Non-destructive evaluation of ceramic candle filters using artificial neural networks

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ABSTRACT

Ceramic candle filters play an important role in coal-based turbine system for a modern power plant. However, after exposure to the high pressure and high temperature in the gas turbine chamber, the effectiveness of the filters deteriorates over time. Their failure to perform may create catastrophic consequences for the multi-million dollar equipment downstream. A non-destructive evaluation procedure using artificial neural networks is proposed to examine the filters. In lieu of experimental data, the vibration signatures of filters damaged to various degrees are created by means of analytical simulation. Then, a feed-forward artificial neural network and a radial basis function neural network are built and trained to evaluate the signatures for the purpose of determining the filters' degree of deterioration. Good results are obtained and presented here. The application of the proposed procedure should not be confined to the ceramic candle filters alone. It is a general procedure that will find many applications on the evaluation of other structural components and engineering products in the industry.

KEYWORDS

Neural Network, Structural Identification, Non-destructive, Finite Element Methods.