

## Considerations upon Structural Health Monitoring of Small to Medium Wind Turbines

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**Abstract :** The small and medium wind turbines are running in quite different conditions as compared to the big ones. Consequently, they need also a different approach concerning the structural health monitoring (SHM) issues. There are four main differences between the above mentioned categories: (i) significantly smaller dimensions, (ii) considerably higher rotation speed, (iii) generally small distance between the turbine and the energy consumer and (iv) monitoring assumed in many situations by the owner. In such conditions, nondestructive inspections (NDI) have to be made as much as possible with affordable, yet effective techniques, requiring portable and accessible equipment. Additionally, the turbines and accessories should be easy to mount, dispose and repair. As the materials used for such unit can be metals, composites and combined, the technologies should be adapted accordingly. An example in which the two materials co-exist is the situation in which the damaged metallic skin of a blade is repaired with a composite patch. The paper presents the inspection of the bonding state of the patch, using portable ultrasonic equipment, able to put in place the Lamb wave method, which proves efficient in global and local inspections as well. The equipment is relatively easy to handle and can be borrowed from specialized laboratories or used by a community of small wind turbine users, upon the case. This evaluation is the first in a row, aimed to evaluate efficiency of NDI performed with rather accessible, less sophisticated equipment and related inspection techniques, having field inspection capabilities. The main goal is to extend such inspection procedures to other components of the wind power unit, such as the support tower, water storage tanks, etc.

**Keywords :** structural health monitoring, small wind turbines, non-destructive inspection, field inspection capabilities

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