Product Prediction in Evolution – Embracing Geo-Metallurgy Concepts

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ABSTRACT

Successful product prediction requires an intrinsic understanding of the critical ore properties of all major minerals in the deposits that affects the processing plant performance, i.e. ore texture for size separation plant (including dry crush and screen plants), density distribution of minerals for density separation plant, ore magnetic susceptibility for magnetic separation plant etc. Typically the understanding of these properties is established by a limited amount of drill hole samples taken from the orebody for the purposes of metallurgical testwork and product prediction, hence the risk of obtaining poorly representative metallurgical data is high and it can potentially lead to poor prediction accuracy.

Over the recent years product prediction practise at Rio Tinto Iron Ore (RTIO) has evolved to strongly focus on what is in the orebody, instead of being limited to a relatively small number of samples taken from orebody for metallurgical testwork purpose. It has also shifted from heavily relying on stratigraphic domain defined mostly for non-metallurgical purposes (also derived mostly from harder and more hematitic deposits mined by RTIO pre-1990) to a stronger focus on domaining based on mineralogical composition that correlates to metallurgical testwork response. Where possible, these correlations are checked against all other non-metallurgical drill holes (typically numbering in the thousands) in the deposit for validation purpose before issued as product prediction regressions in block models.

This concept is made possible by RTIO's long history in collecting material type information from all drill holes in almost all deposits over a long period of time. By describing the mineralogical composition and ore texture of thousands intervals in a deposit, the data can be regarded as the most comprehensive description of an orebody prior to mining operations. Its comparison against the metallurgical drill hole samples provides a good assessment of the sample representativeness – it may highlight a certain ore group or characteristic was under-sampled or over-sampled and the prediction needs to be adjusted accordingly. Such information is also valuable for processing plant design purposes to avoid over or under design due to poorly representative samples.

Keywords: Product prediction, representative sample, material types, mineralogy.