Olympic Dam geometallurgy

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The Olympic Dam breccia-hosted Fe-oxide Cu-U-Au-Ag deposit (IOCG-U) in South Australia is one of the world's largest metalliferous resources. In addition to Cu, U, Au and Ag, the deposit also contains geochemically anomalous concentrations of F, S, C, As, Ba, Bi, Cd, Co, Cr, Fe, In, Mo, Nb, Ni, P, Pb, Sb, Se, Sn, Sr, Te, V, W, Y, Zn and REE. Each of these elements, in fact most elements in the periodic table, occur as a major element and/or as a minor to trace constituent in minerals. Over 100 minerals occur within and are spatially zoned across the Olympic Dam deposit. Hence as the deposit is sequentially mined, the mineralogy of ores delivered to the processing facilities and waste delivered to long-term storage facilities will vary over the operating life of the mine. Minerals, not elements, exert the primary control on metallurgical processing performance.

Ore from the deposit is mined via underground sublevel open stoping, and is processed through to final products (copper cathode, uranium ore concentrate, and gold and silver bullion) onsite at Olympic Dam via a fully integrated processing plant consisting of grinding/milling and sulphide concentration, sulphuric acid leaching of flotation tailings and solvent extraction, single stage flash smelting, electrorefining and electrowinning circuits, and precious metal refining. Each mineral, or mineral group, has unique processing characteristics in each part of the metallurgical plan.

The purpose of the Olympic Dam geometallurgy program is to determine the key process drivers impacted by ore characteristics and develop the ore-related predictors of metallurgical performance. This is accomplished by identifying all minerals present within the deposit, measuring their quantitative abundances (~12,000 samples), determining the mineralogical deportment of all process critical elements and conducting laboratory scale grinding, rougher and cleaner flotation, locked cycle and tailings leach tests (~2,000 samples). Two groups of regressions are developed which express mineralogy as a function of sample chemical composition, and metallurgical performance as a function of sample mineralogy and/or chemical composition. The mineralogy regressions are used to estimate the mineralogy on every assayed drill hole sample (~2 million) used to support the resource model. Mineralogy is then geostatistically estimated into every block in the resource model (~20 million). Metallurgical performance is calculated for each resource block. Economic return on each resource block is evaluated and subsequently used for short-, medium- and long-term production planning, process design, optimization/expansion and closure studies.

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