

Sensor-based ore sorting methodology investigation applied to gold ores

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ABSTRACT

Exploring gold ores has become more challenging every year. Mines have increasingly delivered lower grades and complex mineralogy, which forces mills to process more material to reach the production plan.

Research, testing, and implementation of innovative technologies can prevent high capital investments in metallurgical plants, while maintaining or even increasing production targets even at lower grades. The ore sorting technology provides a pre-concentration of the ore, in the early stages of the production process. The pre-concentration is based on X-ray-transmission (XRT), laser, optical, infrared and/or electromagnetic sensors analysis to identify, and air ejections to separate ore from sub-economic waste.

The aim is to increase mine recovery by reducing cut-off grade and process the extra material without compromising the current mine production, opening new capacity in the mill by rejecting waste material, without significantly amount of capital expended.

The understanding of the relationship between different texture types, grain size and the gold source associations such as quartz or sulphide, and their responses to different types of sensors are the key to project success. The methodology consists to identify the main textures, clustering by the rock description, understanding the response behaviour of each typologies to the sensors, chemical and mineralogical analysis by textures to identify the gold sources, the machine configuration with the information obtained in the last step and pilot test. In order to achieve the objectives, research has been developed to define the types of calibration and sensors for the different types of gold ore produced by AngloGold Ashanti.

The methodology showed potential to achieve excellent gold recovery (higher than 95%) with a mass pull of 40%, using one or two steps of pre-concentration. This information confirms the importance of a geological approach when investigating ore sorting technology for complex gold ores. In addition, the information acquired supports the stability of other processes such as metallurgy and mine geology.