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DERIVING VALUE FROM MODELLING IN THE MINERALS INDUSTRY

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EXTENDED ABSTRACT

The minerals industry is heavily reliant on mathematics as the basis for improvements in the discovery and definition of ore bodies and the subsequent design and operation of associated processing plants. The development and use of sophisticated computer modelling has been critical to virtually all sections of the industry. This is clearly at odds with the image of minerals being an old industry based on mature technologies.

This talk largely concentrates on how the industry currently derives value from modelling and possible future directions for extended work. The primary focus for industry is the value of the output rather than specifics of the modelling techniques being used. In many cases this leads to more than one type of model being used to describe the processes with some overlap in the descriptions obtained. The key questions usually resolve around the confidence in the models, the degree of validation and the extent to which the models can be extrapolated for use in scale up and/or highly modified systems.

Rio Tinto alone is currently actively using 50+ mathematical models within its mining and processing operations. These cover a mix of techniques with a strong proponent of CFD work. The largest single use of CFD within Rio Tinto has been as a critical component in the development of the new direct iron making process, HIsmelt. More commonly CFD has been used to improve the design of existing equipment such as thickeners, agitated tanks and a range of reactors. This has provided significant value in terms of throughput, energy savings, and in extreme cases alerts to design problems prior to installation of new process steps. The examples presented from Rio Tinto's alumina/aluminium, gold, copper and iron operations cover a range of applications that are common targets within the minerals industry.

Despite the advances over the past decade there are still many of our process steps which are not as yet well characterised. This is in part due to limitations in our knowledge of the fundamental processes occurring and also to difficulties in obtaining meaningful measurements to validate our models. These remain a challenge for further developments. The other major challenge is greater use of models, often in combination, as the basis for advanced control both at the unit operation level and for real time continuous plant optimisation.