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PROSPECTS FOR THE APPLICATION OF FRID EQUIPMENT IN RAILWAY TRANSPORT

Innovative development of railway transport involves increasing the efficiency of operation, maintenance and management of the railway industry [1].

One of the innovative solutions is the implementation of high-frequency marking systems for freight and passenger trains, railway tracks and transport hubs. With this method of radio-frequency identification (RFID) of objects, data is read or recorded using radio signals [2]. For the purpose of coordinated and uninterrupted operation of railway transport, the movement of all trains is controlled to form a common information system.

RFID equipment is an effective tool for creating tracking systems not only for locomotives, passenger and freight cars, but also for their constituent parts, for example, wheel pairs [3].

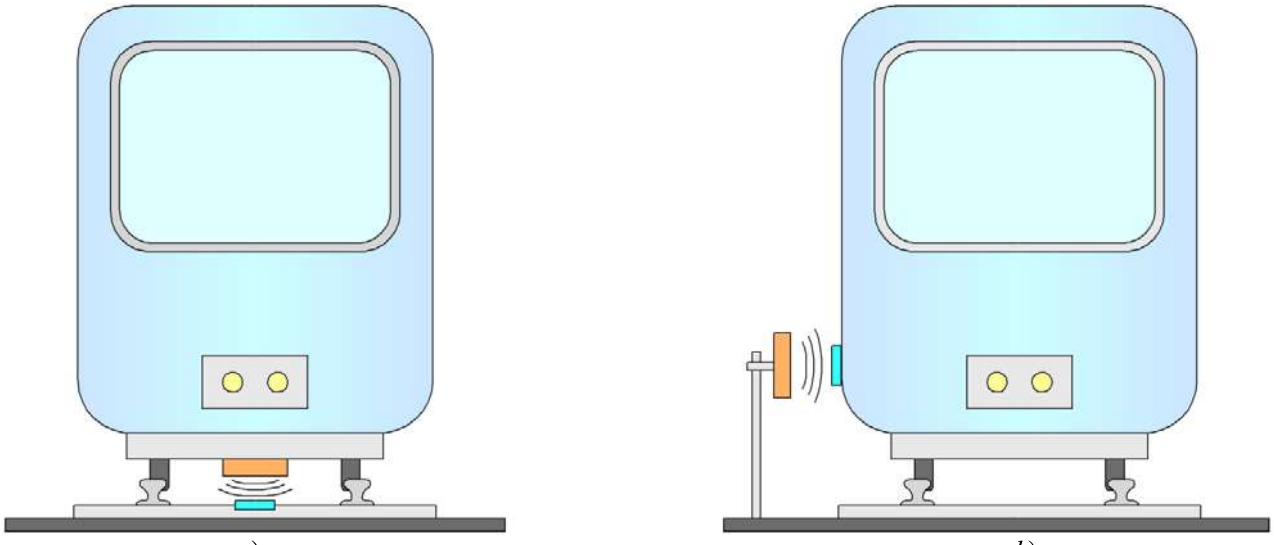
Placement of RFID equipment is possible both on rolling stock and outside rolling stock (along railway tracks) (Fig. 1).

The task of warehouse accounting is also effectively solved. One of the main advantages of RFID is the possibility of application in maintenance, repair and operation processes:

– service of railway transport operators;
– current and major repairs;
– rental and leasing of assets;
– identification and accounting of important spare parts.

The main characteristics of RFID components for use in the field of railway transport are:

– RFID tag scanning from a distance – range from a few centimeters to 20 meters for passive RFID tags, up to 60 meters for semi-passive and hundreds of meters for active RFID tags;
– lack of contact of the RFID tag with the reader or their direct visibility;
– unlimited lifetime of passive RFID tags;
– the possibility of storing information directly on the electronic tag and its reading;
– integration into the IT infrastructure of the enterprise, for this purpose all necessary interfaces are provided.



a) *b*)

Fig. 1 RFID equipment placement scheme:
a – on rolling stock; *b* – outside rolling stock

RFID equipment and RFID tags are designed to work in harsh operating conditions. Equipment and tags, depending on the task, have different parameters. In general, tags can be made:

– in different versions: in the case or in the form of stickers;

– with different levels of IP dust protection and moisture protection;

– with a different temperature range of operation;

– in a vibration-resistant design: resistant to transport vibration and impact.

The most general structure of the RFID system consists of:

– RFID tags that are attached to the identification object – the wagon or its components;

– RFID reader;

– RFID antennas.

The reader works either autonomously (it records the RFID tags with the time of detection, at the same time it can control a relay or a digital port), or under the control of a computer that is part of the IT infrastructure of the enterprise.

When it is necessary to identify the object on which the RFID tag is installed, the RFID antenna of the reader is activated (or the reader is always in polling mode), in response, the tag transmits a unique Electronic Product Code number or serial number of the TID tag, or additional data recorded in memory of the label, then the information is transferred to the computer, after which the system works according to the algorithms implemented in it.

Thus, the main advantage of using RFID equipment in the field of railway transport is obtaining real-time data on the state of critical elements during production, maintenance and delivery.

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PROSPECTS FOR THE APPLICATION OF SATELLITE NAVIGATION TECHNOLOGIES IN RAILWAY TRANSPORT

Currently, digital railway platforms are being actively developed, where intelligent transport systems have applications corresponding to them, and with the help of these applications, real-time control and exchange of information. Complex applications involve real-time data integration. The most requested information for trains and railway tracks is communication centralization and blocking devices, automation devices, control of rolling stock infrastructure [1].

An important role is played by ensuring interaction with intelligent rolling stock. Cloud architecture technologies allow you to create a data processing algorithm, perform subsystem analysis and simulation with data transfer between railway stations, highways and rolling stock [2].

Hardware and software of mobile communication systems in integration with satellite navigation technologies are highly reliable in operating conditions [3]. Wireless technologies are widely used in the system, which allow to quickly transfer information about the technical condition of individual components and assemblies without interfering with the design of the rolling stock. With the help of the GPS navigator included in the system, the location of the train is constantly determined with the indication of the nearest station. At the moment of approaching the end station, the information is transmitted via a wireless network to the depot server to the personnel responsible for the diagnostics of the rolling stock.

The following systems can be introduced into the complex of satellite technologies and technical solutions for railway transport:

– suburban transportation control system based on GPS satellite navigation data, which allows for operational control not only of the location, but also of the train traffic parameters;

– system for ensuring traffic safety during shunting operations and marshalling yards;

– planning, monitoring and analysis system that optimizes the management of repair and maintenance of the railway infrastructure;

– system of dispatch control over the performance of work on the efficiency of the use of mobile rail lubricants;

– dispatcher control system for special self-propelled vehicles;

– system for monitoring the deployment and decision support for the direction of recovery trains.