Diploma thesis abstract

Laser-ultrasonic diagnostics of residual stresses in metals under thermal influences

Student of 225м group Radionov Maksim Anatolievich

Academic adviser: d. p.-m. s. associate professor A.A. Karabutov

This paper discusses the problems associated with the use of laser-ultrasonic defectoscopy for the purpose of residual stresses in materials, namely the diffraction divergence of the probe beam.

The diagnostics of residual stresses by ultrasonic methods imposes the condition of high measurement precision, since even with stress values in metals close to the yield strength, the relative change in ultrasound velocity is 1 - 2%. So in used methodology of materials research it is important to record the time of registration came to the receiver scanning pulses, which is determined by the position of the peak of pulse. However, spreads in the material ultrasonic pulse is influenced by diffraction, and its maximum is shifted from the original position (on the coordinate axes of the running time), thus making an error in the measurement of material parameters.

The purpose of this work is not only a review of compensation methods of probing beams diffraction, but also the development of an experimental algorithm for the recovery and creation of a special program, which allows to process the signals of laser-ultrasonic detector in auto mode, and to compensate for diffraction beams, thereby increasing measurement accuracy. This program is written in the C++, demonstrates the efficiency of the proposed algorithm allows you to process real signals of a laser-ultrasonic detector. Testing of the algorithm and its verification is carried out by using a model gaussian pulse.

With established programs conducted compensation of signals of laser ultrasonic detector and defined measurement error of ultrasonic velocity introduced by the diffraction of the ultrasonic beam, for different materials, in particular for a sample with residual stresses. The error introduced by diffraction into the measurement of residual stress is determined.