

# HIGH PRECISION COLLISION AVOIDANCE SYSTEM CASE STUDY


ANTAMINA MINING COMPANY (PERU)


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CASE STUDY OF THE DEVELOPMENT AND  
IMPLEMENTATION OF A HIGH PRECISION  
COLLISION AVOIDANCE FOR SHOVELS




Contact:  
Jaime Solano  
[jsolano@torsa.es](mailto:jsolano@torsa.es)

 Severo Ochoa 19  
Tech Park of Andalusia (Spain)

 [info@torsa.es](mailto:info@torsa.es)

 +34 952 102 144

 [www.torsaglobal.com](http://www.torsaglobal.com)

# **CASE STUDY**

## **REDUCTION OF COLLISIONS AND INCREASE OF PRODUCTIVITY IN ANTAMINA MINING COMPANY (PERU)**

**2015 - 2017**

## ABOUT TORSA

TORSA is a Spanish international company with more than 20 years of experience in the technology sector.

The main activity of TORSA is designing and manufacturing high technological level solutions for the heavy industry (mining, civil engineering, etc.), logistics and renewable energy sectors. TORSA develops both own products and on demand in collaboration with clients.

From its various branches (Chile, Peru, etc.) and its headquarters in the Technology Park of Andalusia, the largest technology hub in southern Europe, TORSA supports the company's commercial and technical operations for the development of its range of solutions aimed at meeting needs and solving common problems in the various industries where its activity is focused.



## DEVELOPMENT AND IMPLEMENTATION OF A HIGH PRECISION COLLISION AVOIDANCE SYSTEM FOR SHOVELS IN ANTAMINA (PERU)

TORSA's custom development of a high-precision collision avoidance system for Antamina's shovels fleet has generated excellent benefits for the mining company operations and safety areas.

In August 2015 a relationship began between TORSA and the Mining Company Antamina with the presentation to the mining company of development capacity and long experience developing systems of high technological level by TORSA.

Given TORSA's extensive experience developing RFID-based systems, Antamina offered to test this technology in its mining operation, in order to minimize the risk that exists in loading operations, and **reduce the number of events that were occurring in the interactions between the shovels and trucks, and cleaning bulldozers.**

After the first field tests a few months later, both teams detected that a system based just in RFID technology was insufficient to cover the main objective set by Antamina:

To alert the operator of the presence of vehicles and obstacles in an area of 20 meters around the shovel with centimeter precision.

**The operators demanded a system with a high precision to provide them and inform about the distances existing in their closest radius of action, from 0 to 5 meters from the shovel.**

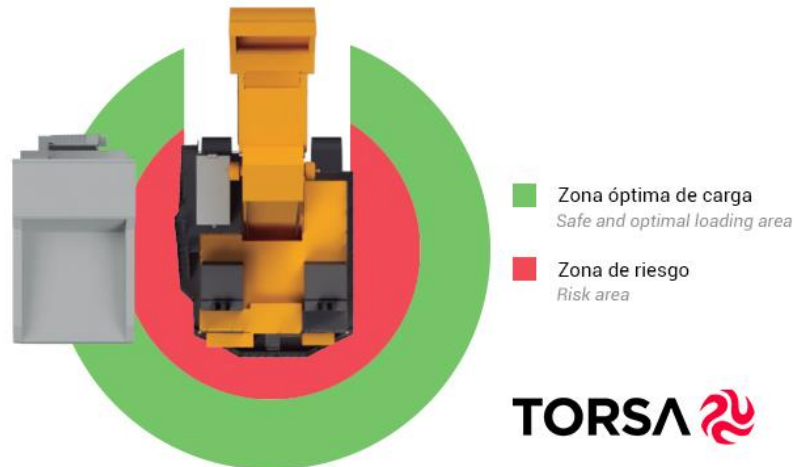
At that time, TORSA proposed to Antamina the joint project of development of a high precision collision avoidance system for shovels in which TORSA would contribute with all the technological development.

TORSA considered mandatory to meet the following features:

- **Robustness:** the system had to have a high degree of protection to be able to withstand the demanding environment of the mining operation, located more than 4,000 m above sea level in the Andes mountains and continually withstanding high exposure to dust, mud, thunderstorms, rain, hail, etc.
- **Accuracy:** the system had to be endowed with high precision in order to alert operators of the blades of the existing risk, since it was identified that in order to alert reliably, it was essential to achieve an accuracy of at least 10 centimeters.
- **Reliability:** the system should not have any false positives, it should be a totally reliable system to guarantee the safety of the operator and the vehicle itself, since a system that causes false positives would lead to poor reliability on the part operator.
- **Profitability:** it was essential to also make the system economically viable in order to make your investment profitable.

