Numerical and experimental study for the identification of defects in wind turbine blades by infrared thermography

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ABSTRACT

Research in the field of renewable energies is today a major axis in the fight against global warming. Among these, wind energy appears to be a growing alternative in several territories around the world. During their use, inclusions and defects in the blades of wind turbines appear. It is the responsibility of the operator to perform periodic maintenance and inspections to maintain the quality of the installations.

The objective of this project is to propose an industrial inspection vision method that allows the visualization of defects within a wind turbine blade using thermography methods. Currently, these techniques are already widely used in many different fields such as the inspection of helicopter blades in the aeronautics field. It is necessary to have a temperature gradient within the object to be examined to have a contrast highlighting the defective areas of the blade. Concretely, if the meteorological situation allows it, the sun will play the role of heat source heating the wind turbine blades in a real situation, in a passive thermographic approach.

Our work is divided into three distinct parts. First, a simplified model of a wind turbine blade was modeled with the COMSOL Multiphysics software. Second, a sample with defects like those of a wind turbine blade was studied in the laboratory using the pulsed thermography technique. This allowed the test of numerical methods of image processing created for the inspection of wind turbines. This numerical method is indented to allow the comparison of the blades of a wind turbine between them to detect defects. Finally, moving blades were observed by infrared camera in a wind farm.