

Geological and Geometallurgical Characterization of Low Grade Iron Ore Deposits of Minas-Rio Project – Minas Gerais - Brazil

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RESUMO: The Minas-Rio Project is constituted by an integrated system that includes open pit mine, beneficiation plant, waste dump, pump stations, pipeline with 535km extension, connecting also filtering plant and Açú port in Rio de Janeiro. The Minas-Rio Project is located approximately 200km Northeast of Belo Horizonte and the main deposit denominated Serra do Sapo is close to the town of Conceição do Mato Dentro and can be accessed by a highway MG-10.

The mineralized itabirites are inserted in the southeast border of São Francisco Cràton (Almeida, 1977) and comprises world class iron deposits, whose mineralization is hosted in a Proterozoic metasedimentary sequence in the Serra do Espinhaço Meridional. The main iron ore is concentrated in a medium unit of the Serra do Sapo Formation which corresponds to a large banded iron formation. The outcrops occur along a narrow ridge of 12km length in NNW-SSE strike and moderately dipping to the East. All these sequences are controlled by thrust fault systems that are responsible for local duplications, inversions or suppression of the beds.

The Itabirites are characterized by alternate millimetric bands of hematite/magnetite and quartz. Depending on the weathering intensity they were classified as Friable Itabirite (IF), Semi-Compact Itabirite (ISC) and Compact Itabirite (IC). The grade range for the rock to be classified as Itabirite is between 25% and 60% Fe. For Fe grades higher than 60%, the rocks were defined as hematite.

The geological modeling of the main lithological groups, were interpreted through 3D surfaces (open wireframes). This modeling technique minimizes undesirable free spaces and overlapping generated in a conventional modeling. Structural discontinuities and outcrops are also considered during the interpretation. After interpretation a geological block model is generated, estimated by ordinary kriging and classified by Scorecard system.

Methods of Sequential Gaussian Simulation allow accessing the uncertainties associated to the estimated grades of friable ore, related to the diverse scales of production panels. The preliminary results obtained from conditional simulation, considering the current drilling campaign, can assist to the optimal sampling and drilling space definition, in long and short terms, minimizing directly futures problems with reconciliation. The outcomes bring answers about different levels of uncertainty associated of iron and contaminants grades in SMU (25x25x15m) and several scenarios of production scales revealing the importance of infill drilling and detailed sampling mainly in the first five years of mining. The results of the calculated uncertainty showed relative high values mainly for contaminants in small scales production. The spatial distribution and the size of the uncertainties guided the current drilling program, certainly will be responsible to minimize errors and future problems of reconciliation.

The geometallurgical model was generated with SGS support and estimated considering more than 450 samples submitted to metallurgical assays. More than 25 variables were estimate for all blocks of Serra do Sapo deposit. The final geometallurgical block model will allow a real interactivity with mining planning and iron ore production in the beneficiation plant.

PALAVRAS CHAVE: IRON ORE, CONDITIONAL SIMULATION, ITABIRITE