MODERN TECHNOLOGIES AND MEANS OF FLAW DETECTION OF RAILS

COВРЕМЕННЫЕ ТЕХНОЛОГИИ И СРЕДСТВА ДЕФЕКТОСКОПИИ РЕЛЬСОВ

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Abstract: It’s already known, that the modern means of flaw detection allow to successfully reveal the dangerous flaws in rails. The increasing speed of railway traffic requires new approaches to the technology and methods of rail testing.

Keywords: flaw detection of rails, modern technologies

The modern computer technology and IT technology allow to considerably improve the whole system of rail condition testing, as well as processing and registration of information. The developers of methods and testing means study in depth the problems of integrated evaluation of rail condition and the automation of receiving the rail quality results.

The basis of complex rail condition evaluation system consists in including different flaw detection means, each with its own technological purpose, in the evaluation process. But all these means should be united by the integrated database, integrated data processing and decoding module, and should have the interactive data exchange with each other and the Diagnostic Centre. Therefore one of the major tasks of the complex evaluation system is the interaction of all the testing facilities and what is very important the complimenting of each other.

We would like to introduce an approximate structure of complex rail evaluation system based on modern flaw detection equipment, produced by RDM SPE (pic.1).

- Mobiles means of flaw detection (for example, a combined magnet-ultrasonic flaw detector car “RDM-VIGOR” or the motor-rail car for the primary testing).
- Two-line flaw detector UDS2-RDM-23 as the primary and secondary expert means of testing and monitoring rails.
- One-line flaw detector UDS2-RDM-12, as the secondary means of testing, including also testing of turnouts.

The primary means is the flaw detection system which during continuous testing collects the major volume of information about the rail condition. It makes up about 80% of information, which is received by the united database after processing and decoding.

The secondary means is a flaw detector, which should test the untested railway portions, due to, for example, the loss of acoustic contact, and the verifying testing of certain railway portions. Moreover, a continuous testing of low-active railway portions can be realized.

“RDM-VIGOR” (pic.2) is a flaw detector car of new generation, equipped with hardware and software complex APKM-14, which detects and reveals the flaws in rails both with ultrasonic and magnetic methods. There are employed systems of video control of the upper rail structure and the rail surface condition. The flaw detector car is equipped with a unique non-contact tracking system with magnet centering, which is mounted on all our mobile means. The construction of the tracking system has been developed and patented and during several years of service it has proven its high operational abilities. The testing speed of such flaw detector car is up to 60 km/h. For speed over 60 km/h the flaw detector car should be additionally equipped with a special carriage for high-speed testing.

The detachable ultrasonic two-line flaw detector for continuous testing UDS2-RDM23 (picture 3) combines modern achievements of electronic and acoustic technics including the new sounding circuits on the basis of 28-channel electronic unit. This allows to construct various sounding circuits depending on the set goal. As the devices are being exported into different countries, where the technology of testing differs, we adapt the device’s operation to the requirements of each specific customer. It concerns the interface language of the flaw detector and the parameters of testing. In particular, UDS2-RDM23 is now being operated on the railways of Russian Federation, Latvia, Lithuania, Georgia and Kazakhstan. We render assistance in introduction of the devices, teaching of operators and decoders. We also offer a life-circle software upgrading for our flaw detectors free of charge.

Another our serial device of secondary testing is a one-line flaw detector UDS2-RDM12, developed for testing of rails, turnouts and welded joints (pic.4). In the sounding circuit and software aspects this flaw detector is analogous to UDS2-RDM23. This device is being successfully operated on railways of CIS countries, Baltic countries and Poland.

The portable flaw detector UDSM2-35 (pic.5) is intended for testing of welded joints, both aluminothermic and electrocontact. The memory of the flaw detector is packed with settings in accordance with the technological instructions for testing joints. The operator connects the appropriate transducer and sequentially chooses the necessary setting of testing of the welded section, therefore reducing the testing time.

The flaw detectors are connected to the system of global positioning GPS/Glonass and ensure the possibility to transfer the data using GPRS system with any mobile operator. The flaw detectors are equipped with a GPRS modem, therefore, the operator can easily transfer the testing data (the whole testing record or a partial record of rail portion) to the diagnostic center.
The GPRS-based connection system forms a two-way digital communication path between the flaw detector’s electronic unit and the server of the defectogramm decoding center. It does not require extra actions from the operator.

The architecture of data transfer includes:
- electronic unit of the flaw detector, which includes a modem with inserted SIM-card of your GSM-operator;
- server, located in the diagnostic center, with pre-set database software and connected to the broadband Internet;
- client’s workplaces – PCs, connected to the server using local network and used as workplaces for the defectogramm decoding.

A special hand-operated scanner for a specified testing with a manual piezo transducer is a great help for operators (pic.6). The scanner is included in the basic hardware and during testing allows to determine the conditional size of the flaw and its location in the rail. At the same time there is formed a record of testing in the form of projection on the surface of piezo transducer scanning defectogramm of the scanned rail portion. This record can also be sent to the diagnostics center (pic.7).

Peculiarities of the complex rail testing method using modern flaw detection means produced by “RDM”:
- integral software for registration of information and decoding of defectograms;
- the possibility of setting up an electronic flaw database,
- the possibility of creating a closed cycle of testing;
- the possibility of transferring data using GSM connection, which allows to create an integral system of supervision from the decoding center over both flaw detection devices and flaws in rails, as well as the possibilities of supervision for the specialists who have access to the database.
- the possibility of automatization of the testing data process.

The presented system of complex rail condition evaluation allows to change completely the way the testing of rails being performed:
- to increase the efficiency and reliability of testing, to automate the formation of a qualitative rail condition evaluation;
- to reveal the existing problems in the testing technology, to reduce the “human factor” impact;
- to unify the calculation of testing periodicity;
- to eliminate the reason of incorrect periodicity calculations and to reduce the working hours;
- The system can integrate with and complement the existing testing system.
Fig. 3 Ultrasonic flaw detector UDS2-RDM-23

Fig. 4 Ultrasonic flaw detector UDS2-RDM-12

Fig. 5 Ultrasonic flaw detector for secondary testing UDS2M-35

Fig. 6. Scanner

Fig. 7 Report of the verifying testing obtained, using scanner