1.3.41. TECHNOLOGY AND EQUIPMENT FOR ACOUSTIC TESTING THE EXTENDED OBJECTS OF OIL-EXTRACTING INDUSTRY

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The new progressive technology of acoustic testing of oil-extracting industry extended objects with length surpassed the cross-section sizes in 100 and more times (pump rods, pump-compressor pipes etc.) is presented. The developed technology is based on the use of waveguide effects and assumes the choice of a wave with minimal velocity dispersion (rod wave for the bars testing and torsion wave for pipe testing) and maximal offset from interfering wave types (изгибная, symmetric and antisymmetric of higher orders).

The areas of testing object with the change of mechanical impedance $Z = S\rho C$ (S – cross-section area, C – wave velocity, ρ – density) and the areas containing stress concentrators are the sources of echo-pulses. The first are scabs, folds, inclusions, shrinkage cavities, thinning, variations in wall thickness, corrosive damage, mechanical damages, the second – cracks, hair seams etc. Mechanical effect of acoustic pulses on the extended objects is similar to operational stresses (for example stretching-compression strain for the pump rod at a chink operation is analogical the strains attendant the rod wave propagation. It allows to increase the sensitivity to defects, simplifies their identification and danger estimation. Thus it is possible to approve that the defects detected by this technique are the most dangerous, inclined to development at operation and can become the reason of breakage of a pump rod column.

The technology uses the variant of echo-pulse technique from the ends of extended object, thus doesn't demand scanning, additional surface preparation and application of coupling liquid or immersion environment. Method has high productivity of the equipment realizing technology, makes up to 1000 pieces or about 10 km of length and equally high sensitivity to dangerous internal and surface defects.

The technology of acoustic testing of extended objects is used for development the installations for oil field equipment diagnostics: acoustic defectoscope of the pump rods ADNS, acoustic defectoscope of the pump-compressor pipes ADNKT has been implemented at close corporation in the pump rod repair bays of public oil-extracting enterprises of Russia ("Tatneft", "Belkamneft", "Lukoil. West Siberia" etc.); acoustic defectoscope of the rods (ADP) has been implemented the works of oil field equipment (Perm, Russia, Aktjubinsk, Kazachstan) for incoming inspection of the pump rod billets.

About 200 thousand both new and second-used pump rods have passed service for five years of industrial using of acoustic testing and hardenings complex technology in "Belkamneft". The pump rod column failure reduced in 3.5 times and the failure number was established at a level 60 – 70 one year.