

Fatigue Crack Growth Rate Measurement by Means of Classic Method and Acoustic Emission

Authors : V. Mentl, V. Koula, P. Mazal, J. Volák

Abstract : Nowadays, the acoustic emission is a widely recognized method of material damage investigation, mainly in cases of cracks initiation and growth observation and evaluation. This is highly important in structures, e.g. pressure vessels, large steam turbine rotors etc., applied both in classic and nuclear power plants. Nevertheless, the acoustic emission signals must be correlated with the real crack progress to be able to evaluate the cracks and their growth by this non-destructive technique alone in real situations and to reach reliable results when the assessment of the structures' safety and reliability is performed and also when the remaining lifetime should be evaluated. The main aim of this study was to propose a methodology for evaluation of the early manifestations of the fatigue cracks and their growth and thus to quantify the material damage by acoustic emission parameters. Specimens made of several steels used in the power producing industry were subjected to fatigue loading in the low- and high-cycle regimes. This study presents results of the crack growth rate measurement obtained by the classic compliance change method and the acoustic emission signal analysis. The experiments were realized in cooperation between laboratories of Brno University of Technology and West Bohemia University in Pilsen within the solution of the project of the Czech Ministry of Industry and Commerce: "A diagnostic complex for the detection of pressure media and material defects in pressure components of nuclear and classic power plants" and the project "New Technologies for Mechanical Engineering".

Keywords : fatigue, crack growth rate, acoustic emission, material damage

Conference Title : ICMSE 2014 : International Conference on Materials Science and Engineering

Conference Location : Amsterdam, Netherlands

Conference Dates : May 15-16, 2014