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Explicit and implicit geological modelling methods on resource definition and resource utilisation - Sishen iron ore deposit case study

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Abstract

Technological advances make geological modelling easier and more intuitive than ever before. There is a clear shift in the mining industry concerning the needs of the geological model and its function. Geological modelling is one of the first steps in the resource evaluation process; its primary function is to define the orebody's physical properties and characteristics. It can, therefore, be argued that the geological model has a commanding impact on the entire resource evaluation process. Although many publications exist regarding modelling conventions, few truly compare the explicit versus implicit approaches and document the observed differences.

This case study on the Sishen iron ore deposit shows that modern implicit modelling techniques can create geological models comparable to those created using traditional wireframing techniques. In many aspects, these implicit models are superior to their explicit counterparts due to their increased modelling speed and multiple data source inclusion. The implicit modelling process delivered a geological model with modelled ore volumes equivalent to those of the traditional explicit geological model. However, spatial reconciliation between the explicit and implicit versions of the Sishen geological models showed substantial discrepancies due to fundamental differences in geometry and connectivity, and modelling conventions. These differences in the geological models are manifested in considerable change in the final, defined Sishen resource.

This case study for the Sishen iron ore deposit confirms that geological models are critical to the entire resource definition and extraction process. Any resource evaluation and planned extraction activity is only as accurate as the geological model used to define the resource originally. This study also shows how critical it is to test geological model performance through the entire mining value chain. Basic volumetric comparisons or tonnage reconciliations can mask the effects of geological modelling approaches on resource definition and extraction.