1.3.68. STRUCTURAL NOISE AS A NORMATIVE PARAMETER AT THE ULTRASONIC NONDESTRUCTIVE TESTING

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The report content can be interesting for a wide range of specialists in metals' ultrasonic nondestructive testing. The results of the following are submitted in the report:

– investigations on a battery of methods and means of ultrasonic structuroscopy of metals, including cast iron;

– monitoring of dynamics of strength properties changes of metallic configurations and their reliability forecasting on the basis of analysis of structural noise statistical parameters occurring at the ultrasonic nondestructive testing.

Ratio signal/noise is widely utilized at the ultrasonic flaw detection of metals as a criterion of flaw detection of a unit under test. In the structurescopy of a cast iron the ratio signal/noise is used for information criterion for the assessment of the sphericity of graphitic inclusions. But there are units under test for which the structure assessment is difficult to be done due to the absence even of the first ground signal. In this case, though the ultrasound attenuation in the cast iron is high (i.e., big gage), the data on the structure can be pulled out from the structural noise, which at the cast iron testing, always takes place. Average amplitude meaning of structural noises (1) depends on the longitudinal wave velocity in the metal and dissipation and absorption factors, i.e. structural sensitive acoustic parameters, utilized for the cast iron structure assessment. Radio engineering processing methods application to the structural noise signal brings to significant increase of the self descriptiveness.

The report introduces the following suggestions: for both integral and spatially localized parameters definition of the structural noise and for their monitoring as well the set of statistical timing and frequency functions, such as correlation noise functions, Fourier spectra transform, Gabor transform, wavelet transforms both in standard and original baselines, integral correlation and sliding correlation spectra.

The results of various spatio-temporal methods of reflection differentiation from the structure utilization are also outlined in the report. They facilitate to carry out quantitative and qualitative analysis of the structural clutter behavior.

The analysis of the set of acoustic reflections from the structure components behavior shows that the structural noise behavior, fixed in the spots of defects origin and development, change.

Besides, if the metal structure changes, the behavior of the reflected from the structure of cumulative signal, changes as well, which facilitates to carry out a dynamical monitoring of the metal status during the process of product life cycle, working in the conditions of dynamic, climatic or radiation loading.

References:

1. **Ermolov I.** Theory and practice of ultrasonic testing. – Moscow: Mashinostroyenie, 1981. – P. 156.