

USING OF RFID TECHNOLOGY IN MAINTENANCE MANAGEMENT

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Abstract: Automated data collection helps to improve the precision of decision-making processes. Currently, the radio frequency identification technology belongs to the most common application in the field of identification technology. In the world, the implementation of RFID technology is used in almost all areas of industry. RFID tags allow to use of the different products and materials applications. The article provides an overview of using this technology to record and register maintenance intervals of railway wagons. The application of RFID technology helps to avoid huge disasters and accidents caused by lack of information about the technical state of rail freight wagons.

1 Introduction

RFID technology uses radio waves for automatic identification and tracking objects to where the RFID tag is applied. RFID tags has stored various information necessary for the user and using a reader which transfers informations to the system [1, 2]. This aspect has a direct impact on the reduction of the human factor in the decision making processes and implementation of necessary jobs for technical checks of the condition of freight wagons and realise preventive inspections. RFID technology allows continuous monitoring of selected data and can point out, for example, the date of preventive examinations and other roadworthiness [3].

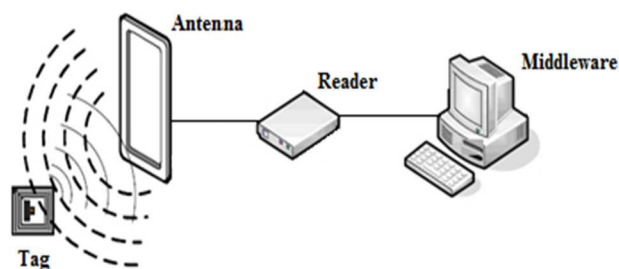


Figure 1 The components of the RFID technology

2 The current state of the maintenance of rail freight wagons

The main problem of rail freight is the failure of wagons used for this transport. Bad technical condition is caused by improper handling of the wagons during the period of operation. Every single

part of the wagon is influenced by other parts of the system and its surroundings during the period of use. These disorders cause the cars are excluded from the operation. Maintenance, care and repair of rolling stock are scheduled periodically or preventive. Unscheduled repairs occurs only if the failure is detected. When wagons operate, each of the loading stations perform accurate technical inspection activities, if a problem is found with any part of the wagon, the wagon has to be taken out of operation and transported to the nearest repair station. For the technical condition of wagons during the operation depend to employees responsible to do this technical control. If an error occurs, freight wagon that fault may result in malfunction or damage to other functional parts of the wagon. This can cause tragic consequence such as derailment of the trainset.

2.1 The consequences of inconvenient technical condition of wagons.

Consequences of that accidents are significant, except for the economic losses resulting from impassable transport hub (lost profits, penalties for late payment). There are also the material losses such as damage their rail freight wagons, rail switches, or the environment in the immediate vicinity of the accident. Sometimes it brings loss of life, as in the recent case, which has become on July 6, 2013 in Lac Mégantic in Canada (Figure 2), which was derailing train set [6]. This train was carrying dirty oil in tanks. The accident was caused by brake failure caused by air leakage in a derailment occurred explosions of five tanks and

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then the destruction of more than 30 buildings in the area where the explosion killed 42 people. Another example will be represented in the next accident. This train accident became on June 29, 2009, in Viareggio, Italy (Figure 3). The explosion occurred tankers carrying liquefied petroleum gas and killing 32 people [7]. The accident was caused by poor technical condition of the brakes and gearing. As indicated above, frequently the cause of such accidents due to bad technical conditions and in particular the wear of the brake system and components.



Figure 2 The accident in Lac-Mégantic [6]



Figure 3 The accident in Viareggio[7]

3 The current state of recording technical inspections

The registration of these technical inspections is based on direct entering the informations as to preformed place which is located on the right side of the wagon. The records include:

- Nb - date of lubrication of the brake system
- M - date of bearing lubrication chamber lubrication

- EVIC - date of visual inspection of the wagon wheelset axle

Location of these technical inspections, in the first column of the table shown in the figure 4.



Figure 4 The current state of recording technical inspections

The main disadvantage of the current registration of technical controls is related to the human factor. Consequences arising from the adverse impacts of human error can be eliminated by the application of the technologies of automatic identification. However, the proposal was chosen as applicable RFID technology.

4 Design of an application RFID tags as a replacement for the currently used method of keeping the service controls

RFID technology can be used for gathering all the information on the freight wagon. It is necessary to apply RFID tags resistant to the external environment. The rank of the tags is apparent from the standardized location reading device and on the left side plate in height of 1200 mm (Figure 5).

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Figure 5 Proposal for placement RFID Tag

In memory of the RFID tag will be stored information about the complete technical condition of the wagon about repairs and when they were done. The next periodic technical inspection and records of extraordinary repairs. The collection of this information will provide not only a complete overview of the technical condition of the rail freight wagons, but can summarily quantify the costs associated with servicing and operation of rail freight wagons. In addition to the technical inspection intervals RFID technology provides space for the complete collection of information on the wagon (identification interoperability, state code, custom wagon number, check digit can identify the sender, recipient and payer type of goods, the total weight) [4].

This application provides the possibility of direct connection RFID technology with enterprise information system of rail freight transport (Figure 6). For these applications, it would be appropriate to use two configurations of readers. Mobile readers should be used mainly for local operating wagons where the individual stations make changes of the information stored in the RFID tag as adjustments in the composition of the train or vehicle documents. Stationary sensors should be placed at the entrance and exit from the station [5].

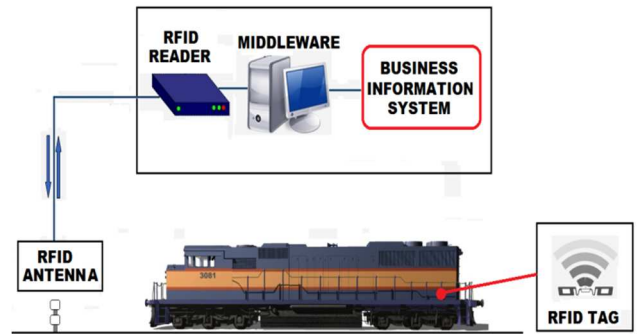


Figure 6 The scheme of the proposed application in conjunction with Business Information System

Conclusion

The biggest advantage of RFID applications can be reduction of accidents and improve the information flow. Based on the automated registration of technical condition, it can exclude wagons from the transport, which have already expired particular technical controls, respectively, in advance and in a timely schedule of this inspection. On this basis it is possible to eliminate situations that could arise from the bad technical condition of the wagon. The aim is to build a functional and modern network information flow and data collection to be used by operators of railway lines and reducing the number of accidents caused by the use of rail freight wagons in bad technical condition.

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