

3D REACTIVE TRANSPORT SIMULATION OF PRODUCTION OPTIMIZATION SCENARIOS (KATCO)

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ISL is a very challenging mining technique as the miner never sees the deposit. The software HYTEC, a 3D reactive transport simulation tool at the state of the art, perfectly addresses this challenge. Based on 3D geological models, It allows simulating simultaneously hydrodynamics and chemical reactions occurring between the mineral and the aqueous phases. It enables KATCO to quantify the uranium production out of different exploitation scenarios. Applications go from long term mine planning and design to short term studies and optimization.

This study focuses on short term optimization for one region of the Tortkuduk well-field. The area, under operation since late 2010, is composed of four technological blocks, divided into 53 hexagonal cells. These blocks produced about 2000t of uranium and are currently in stand-by. However some cells could still offer high potential according to sampling analysis and investigation based on reactive transport simulation. For this reason the area could be shortly restarted. Indeed, the modelling approach offers the opportunity to accurately represent how the reservoir behaves, and to target the location of the remaining uranium. In addition HYTEC gives quantitative results on reanimation performance: quantity of uranium recovered and acid consumed over time.. Uncertainties are also computable by using different geological models, showing respectively best and poorest cases for uranium estimation.

The first part of the analysis consists in a history matching of the area i.e. how the software reproduces the observed data of the past exploitation. It shows very consistent results even at the cell scale, validating the predictions abilities of HYTEC for this area. For instance HYTEC can reproduce gravity effects that exist between vertically overlapping cells. Indeed, a significant part of the uranium contained in the upper levels is recovered by the lower-levels producers.

Based on the model adjusted to the observed data calibration made with the history matching, revamping scenarios were built based using successive on a multi-step simulations approach. The base case considers that all the wells of the area restart. It provides a general dataset of the cells potential. Then, several scenarios are carried out to test the different combinations of restarted cells. The most profitable best one is selected and additional optimization action can be added to the final scenario, such as producer addition, producers-injectors inversions and multi-levels cells combination (i.e. keeping injectors of

the upper cell(s) and starting only lower cell producers). In parallel, an economic analysis is performed in order to quantify the profitability of the optimization scenarios proposed to reanimate this area.