

1.3.67. METHODS OF EXCITATION, FEATURES OF PROPAGATION AND FIELDS OF APPLICATION OF ULTRASONIC NORMAL WAVES IN FLAW DETECTION

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As is known, Lamb waves representing waves in layers with free boundaries with displacement both in the direction of propagation and normally to the free boundary, and transverse (shear) normal waves (SH-waves) representing waves in layers with free boundaries, where motion occurs normally to the direction of propagation and in parallel to free boundaries, are referred to normal waves in elastic layer (plate). In the paper, dispersion distortions of propagating pulses of normal waves are examined. It is demonstrated that two main methods are used for excitation of normal waves: piezoelectric method, where excitation is performed through the layer of coupling liquid or using dry point contact (contactless), and electromagnetic-acoustic (magnetostriction or electrodynamic) one. Considered waves are featured by the dispersion nature of their phase and group velocities, which predetermines their occurrence and existence in from the form of symmetric and asymmetric modes at some relationships between layer thickness, frequency and parameters of area, where ultrasonic (US) oscillations are excited.

It is demonstrated that dispersion is manifested as modification in the nature of US oscillation amplitude and pulse length attenuation. It is established that pulse amplitude of Lamb waves and SH-waves excited on horizontal sections of dispersion curves of phase velocities varies under the $1/\sqrt{R}$ law and is determined by the divergence of US oscillation beam. Variation of pulse length in this case is negligibly small. For steep sections of the dispersion curves of phase velocities of the waves of both types, pulse amplitude varies under the law from $1/\sqrt{R}$ to $1/R$, while variation of pulse length bears optimal nature.

Examples of implementation of excitation methods for ultrasonic normal waves are presented; recommendations on selection of working sections on dispersion curves are given; effect of dispersion distortions of the US normal wave pulses on resolution and selection of insonification base during flaw detection of elongated articles is marked out.