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ROCK STRENGTH DOMAINING AT MOGALAKWENA MINE, SOUTH AFRICA

An Approach to On-Site Geometallurgical Characterisation

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ABSTRACT

The geometallurgical characteristics of ore are key drivers of value realisation when applied to the optimisation of mining and plant processing. The variability of ore strength and hardness has an impact on crushing, milling and liberation efficiency due to the method in which different rock behaves under stress and grinding. Mogalakwena Mine is exploiting the intrusive Platreef which forms part of the Northern Limb of the Bushveld Complex. This complex orebody exhibits areas of metasomatic alteration, metamorphism and sporadic mineralisation of the footwall and hanging wall. These different varieties of ore type have various hardness and strength characteristics. These variables must be known prior to processing in order to optimise recovery. Predictive modelling is vital before ore is mined and processed. Exploration core represents accurate geological data and this database was used to source rock strength information. The textural and grain size distribution of each rock type in the reef was investigated for the Overysel (OY) farm. Point load testing is done on core samples in each borehole and is converted to uniaxial compressive strength (UCS). The relationship between lithology, texture, grain size and UCS was examined. There is an inverse relationship between UCS and grain size for unaltered rocks while altered rocks do not exhibit this relationship. Strength and hardness mean results were compared with evidence that bond work index and UCS may be related. Drilling performance is linked to UCS and more accurate UCS values for blast patterns assists in scheduling. The grain size adjusted UCS values was applied to a 3D model for OY farm. The model represents rock strength changes across the ore body. The model can be updated at a smaller grid spacing using strength data generated by digitally recorded drilling measurements. The project forms part of establishing relevant data and data sources for a larger geometallurgical programme. The project reveals that ore categories can be tailored to represent variables which impact mining performance and, with more data, plant performance. The financial benefits of strength domaining are made clear in the use of autogenous milling.