

Fosterville Gold Mine: Adapting to New Challenges

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ABSTRACT

The Fosterville operations of Kirkland Lake Gold are a high-grade, low-cost gold mine located 20 km east of the city of Bendigo in the state of Victoria, Australia. A feasibility study into a sulphide mining operation was completed in 2003 and the operation, commissioned in 2005, comprised of a crushing and grinding circuit followed by Flotation, Bacterial Oxidation (BIOX[®]) and CIL areas. In the past 15 years, the BIOX[®] process has demonstrated to be a reliable and effective pre-oxidative technology yielding in excess of 97% sulphide oxidation (for a design of 95%).

Sulphide gold mineralisation at Fosterville occurs in a solid solution within disseminated arsenopyrite and pyrite, and the challenging ore body contains varying amounts of native carbon (non-carbonate carbon (NCC)) in the form of black shale. This native carbon typically reports to the concentrate and can adversely impact leach performances through preg-robbing as the native carbon competes aggressively with the activated carbon in adsorbing solubilised gold-cyanide complexes. In 2008 Fosterville Gold Mine pioneered the development of a high temperature preg-robbing mitigation process called HiTECC[™], with the first commercial installation commissioned on-site in 2009. This highly successful technology has been demonstrated to increase overall plant recoveries by up to 12%.

With the discovery of the fabulously high-grade Swan ore body, the increase in the presence of gravity recoverable gold (GRG) at depth saw the complexities of the processing circuits grow with the installation of Knelson concentrators and shaking tables. This additional equipment assists in recovering up to 85% of the GRG before it reports to the BIOX[®] circuit.

As a non-discharge site, Fosterville Gold Mine have maintained their commitment to strengthening the sustainability of the site's water balance through the application of innovative technologies among them, the Metso Outotec ASTER[™] process. This technology can treat leach tailing solutions with concentrations of up to 5,000 ppm of thiocyanate to concentrations as low as 0.1 mg/L. Globally, the facility at Fosterville is the fourth commercial application of the ASTER[™] technology.

This paper further describes these innovative solutions which, in the third quarter of 2020, have assisted in establishing Fosterville Gold Mine as one of the largest and lowest cost gold-only producers in Australia.