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TECHNICAL MEASUREMENT AND ANALYSIS OF THE IMPACT OF MAGNESITE DEPOSIT OF DUST ON THE READABILITY OF RFID TRANSPONDERS

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Keywords: RFID transponder, magnesite dust, measuremnt
Abstract: The present paper deals with experimental testing of the readability of RFID transponders in the sputtered magnesite dust layer under different conditions. In the first part of the article describes the measurement and the used.equipment. The second part includes the creation of experimental model with a subsequent evaluation of measurements for the purposes of carrying out verification of the applicability of the selected RFID transponders in the circumstances. In conclusion, the publication is evaluated the progress of the experiment and the results of measurements determining the environmental conditions and meets the requirements of the application.

1 Introduction

Meaning applications of RFID technology in the monitoring of material flows is to ensure optimal flow of information about the production and traceability of individual items monitored in real time. Monitoring the material flow at the production plant in real time would create ideal conditions for enhancing the quality of production but also the safety of their operation. The application provides a solution for increasing the quality of service and production. Its essence is to monitor the motion of transport batch through the application of RFID technology. Since no one has so far to address the impacts of magnesite functionality RFID systems, yet. It was necessary to to make measurements and choose the right transponder for applications of RFID technology in terms of magnesite mine [1], [2].

2 Identification of external factors with measure of their impact on the readability of RFID transponders

In the real environment of operation magnesite mines affect the quality parameters of the RFID technology products especially magnesite external factors such as dust and weather conditions such as cold water and that alter the structure sputtered layer of magnesite. The impact of these factors was verified experimentally in laboratory conditions in expert laboratory of identification technologies at the Department of Manufacturing Management, Technical University of Kosice. Measurements were carried out, which were intended to verify the readability of RFID transponders under the influence of external factors, which were found at the premises of the mine.

2.1 Description of experiments

The experiment was set up to generate real operating conditions to ensure the testing of selected RFID transponders [3]. Realization was subject to the creation of a model simulating real conditions of operation in magnesite mines which are magnesite dust and weather conditions. The required magnesite layer on the surface of the RFID transponder in the range of 10-20 mm was formed by sputtering the magnesite powder to the surface of the RFID transponder. Furthermore, magnesite was added to the water in the described proportions and was also exposed to low temperatures due to external simulation imaginatively.

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2.1.1 Used equipment

To ensure the required outputs of each measuring of the impact of the magnesite dusty layer on the readability of the selected RFID transponders were used elements listed in Table 1.

Table 1 The inventory of the equipment used for the implementation of measurement

	Manufacturer	Model
UHF RFID reader	Impinj	Speedway Revolution
UHF RFID antenna	Alien	ALR-8696
RFID middleware	Impinj	Speedway
UHF RFID transponder	Confidex	Ironside™ Gen II
Surface termometer	TESTO	905

Configuration of the elements involved in the measurements:
RFID antenna located at a distance of 1 m from the RFID transponder.

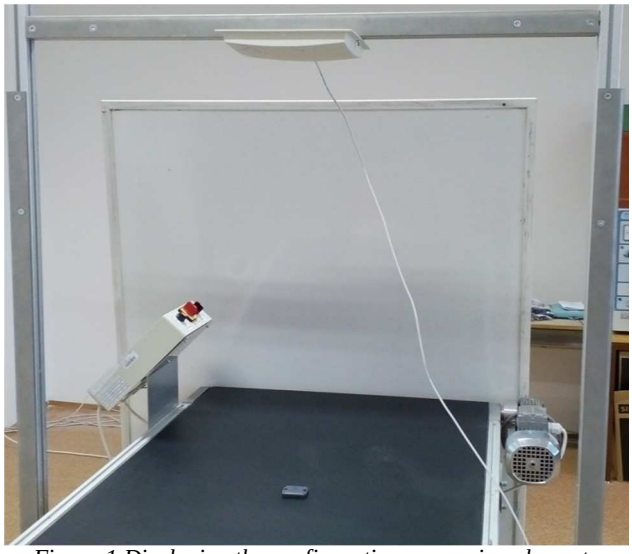

Figure 1 Displaying the configuration measuring elements

A.1 - applying a layer of the magnesite powder to the surface of the RFID transponder of thickness 10 mm.
A.2 - applying a layer of the magnesite powder to the surface of the RFID transponder of thickness 20 mm.
A.3 - applying a layer of the magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml).
A.4 - applying a layer of the magnesite powder to the surface of the RFID transponder 20 mm thick with the addition of water in a 1: 1 (g / ml).

