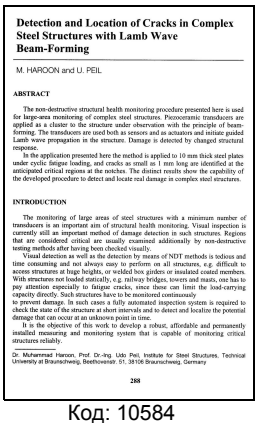

Detection and Location of Cracks in Complex Steel Structures with Lamb Wave Beam-Forming

M. HAROON and U. PEIL

ABSTRACT

The non-destructive structural health monitoring procedure presented here is used for large-area monitoring of complex steel structures. Piezoceramic transducers are applied as a cluster to the structure under observation with the principle of beam-forming. The transducers are used both as sensors and as actuators and initiate guided Lamb wave propagation in the structure. Damage is detected by changed structural response.

In the application presented here the method is applied to 10 mm thick steel plates under cyclic fatigue loading, and cracks as small as 1 mm long are identified at the anticipated critical regions at the notches. The distinct results show the capability of the developed procedure to detect and locate real damage in complex steel structures.

INTRODUCTION

The monitoring of large areas of steel structures with a minimum number of transducers is an important aim of structural health monitoring. Visual inspection is currently still an important method of damage detection in such structures. Regions that are considered critical are usually examined additionally by non-destructive testing methods after having been checked visually.

Visual detection as well as the detection by means of NDT methods is tedious and time consuming and not always easy to perform on all structures, e.g. difficult to access structures at huge heights, or welded box girders or insulated coated members. With structures not loaded statically, e.g. railway bridges, towers and masts, one has to pay attention especially to fatigue cracks, since these can limit the load-carrying capacity directly. Such structures have to be monitored continuously to prevent damage. In such cases a fully automated inspection system is required to check the state of the structure at short intervals and to detect and localize the potential damage that can occur at an unknown point in time.

It is the objective of this work to develop a robust, affordable and permanently installed measuring and monitoring system that is capable of monitoring critical structures reliably.

Dr. Muhammad Haroon, Prof. Dr.-Ing. Udo Peil, Institute for Steel Structures, Technical University at Braunschweig, Beethovenstr. 51, 38106 Braunschweig, Germany

Код: 10584

M. Haroon, U. Peil

Detection and Location of Cracks in Complex Steel Structures with Lamb Wave Beam-Forming

Издательство DEStech Publications, Lancaster, 2010 год

6 стр; формат: 23,5 x 16 см; библиографический список: 13 единиц
ISBN: 978-1-60595-024-2

The non-destructive structural health monitoring procedure presented here is used for large-area monitoring of complex steel structures. Piezoceramic transducers are applied as a cluster to the structure under observation with the principle of beam-forming. The transducers are used both as sensors and as actuators and initiate guided Lamb wave propagation in the structure. Damage is detected by changed structural response.

In the application presented here the method is applied to 10 mm thick steel plates under cyclic fatigue loading, and cracks as small as 1 mm long are identified at the anticipated critical regions at the notches. The distinct results show the capability of the developed procedure to detect and locate real damage in complex steel structures.

Ключевые слова:

Содержание.