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Sensing technology applications in the mining industry – Short Review.

J. Duarte (PROA/LAETA, Faculty of Engineering, University of Porto, Portugal)
J. Castelo Branco (PROA/LAETA, Faculty of Engineering, University of Porto, Portugal)
F. Rodrigues (RISCO, Civil Engineering Department, University of Aveiro, Portugal)
J. Santos Baptista (PROA/LAETA, Faculty of Engineering, University of Porto, Portugal)

Abstract

Introduction: Industry 4.0 is reflected in a technological evolution in all economic sectors, leading to an improvement in traditional risk factors. Real-time collection, integration and processing of physical and digital data from multiple sources helps to adopt more efficient production processes and safer workplaces. Mineral resources production is connected with human evolution and each manufacture handles high volumes of millions of tons. It has a high number of serious injuries, occupational diseases and deaths due to explosives use, outdoor tasks, high levels of noise and vibration, and heavy equipment usage.

Objectives: This short review aimed to identify what type of sensors are implemented and how they are used to promote safety in the extractive industry.

Methodology: The Preferred reporting items for systematic reviews and meta-analyses were used to conduct the search. The keywords were divided into two main groups: one related to sensors, and other related to the interest field.

Results: From all the primarily identified works, only a few were included in the study because they include the application of sensors in several domains, e.g. safety, management, and localisation. Most of the obtained results focus on underground activity focus on tunnels' stability and ventilation. In open-pit, the focus is on slope stability and the prevention of accidents with heavy equipment. Safety is not the main focus of sensors' use, but rather environmental (geologic mapping, land cover) and production (issues, with real-time monitoring of land use and mine development).

Conclusions: Industry 4.0 can promote safety by designing more efficient and safer production processes. Using sensors to monitor activities, collision prevention and real-time stability monitoring of soils and tunnels are some examples. In the analysed works, there is a lack of effective integration with the human factors and of preserving human life, preventing accidents and occupational diseases.

Keywords: Industry 4.0; Safety; Sensors; Mining