Figure 2 Displaying the the magnesite powder coating layer on the surface of the RFID transponder 20 mm thick with the addition of water in a 1: 1 (g / ml)

A.5 - applying a layer of the magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml), followed by freezing at -3.5 ° C.
A.6 - applying a layer of the magnesite powder to the surface of the RFID transponder 20 mm thick with the addition of water in a 1: 1 (g / ml), followed by freezing at -3.5 ° C.

Figure 3 Displaying the the magnesite powder coating layer on the surface of the RFID transponder 20 mm thick with the addition of water in a ratio of 1: 1 (g / ml), followed by freezing at -3.5 ° C

3 Measurement results

The evaluation software was a product of Impinj and basic readability endpoint was selected parameter number of readings in a single measurement.

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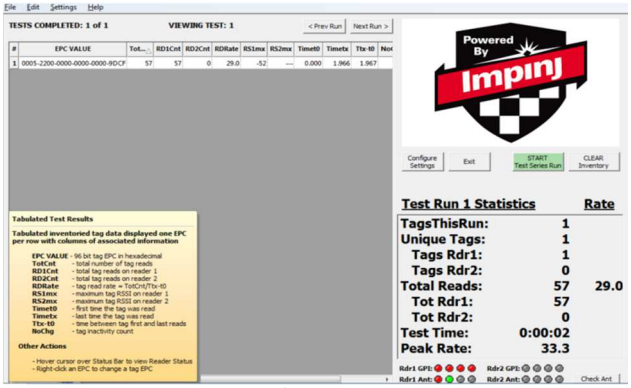

Figure 4 Sample of Impinj evaluation system

The values of the measurements of the readability of the RFID transponder are listed in Table 2. The number of measurements in a single configuration element has been established and implemented in the number of 500 measurements. To ensure the possibility of comparison of the values of the quality parameters were then calculated the arithmetic mean [4], [5].

Table 2 Table of measurement parameters and final results

Sign	Thickness of the magnesite material layer [mm]	Temperature of the magnesite material layer [°C]	Admixture	Average number of loading within a given test	The occurrence of unreadability in a single test
A.1	10	20	-	56,4	0
A.2	20	20	-	56,3	0
A.3	10	20	H_2O, 50 %	55,7	0
A.4	20	20	H_2O, 50 %	55,7	0
A.5	10	-3,5	H_2O, 50 %	54,1	0
A.6	20	-3,5	H_2O, 50 %	53,8	0

A.0 - average number of loading for testing the readability cue direct manner without adding external factors reached 57.0 loading. Said value is found to be a fundamental and is then compared with the values in the individual tested. The comparison of these values can be determined by inference from measures.

A.1 - average number of loading for testing the readability when applying magnesite layer of dust on the surface of the RFID transponder with a thickness of 10 mm reached 56.4. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions without problems.

A.2 - average number of loading for testing the readability at application layer magnesite dust on the surface of the RFID transponder thickness 20mm reached 56.3. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions for seamless ..

A.3 - average number of load for testing the readability of the application of a layer of magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml) reached 55.7 loaded. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions without problems.

A.4 - average number of load for testing the readability of the application of a layer of magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml) reached 55.7 loaded. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions without problems.

A.5 - average number of load for testing the readability of the application of a layer of magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml), followed by freezing at -3.5 ° C reached 54.1 loading. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions without problems.

A.6 - average number of load for testing the readability of the application of a layer of magnesite powder to the surface of the RFID transponder of thickness 10 mm with the addition of water in a 1: 1 (g / ml), followed by freezing at -3.5 ° C reached 53.8 loading. Decline in the value of the average number of load from baseline (set in A.0) is negligible within the testing and implementation of reading the RFID transponder is in these conditions without problems.

Conclusion

From previous data measuring of the impact of the magnesite dust layer on the readability of RFID transponders can be reported following that zhr magnesite found on the surface of the selected RFID transponder does not affect its readability, even under the influence of external factors such as the presence of water and in that the measurement range or freezing temperatures. It is possible to implement the right RFID technology in an environment with a high concentration of magnesite by finding does not affect the functionality of UHF RFID technology.

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Review process
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