ENSURING RELIABILITY OF FREIGHT CARS FOR THE PERIOD OF THEIR TURNOVER

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ABSTRACT

Data of system analysis enabled the authors to identify main factors influencing technical condition of freight cars during their operation and, accordingly, pacing factors of traffic safety. At the same time measures are proposed that would change the existing order of inspection and maintenance of rolling stock, improve technological procedures and reduce the number of failures of car equipment.

Keywords: railway, freight car, security, turnover period, technical diagnosis, continuous monitoring, system organization, trouble-free operation.

Background. *Railway rolling stock requires at all times of its operation continuous monitoring by means of technical diagnostics. Problems of diagnosis are particularly acute when with increasing speeds and weight of trains, increasing the axial load required parameters have reached the limits and consequences of accidents are becoming more serious and even catastrophic [1].*

Pic. 1 shows an existing scheme of service maintenance of freight cars in operation.

PTT – points of technical transmission, CP- checkpoints, MWCR – mechanized ways of car repairs, SMP AF- arrival fleet of service maintenance point, FY – formation yard, SMP DF- departure fleet of service maintenance point, PCT- points of preparing cars for transportation.

Objective. *The objective of the authors is to consider existing system of technical diagnostics of freight cars.*

Methods. *The authors use mathematical and engineering methods, analysis, evaluation approach.*

Results. *Analysis of existing system of technical diagnostics of freight cars in operation allows identifying main factors affecting traffic safety.*

1. Over two hundred means of technical diagnosing of cars are known, including non-destructive testing. However, almost all are located on the approaches to stations or are used on the route. But they are not found in areas of preparing cars for transportation (hereinafter- PCT) and maintenance. Wherein the control is based on the technique, not technology, as it should be. Methods of assessing the technical condition are designed for individual units and parts, although it is necessary first of all to control integrated diagnostic parameters that define working efficiency of rolling stock as a whole [2].

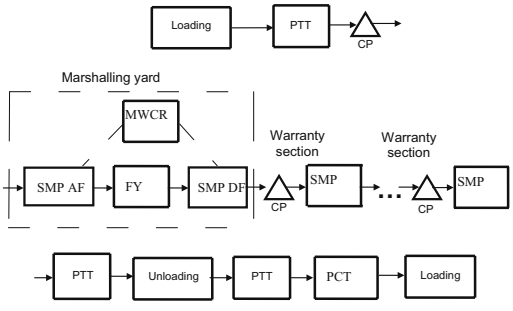
2. Most of failures of freight cars account for failures of wheel sets (48,5%). Half of them (non-uniform rolling, slide, chip, metal displacement on tread surface, crack of rim) are associated with technical state of braking equipment (Pic. 2). And a special feature: eliminating some fault, brake defect is usually ignored. During current uncoupling repair (hereinafter- CUR), as a rule, a failed part or assembly unit is replaced, without removing the cause of failure. As a result, the car is doomed to re-appear by repairmen.

3. The greater part of faults of wheel sets is connected with a thin flange with attributable gradual failure (wear). Most gradual failures are detected in loaded cars (thin flange, uneven rolling, thin rim), though these cases are to be detected on PCT and prevent arrival of loaded cars at CUR.

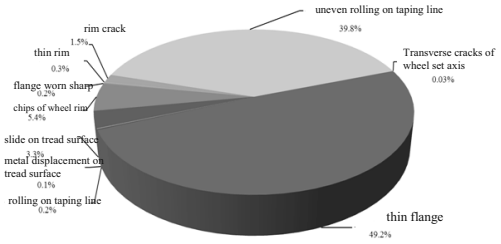
To increase safety of transportation process, taking into account marked points, a number of organizational and preventive measures is offered, which are designed to regulate the consistency of technical diagnostics and elementwise technological ties.

