DeICE-UT - Wind turbine blade anti / de-icing, combined ultrasonic guided wave and vibration system

It is now widely recognised that the burning of fossil fuels is leading to global climate change. As a result, the EU is committed to leading the global efforts to reduce the amount of CO_2 emitted by reducing energy usage and increasing the proportion of energy that is generated from renewable energy.

A significant share of this renewable energy supply comes from wind power. While it is a well-established technology, there are a number of recurring problems which need to be addressed to improve safety and efficiency – one of these is ice build-up on turbine blades.

Project Objective

The DeICE-UT project will overcome the current limitations of existing wind turbine blade de-icing systems by developing an innovative dual de-icing system combining both high power ultrasonic guided waves and low frequency vibrations. The first will create high power ultrasonic guided waves with power densities of at least 1W/cm2 and frequencies of 20 to 200KHz in the blade that will shatter the ice – composite bond. The second will use low frequency (0-500Hz) controllable shakers that will vibrate the structure with accelerations that may exceed 30g, in order to shake and crack the ice off. Both of these active elements will be mounted on the inside of the blade on locations that will be determined during the project.

Previous work on helicopter blades has shown that low frequency vibrations are highly effective at de-icing across the blades except at the leading edges, whilst the application of ultrasound (US) shows very good de-icing where the US power is high.

The DeICE-UT project will apply these two complementary technologies in combination to:

1. Stop ice from gathering on wind turbine blades during adverse weather conditions
2. Remove any ice afterwards – to ensure ice-free operation even if ice accretion rate is very high.

To achieve high ultrasound powers within the required regions of the blade, guided wave US technologies will be utilised. By doing this, DeICE-UT will provide a solution to enable the safe and reliable operation of wind turbines in adverse weather conditions and achieve the following benefits:

- reduction of downtime for ice-prone sites across the EU leading to increased efficiency and reliability
- reduced maintenance and increased component lifespan, leading to reduced maintenance costs
- reduction of energy to operate system – 2% of turbine power output for DeICE-UT compared to >12% for other systems
- increase in the number of wind turbines located in extreme climate regions, leading to reduced residential complaints as ice prone sites are also sparsely populated
- reduce the danger of accidents resulting from ice thrown from the blades.

Implementation of the technology across the EU could make a significant contribution to increasing the renewable energy share and reducing CO_2 emissions.

For further information, please visit the project website at **www.deice-ut.eu**.

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DeICE-UT
DEICING OF WIND TURBINE BLADES