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COMMON DEFECTS IN WHEELSETS OF FREIGHT WAGONS AND METHODS FOR THEIR TECHNICAL INSPECTION

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Annotation. This article examines the common technical defects that occur in the wheelsets of freight wagons during operation, as such wheelsets constitute the most critical running components of the rolling stock. The causes behind the development of uniform tread wear (prokat), flat spots (polzun), and built-up areas, as well as their correlation with the operation of the wagon's pneumatic braking system, are analyzed. Furthermore, the paper provides a detailed explanation of the rules for inspecting wheels using simple visual and acoustic (hammer-tap sound test) methods under the conditions of the Tashkent Wagon Depot and intermediate railway stations. The findings demonstrate that early detection of wheel defects significantly reduces the risk of main-line derailments and track damage.

Keywords: freight wagon, wheelset, defect, flat spot, technical inspection, hammer-tap test, safety, Tashkent Wagon Depot.

1. Introduction

In railway transport, the wheelsets of freight wagons bear the highest share of static and dynamic loads and remain in constant contact with the rails, making them the most critical components of the rolling stock. The operational safety of the wagon, its resistance to derailment, and ride smoothness depend directly on the technical condition of these wheelsets.

Today, increasing freight volumes and heavier train configurations have substantially heightened the mechanical stresses imposed on wagon wheels. Consequently, various mechanical defects, fatigue wear, and microcracks develop on the wheel tread surfaces during service. Since trains halt at intermediate stations for relatively short intervals, car inspectors must perform rapid and highly reliable technical checks. Properly organizing this inspection process and identifying basic defects in a timely manner serves as the fundamental cornerstone for preventing major railway accidents on main lines.

2. Materials and Methods: Common Wheel Defects

During the operation of freight wagons, intensive friction against the rail head and the gripping force of brake shoes generate three primary types of common defects on the wheel tread surface:

1. Uniform Tread Wear (Prokat): This refers to the gradual wearing away of the wheel tread running surface due to continuous rolling friction against the rail. While this is a natural wear process, if the depth of the wear exceeds permissible standards, the wagon begins to deliver severe dynamic impacts to the rail joints (fishplates), accelerating track degradation.
2. Flat Spot (Polzun): This defect occurs when a train undergoes abrupt emergency braking or when a malfunction arises in the pneumatic brake system (such as in the model 483 air distributor), causing the wheelset to lock up entirely (*wheel slide*). As the locked wheel skids along the rail surface, intense friction grinds a flat, localized spot onto the tread. Consequently, when the wagon resumes rolling, it produces a distinctive, heavy rhythmic pounding sound.

3. Flange Wear (Grebny): When a heavy freight train navigates sharp curves (curved track segments), the lateral edge of the wheel flange (reborasi) presses hard against the inner side of the rail head. This severe lateral interaction leads to rapid abrasive wear, resulting in a thin, critically sharp wheel flange.

3. Results and Discussion: Simple Inspection Methods

Inspecting wheelsets at station tracks or upon arrival at the Tashkent Wagon Depot does not require expensive or overly complex electronic diagnostic equipment. In practice, two simple, time-tested, and highly effective methods are utilized:

- Acoustic Method (The Hammer-Tap Test): Immediately after the train comes to a complete stop, the car inspector walks along the track and strikes the wheel plate and rim individually using a specialized long-handled inspection hammer. This method relies directly on the principles of acoustic physics: a structurally sound wheel free of hidden internal defects emits a clear, high-pitched, and sustained metallic ring. Conversely, if there is a concealed internal crack or if the wheel center has shifted on the axle, the emitted sound becomes dull, brief, and muffled. Any wagon exhibiting such a muted acoustic response is immediately detached from the train for safety reasons.
- Measurement via Specialized Gauges: Whenever visual inspection raises suspicion regarding the extent of tread wear or flat spot depth, the inspector applies a standard steel profiling gauge directly to the wheel tread surface.

Defect Type	Permissible Limit (mm)		Corrective Action Required

		Critical Value (Hazardous Level)	
Uniform Tread Wear (Prokat)	Up to 7 mm	From 8 mm and above	Wheel turning on a lathe or replacement
Flat Spot (Polzun)	Up to 1 mm	From 2 mm and above	Speed restriction and transfer to depot
Flange Thickness (Greben	25 - 33 mm	Less than 24 mm	Immediate withdrawal from service

As indicated in the table, if a flat spot depth exceeds 1 mm, the wagon's movement is halted to prevent rail breakage from dynamic impacts. The wagon is then routed to the Tashkent Wagon Depot, where the wheelset is reprofiled on a specialized wheel-truing lathe to restore its perfect circular geometry.

4. Conclusion

Based on the analysis conducted, the following conclusions can be drawn:

1. Wheelsets are the primary mechanical components dictating both the operational safety of freight wagons and the structural integrity of the permanent way.
2. Conducting rapid technical inspections at station stops using a standard inspection hammer to evaluate acoustic resonance, combined with precise

gauge measurements, represents the most cost-effective, rapid, and field-proven diagnostic method.

3. Ensuring the timely and quality execution of these straightforward technical inspections completely eliminates the risk of freight wagon derailments on route, safeguarding the railway network from catastrophic infrastructure damages and financial losses.

References:

1. Asadchenko, V. R. (2018). *Parts and Repair of Wagons.* Moscow: UMC ZhDT.

2. Inoyatov, K. S. (2021). *Fundamentals of Wagon Production and Repair.* Tashkent: TSTU.

3. Yuldashov, A. A. (2024). *Freight Wagons of Uzbekistan Railways: Operation and Repair.* Tashkent.