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Determination of the Environmental Conditions in an Underground Mine

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Extended Abstract

Determination of the underground environmental conditions in a mine is critical, either for modelling the future situation that miners will have to face or for mine planning. Moreover, it becomes more important as mine workings are expanding and the workplaces are tougher, decreasing the efficiency of the employees and safety and health conditions. Hence, an approach to assess and predict the underground conditions is exposed in a case study.

For such purpose, several control points along the principal ventilation system have been chosen in order to find out the evolution of the effective temperature and pollutants emitted by the mining equipment (NO_x, CO and CO_2). These points standing for the ventilation conditions have been selected on the basis of the specific characteristics of the mine, taking measures of the features stated between 2008 and 2014.

The processing method of this huge amount of data have been done by means of a geographic information system (SIG), using the software ArcGis version 9.3 in this case, which allows managing huge quantities of interconnected spatially referenced information in a long term. Its usage is important for dealing with eventual changes in the ventilation layout that would cause changes in the control point placement, discriminating non representative data and obtaining the mean values from the measures collected.

Results have allowed determining the trends of effective temperature, CO_2 and NO_x along the ventilation circuit, obtaining a characteristic equation for each factor that will help to know, approximately, the conditions of new workings and workshops in advance. Besides, it has also been distinguished the behaviour of the underground conditions when the air flows through airways in old workings and new ones as well as obtain its variation because of that. Despite these findings, it has to be pointed out that CO results have not given a clear trend, probably due to a lack of control points enough, being necessary to increase its density.

For achieving similar results in other mines would be necessary:

- To determine the control points standing for the ventilation circuit, taking into account possible future changes in the ventilation layout. The quantity of points must be enough to avoid local environmental variations.
- To measure the environmental conditions at least one year in order to get mean representative values.
- To use a system, such as a GIS, for managing data with spatial references in a long term, having the possibility to discriminate data by means of visual information or any other possible requirement.
- To relate the mean values with the length of the points chosen and intake.