Study to determine the feasibility of RFID to facilitate traceability in a logistics operator.

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ABSTRACT

In this paper we present the pilot project on the implementation of an RFID system in the facilities of Carreras Logistics Group, located at PLAZA. The main idea of this research was to determine the accuracy of the measurements obtained in a loading dock by contrasting it with the known information of the goods transported.

Various tests were developed not only to determine the accuracy of RFID technology but also to know the best arrangement between the product and the tag.

Keywords: RFID, pilot project, measuring accuracy.

1. INTRODUCTION

The Radio Frequency Identification, also known as RFID, is a two-way automatic identification technology between tags and antennas, as shown in Figure 1, via radio waves, that does not require contact or line of sight [1].

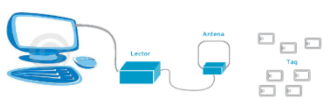

Figure 1. *RFID technology.*

Even though this technology is being used more and more frequently, its application is not exempt from obstacles [2] being the three most important challenges of this [3]:

i) The effects generated by various materials in the antennas.
ii) The collision caused by simultaneous radio transmission and,
iii) The impact of the orientation between the tag and the antennas on the reception.

2. THE EXPERIMENT

The objective of the experiment was determining the feasibility of the application of a RFID system in a logistic operator.

Figure 2. *Carreras, Logistics Group.*

The tests were conducted at the facilities of Carreras Logistics Group (Transport Division) located in the logistics platform PLAZA (Messina 2, Zaragoza, Spain). For the development of the experiments established was required to use an aluminum arc, own design and manufacture, with the following dimensions: Height 2,30m, width 2,25m and depth 0,75m, as well as the equipment detailed in Table 1.

Equipment	Quantity	Characteristics
Intermec Middelware IF30 model	1	For readings: Ultra High Frequency (UHF)
Intermec antennas IA39B model	3	For readings: UHF
Intermec tags GEN2	100	Type: Passive. For readings: UHF
Zebra printer RZ400	1	For codification: UHF
Reading software	1	Developed by ZLC Log.iD Lab for this job.

Table 1. *The equipment used.*

The experiments consisted of passing through the arch, which contained RFID-UHF antennas both at the sides as on top, an electric wheelbarrow with various products wrapped in polypropylene, to which they had included a tag in each of the faces with the description of the goods to be transported, as can be seen in Figure 3. The characteristics of each of the experiments are described in Table 2.

Figure 3. *Images of the experiment.*

Test	Nature of the load	Type of load consolidation	Pallet height	Reading antennas
1	Solid	Homogeneous	Medium	1, 2 and 3
2	Metal	Homogeneous	Low	1, 2 and 3
3	Metal	Homogeneous	High	1, 2 and 3
4	Liquid	Homogeneous	Medium	1, 2 and 3
5	Metal/Solid	Nonhomogeneous	High	1, 2 and 3
6	Liquid	Homogeneous	Medium	1, 2 and 3
7	Metal/Solid	Nonhomogeneous	Medium	1, 2 and 3
8	Solid	Homogeneous	High	1, 2 and 3
9	Solid	Homogeneous	High	1, 2 and 3
10	Solid	Homogeneous	High	1, 2 and 3
11	Solid	Homogeneous	High	2
12	Solid	Homogeneous	High	1, 2 and 3

Table 2. *Conducted tests.*

3. RESULTS

Figure 4 shows the percentage of measurement according to the position of the tag in each of the trials. As can be seen, the highest levels of detection by the antennas are obtained in the third position, which in turn shows the highest percentages in metallic products, reaching reading values of 100%.

The lowest measure values were obtained at positions 4 and 5 wherein the tags were not detected in three of the experiments performed, where as in other tests the percentage of reading did not reach 20%.

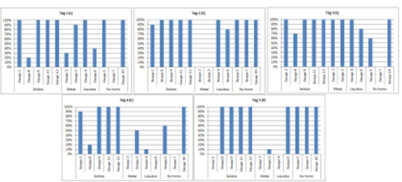

Figure 4. *Percentage of measure by tag position and nature of the load.*

Figure 5 provides the percentage of reading per antenna for each of the positions of the tag. Analyzing the following graphs, one can appreciate that the proximity of the tag to the antenna is critical to achieve the desired measures, as the tags located in positions 1, 2 and 3 were detected mainly by the antennas 1, 2 and 3, respectively, which were the closest to them. Figure 6 shows the percentage of global tag reading

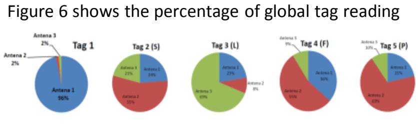

Figure 5. *Percentage of measures per antenna.*

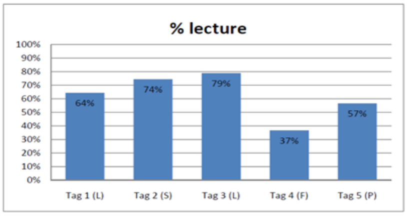

Figure 6. *Average percentage of measures per position.*

4. CONCLUSIONS

The tests carried out showed that there is still the difficulty of implementing RFID technology in logistics operators, since none of the five positions where tags were placed reached a reading of 100%. The maximum values obtained, and therefore the most suitable places for placing the tags, were found at positions 2 and 3 corresponding to the top of the pallet load and one side, since in these arrangements the level of detection reached values of 74% and 79%, respectively.

5. REFERENCES

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