

**SUITABILITY OF MODERN OPTICAL METHODS AND  
STANDARD NONDESTRUCTIVE TECHNIQUES IN MONITORING  
OF DAMAGE DUE TO STATIC OR CYCLIC LOADINGS**

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**ABSTRACT** - In many cases, damage has a local character and it is based on development of cracks appearing around structural defects or geometrical notches. An identification of these areas and their subsequent monitoring requires a full-field displacement measurements carried out on the surfaces of objects tested. This paper presents an attempt to use the Electronic Speckle Pattern Interferometry (ESPI) and Digital Image Correlation (DIC) for damage evaluation and its monitoring on specimens made of the P91 steel, aluminide coated nickel super-alloy, and titanium alloy subjected to monotonic or cyclic loading.

In this work, also a development of fatigue damage was investigated using destructive and non-destructive methods in materials commonly applied in power engineering or automotive industry. The fatigue tests for a range of different materials were interrupted for selected number of cycles in order to assess a damage degree. As destructive methods the standard tensile tests were carried out after prestraining due to fatigue. Subsequently, an evolution of the selected tensile parameters was taken into account for damage identification. The ultrasonic or magnetic techniques were used as the non-destructive methods for damage evaluation in the case of steel. In the final step of the experimental program some microscopic observations were performed. The results show that ultrasonic and magnetic parameters can be correlated with those coming from destructive tests. It is shown, that a good correlation of mechanical and selected non-destructive parameters identifying damage can be achieved for the materials examined.