Evaluation and design of the uranium project "Tigre I – La Terraza", Sierra Pintada, Mendoza, Argentina

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The Sierra Pintada uranium district in Mendoza Province, Argentina, was discovered by airborne survey. This deposit is associated with a volcanic caldera and occurs in the Lower Permian volcaniclastic sediments of the Cochico Group, in which aeolian and fluvial sandstones, inter-bedded with ignimbrites, were reworked by pyroclastic flows. The origin of the mineralization is interpreted as a product of the leaching of the inter-bedded rhyolitic tuff.

The mineralization is lenticular and nearly concordant with the bedding. The deposit has been affected by a complex fault system, which is responsible for mineralization and disposition via spatial displacement. The primary uranium minerals are uraninite, brannerite and coffinite. Uranophane and low liebigite uranium are the products of the oxidative alteration of primary minerals.

This study involves the technical and economical evaluation of the open pit uranium mining project Tigre I – La Terraza in Mendoza, Argentina, at prefeasibility level. Its development includes geological modeling through economic evaluation, and the incorporation of different mining-specific software.

For the development of the project, priority was given to the utilization of mineral resources, despite the fact that this resulted in reduced economic benefits.

Evaluation began with analysis of the available drill-hole information and bibliographic material essential for modeling of the deposit. The result was a suitable database for resource modeling.

With this information and with the support of basic engineering, the deposit was modeled (Model I: Ore wireframes) and represented as a block model (Model II: Empty ore block model).

In order to estimate the resources in situ, a geostatistical analysis was performed, which resulted in the interpolation of uranium grades into the block model by the ordinary kriging method (Model III: Ore block model estimated by ordinary kriging).

The surrounding waste blocks were then added to the model (Model IV: Union of the waste block model with Model III), as required to perform pit optimization with the specific software (Model V: Software optimization). It was also necessary to obtain the costs and other geotechnical and metallurgical data from project parameters and the existing mine plan. This optimization was achieved by systematically integrating the mine plan design, derived from the history of mine operation, in conjunction with technical calculations.

After pit optimization, a pit design was completed and, consequently, blocks that can be extracted from the interpolated block model were selected. Selections were made taking the pit design into consideration (Model VI: Model IV limited by the designed pit).

Subsequently, a schedule optimization was completed to obtain the optimal extraction sequence of the final model (Model VII: Final software optimization).

Finally, an economic evaluation of the project was performed to provide the estimated cash flows, payback, net present value and internal rate of return, with the corresponding sensitivity analysis.