1. To take into account relationship of various malfunctions during detection in the process of maintenance. If defects are present on the surface of wheel sets, flaw detection of molded pieces of bogies is performed. Repeated failure due to wear of flanges all controlled sizes of molded pieces of bogies and axle-box bodies are checked, the degree of parallelism of wheel set axles in the bogie is identified. Detection of cracks in the automatic coupler body demands revision of technical condition of the draft device, etc. [3].

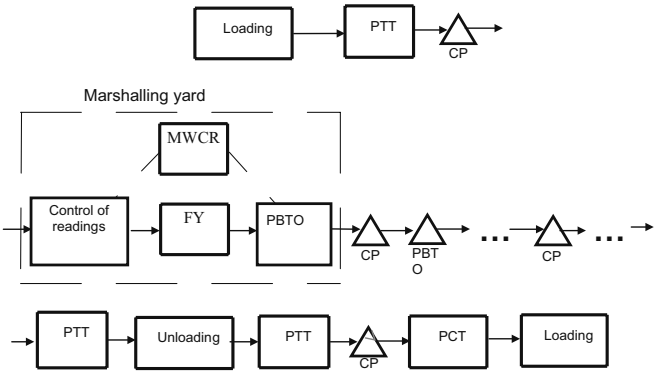
2. It is necessary to distinguish between sudden and gradual failures. Sudden failures are such as slides, metal displacement, destruction of axle bearing, fractures of molded pieces of bogies, arise suddenly and immediately, but in some cases can be prevented in the preparation of cars for transportation due to timely testing of automatic brakes, flaw detection of components and introduction of technical diagnostics [4]. With regard to gradual failures of wear and fatigue nature of loaded



Pic. 1. Existing scheme of service maintenance of freight cars in operation.



Pic. 2. Failures of wheel sets of freight cars.



Pic. 3. Long-term scheme of maintenance of freight cars.

cars for the period of turnover, they should receive preventive barriers at PCT through a comprehensive diagnosis. Therefore it is necessary to equip PCT and maintenance points with full-fledged means of detection, prevention and possible elimination of gradual failures in operation. This is meant to go from guarantee sites to guarantee of failure-free operation for the period of turnover of freight cars.

3. In order to prevent failures of cars caused by failures of braking equipment it is proposed to begin to improve the system in the first place on maintenance points (hereinafter – MP). Namely, brake network charging and check of density should be performed from permanent installations type UZOT-R or UKTP and complete testing of brakes – from locomotive. This will allow to provide train conditions (which means «full») and to reduce time for maintenance of brake equipment.

4. En route should be placed wayside devices to detect overheated axle boxes, wheel defects, drawing details, violations of overhead clearance (KTSM-2-B, K, V, G), as well as other equipment, which controls sudden failures [5]. On PCT and mechanized maintenance points of cars (hereinafter – MMPC) it is necessary to introduce technical diagnostic of wear and fatigue defects of type «Complex» for non-contact measurement of geometrical parameters of wheel sets, a post of acoustic control (hereinafter-PAC) for defect detection of axle boxes at an early stage of their development, device for control of the angle of attack of wheel on rail (hereinafter – AAWR) for comprehensive evaluation of the technical state of undercarriages of cars and non-parallelism of wheel set axles of bogies, equipment for draft device diagnostics (EDDD) and others [6].

5. Development of a fundamentally new and reasonable maintenance system will ensure trouble-free operation of a freight car. It is proposed to perform a comprehensive testing of technical state at PCT before loading. At receiving yard instead of the continuous inspection of the car it is advisable to confine to control test of readings. At departure yard regulated works on preparation and testing of brakes are to be performed. Functions of MP for control of cars and current repairs must be carried out on PCT. En route only points of brake test operation (hereinafter – PBTO) and checkpoints equipped with technical means for detection of unexpected failures (hereinafter – CP). Pic. 3 is a perspective diagram of maintenance of freight cars for the period of their turnover, where PTT are points of technical transmission, MWCR – mechanized ways of car repairs, FY is a formation yard.

Conclusion. *Implementation of proposals will help to ensure trouble-free operation of freight cars, which in turn will contribute to the safety and reliability of transportation process.*

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