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Characterization of the Mechanical Influence of Comparative Vacuum Measurement (CVM) Sensors in the Context of Structural Health Monitoring (SHM) Systems

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Due to the rising number of fiber-reinforced plastic (FRP) parts in industry, nondestructive testing (NDT) as well as structural health monitoring (SHM) is becoming increasingly important to detect damage and to guarantee structural safety. Both methods have in common that the same damage types have to be detected. In the first case the damage evaluation is performed during maintenance whereas in the second case the status of a structure is monitored during service. Therefore this paper describes typical defect types and gives an overview of the main NDT and SHM methods, before a new SHM method is addressed and described in detail. The comparative vacuum measurement (CVM) method is described in detail. The main advantages of this method are the low sensor costs as well as the applicability to complex geometries and structures together with a simple data evaluation. The main drawback is the mechanical treatment of the substrate. Patterns of small holes have to be drilled into the structure and may have an effect on its mechanical properties. Therefore tensile tests with a typical hole pattern are performed and the local strain distribution around the holes is investigated using a stereo correlation measurement system. The obtained experimental results should build a base for the application of such SHM networks on larger structures.

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Ключевые слова:

Содержание

Abstract
Introduction
Comparison of SHM and NDT methods
Influence of mechanical treatment for CVM measurement technique
Conclusion and outlook