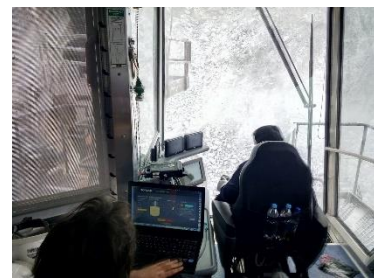
In just 6 months since the system development proposal and after a large number of hours invested in research, study and development, TORSA was able to design all the hardware, software, firmware and detection algorithm of a brand-new system ready for commissioning and field testing.

The system, which was originally based on radio frequency detection, evolved into a new sophisticated system based on high-precision technologies (LIDAR, GPS RTK, etc.), with a complex detection algorithm capable of mapping the entire operational environment of the shovels, and alert operators in real time with a precision centimeter precision.



After 2 months of pilot testing, the system was accepted by Antamina and decided to install it the whole shovels fleet, and it has been running ever since with great satisfaction from the mine operators.

Additionally, the system was equipped with a powerful communication interface, which sends all the detection and event data from the system to the platform TORSA Cloud for analysis and continuous monitoring from the Antamina control center.

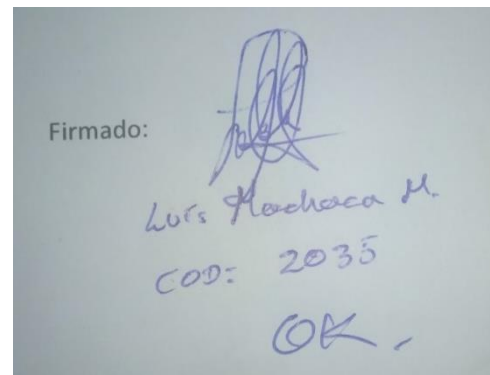
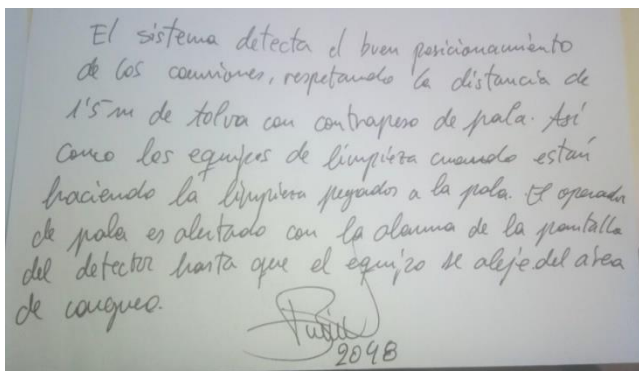


Nowadays, Antamina has all their shovels fleet (8 x P&H4100, 4 HITACHI EX5600) equipped with the CAS of TORSA. After 3 years of use and with an optimal operation, Antamina has experienced a dramatic reduction of collisions and an important increase of safety during all the loading and operational tasks where their shovels fleet are involved.



## CONCLUSIONS

During the pilot test, TORSAs personnel were able to interview all the shovel operators involved in the test and various aspects (alert sounds, user interface, etc.) were adapted and customized to guarantee their comfort and safety. The TORSA high precision collision avoidance system was able to **meet all needs that the shovel operators exposed, as direct users of the system it was necessary to guarantee that the system was not invasive for them and alerted them at all times when a risk was detected in their area of operation.**



Video of feedback from shovel operator and training department of Antamina:

<https://www.youtube.com/watch?v=XL-laBjKBAM>

The system was conceived to increase the safety of the mining operation during the loading and interaction of vehicles, but **after its implementation in the entire Antamina shovel fleet, it was observed that the system also benefits considerably to the productivity of the mining operation.** This is because, by increasing the safety and making feel the operator more protected, the rate of trucks loaded per hour increases considerably. In a field study, it was determined that, after the implementation of the system, the shovel operators loaded an average of 2.5 additional trucks more per hour.

### **NATIONAL PRIZE FOR TECHNOLOGICAL INNOVATION 2019 (PERU)**



The National Society of Mining, Petroleum and Energy of Peru (SNMPE) has awarded the **2019 Technological Innovation Award to TORSA and the Antamina Mining Company** for the custom development carried out with the high precision collision avoidance system for shovels. Having been considered a success due to the drastic reduction of events between vehicles, increased safety in loading tasks and the increase in productivity experienced.





## CONTACT DETAILS AND INFORMATION REQUEST

High Precision Collision Avoidance System:

<http://torsaglobal.com/en/solution/collision-avoidance-shovels/>

More information about TORSA's Collision Avoidance System, other technological solutions for the mining industry and this case study could be provided under request.

Jaime Solano (Technical Sales Director) - [jsolano@torsa.es](mailto:jsolano@torsa.es)  
[www.torsaglobal.com](http://www.torsaglobal.com)