Drill hole spacing analysis in an iron ore deposit in the Pilbara, WA

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ABSTRACT

Analysis of the estimation variance has been used to quantify the effect that different drill hole spacings have on the estimation of tonnes and grade at a stratiform iron ore deposit in the Pilbara region of Western Australia. Although this is far from a new method, its practice has mostly been limited to the coal industry and not used or at least documented throughout the iron ore industry. It is a very simple geostatistical approach that produces prompt and accurate results that are sufficient for analysing drill hole spacings.

The study area contains supergene martite-goethite hosted mineralisation which has formed as a number of discrete lenses subparallel to stratigraphy. Mineralisation within each banded iron formation (BIF) sequence is mainly stratiform and thus amenable to using the estimation variance of mineralised thickness and grade accumulation 2D variables to optimise drill hole spacings. The elementary estimation variance of a block by a hole located at its centre was first calculated from a variogram model, the dimensions of the block being equivalent to the drill hole spacing to be tested. A domain of interest was defined as the area equivalent to a quarterly production volume. The estimation variance of that domain was then obtained by dividing the elementary estimation variance by the number of blocks that fit in it. This process was reiterated for all drill hole spacings.

From the accumulation and thickness estimation variances, grade variances were calculated and plotted against drill hole spacing along with the mineralisation thickness variance. The estimation variance of the quarterly production volume decreased with increasing quantity of drilling for all variables. From these plots a decision was made on the amount of uncertainty in the estimation of tonnes and grade the company was willing to accept with respect to the cost of additional drilling. This decision was made an order of magnitude faster than if any alternative geostatistical method was used such as conditional simulation.