

1.7.12. DIAGNOSING OF ROLLING STOCK DETAILS AND WAY DESIGNS BY ACOUSTIC EMISSION TECHNIQUE

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Train motion safety depends first of all from the defect absence in equipment of trains, railway and artificial constructions (bridges). New techniques based on the Acoustic Emission (AE) method allow to increase the reliability of these elements. Its advantages are decrease of human factor influence on the testing results, exception of time-consuming scanning process, the possibility of testing large-sized structures with complex geometry in corpore, testing process automation, accumulation and documenting of the information on testing results.

AE technique and tensometry are used for inspection of the details of metal bridge spans. AE signals registration is carried out under the load produced by trains passing the bridge. The diagnostics of longitudinal supporting girders of the railroad bridge across the Ob-river are carried out during 2000 – 2006 years. The presence of both fatigue defects detected early as new advancing cracks with early growth stage is confirmed. The future prospect of the suggested method allows creating of the system for continuous monitoring of the main bridge elements technical state.

The method of AE signal registration in the railways on the bridge in conditions of high mechanic and electromagnetic noise is developed. The adequacy of deformation mode level produced by passing train weight is justified. It is shown, that it is necessary to carry out the rails AE diagnostics during the train approaching towards the rail and after train leaving from the rail. The developed way is patented and the technique is applied for diagnostics the rails on the bridge across the Ob-river.

The AE technique is used for increasing the reliability of nondestructive testing of rail welded connections in conditions of rail welded plant. Here testing of welded areas is being carried out under thermal stress changing while welding seam cooling. The series of experiments resulted in AE signals and their processing allowed revealing the regularities in AE parameters inherent to the various defects (cracks, shrinkage cavity, wormhole, burning, spill, rolled kink, voids, slag inclusions and so on). The technique for AE testing of rail welded connections was prepared on the basis of the obtained results. This method has been approved at the rail-welding works.

AE automated diagnostic installation is developed for revealing defects advancing in car wheelset pairs under static loading. Loading is carried out by hydrocylinders on both axle journals and lateral pressure on a wheel treads. The installation tests are carried out in car repair depot and 35 second-used wheelset pairs are inspected, the defect presence is confirmed by other non-destructive methods in 34 cases.

The results of AE technique development for diagnostics of freight-car truck cast details (solebars and bogie bolster) are presented. The technology of service life prolongation for the cast details which have worked 30 years and more is described. These AE equipment are installed in 104 car repair depots. The information about the volume of tested articles, rejection percent, testing productivity at the roads of Russia are given.