DEFECTS ANALYSIS BASED ON RESULTS OF MULTI-CHANNEL PERIODICAL TESTING

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On the Russian railways, continuous testing of rails is carried out by flaw detection carts moved by the operators (at a speed of up to 5 km/h), flaw detector cars (up to 60-80 km/h) and high-speed (up to 100-120 km/h) flaw detection complexes. Multichannel rail flaw detection system use several non-destructive testing methods at a time: ultrasonic, magnetic-dynamic, eddy current, visual, etc. In the course of periodic rail flaw detection, it is difficult to monitor the state of rails and track the trend of defect development simultaneously over a large number of channels and signal parameters from the defects. To solve this problem the authors suggested using a generalized (integral) parameter Kint of the defect, which takes into account the basic characteristics of signals from defects simultaneously in all channels (methods) of control. The development of real defects in the rail head at multiple testing (up to 17 times) has been analyzed using the integral parameter. It turned out that signals from transverse cracks in the rail head can become critical in sized in a short time (up to 1 - 4 months). They are the most dangerous defects due to the possibility of a sudden break in the rail. The increase of the longitudinal cracks in the rail head occurs rather slowly over time (up to 4 years). Application of integral parameter Kint of the defect will allow: 1) Taking into account all the main informative parameters of signals from the defects (conditional length ΔL, number N and amplitude Ai of the reflected echo pulses, number M of channels with the signals of the defect) with the use of a generalized parameter presented as a simple numerical value. 2) Estimating the danger of signals from the defects based on the objective (digital) value Kint simultaneously on all channels of the flaw detector, rather than by a subjective method (visual analysis by operators of different qualifications and errors caused by the “human factor”). 3) In the course of regular control, monitoring the development of defects by plotting the dependence Kint over time (by months). 4) Separate dangerous transverse cracks in the rail head and non-dangerous longitudinal delaminations (according to the rate of increase in the dependence of Kint over time). 5) Increasing the efficiency and performance of the “manual” (visual) and automatic analysis of the resulting multi-kilometer rail scanning defectograms.