is glass reinforced plastic held together by adhesive.

Scope

A heat transfer model of the blade structure to calculate the maximum steady state temperatures of the blade components for a range of heating element heat flux values.

The model will allow cooling the external skin of the blade by both forced and natural convection. The model will assume dry air cooling as this is the condition that will result in the hottest structural temperatures. The surface conditions of the blade will be 1) dry, 2) wet and 3) iced.

The results from the study will show the conditions (ambient temperature, wind speed) where the structure reaches the maximum allowable temperature. Recommendations of the maximum ambient conditions the system can be operated for a range of heat flux values will be included.

Keywords

Wind turbines, Anti-ice System, Heat Transfer.

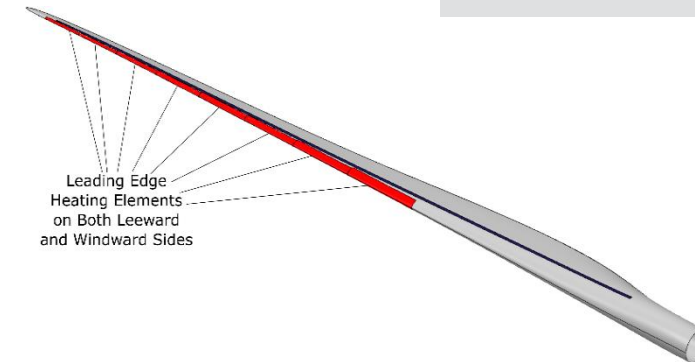
APPLY

Contact person:

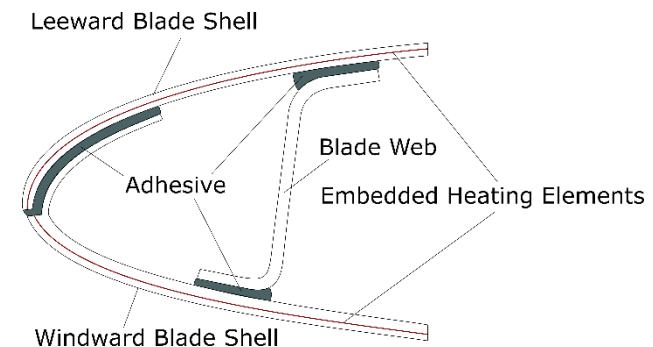
Karl Gregory

E-mail:

kgre@vestas.com



Electrical Heating Element Locations



Section Through Leading Edge of the Blade