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Ultrasonic Fields and Inspection of Huge Complex Composites

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Abstract

Reliability and effectiveness of widely used composites results in a significant demand for ultrasonic nondestructive testing. In this paper, an ultrasonic field calculating model is described for composite material. Focal distance, beam spread of transmitted ultrasonic field can be obtained by measuring transmitted ultrasonic filed. The principle of ultrasonic transmission method for non-destructive testing of equivalent elastic modulus is discussed based on elaborating the elastic modulus theory. Because parts of complex surface to be detected are usually parts with variable thickness. After analyzing the disadvantages of current testing method, an improved real-time sensitivity adjusting method based on stable amplitude is presented. In order to guarantee more ultrasonic signals transmitted through composites, the sound axis of transducer should always keep consistence in normal plane of curved surface. A twin-robot testing system is set up to inspect the complex surface automatically by ultrasonic transmitted way. The experimental results above is effective and feasible for nondestructively ultrasonic testing huge complex composites.

Keywords: Ultrasonics, composite material, acoustic field, twin-robot, curved sample