Код: 10800

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Using Embedded Electrical Grid for Active Thermography Diagnostics of Composite Structures

Дрезден, Германия, 2012 год

8 стр; формат: 23,5 x 16 см; библиографический список: 7 единиц

Thermovision techniques, which are generally used in manufacturing industry for process control, were for a long time limited by low measurement sensitivity and poor possibilities of fast, high frequency data acquisition. As soon as these problems were overcome, thermovision cameras became a valuable tool for damage diagnostics.

Thermovision based structural health monitoring techniques dedicated for composite structures are widely discussed by many researchers. The most popular approaches are: pulse-heating thermography, lock-in thermography, vibro-thermography and step-heating thermography. All these methods use external excitation in the form of thermal or mechanical vibration sources.

The thermal source used in the proposed method is a 3D electrical grid, embedded in the structure and composed of through-the-layer and surface-layer elements. The diagnostics are based on the fact that a small current applied to the grid generates a scattered thermal field corresponding to the grid layout. Loss of the adhesion between layers in a particular area is accompanied by simultaneous break of the grid conductors in that area. Consequently, the thermal field density in the damaged zone will be decreased. The effect of a forced temperature field is experimentally observed by a long-wave thermovision camera.

Доклад. 6-я Европейская конференция по мониторингу технического состояния сооружений, 2012. Редакция Кристиана Боллера.

Ключевые слова:

Содержание