

# Mastering Clay and Oxide Ores at St. Ives Gold Mine:

## Easing Circuit Constraints and Bottlenecks with Time-Honoured Comminution, Leach CIP, and Tailings Circuit Wizardry!

*E Mort*<sup>1</sup>, *R Radford*<sup>2</sup>, *B van Saarloos*<sup>3</sup>

1. Senior Metallurgist, Gold Fields Australia, Perth WA 6005 [emily.mort@goldfields.com](mailto:emily.mort@goldfields.com)
2. Metallurgy Manager, Gold Fields Australia, Perth WA 6005, [reg.radford@goldfields.com](mailto:reg.radford@goldfields.com)
3. Project Metallurgist, Orway Mineral Consultants, Perth WA 6004, [blaze.vansaarloos@orway.com.au](mailto:blaze.vansaarloos@orway.com.au)

### ABSTRACT

The St Ives Gold Mine processing plant is designed to handle 4.2 million tonnes per annum (mtpa) of fresh ore material at a nominal head grade, targeting a consistent achievement of budgeted ounces. Historically, St Ives has mined and stockpiled excess volumes of clay, oxide, and transitional ores as the preference was to prioritise processing fresh open pit or underground material, typically incorporating approximately 10% oxide material into the blend.

However, recent constraints of open pit and underground fresh ore availability have necessitated a shift towards processing remnant stockpiles of clay and oxide ores. This has resulted in current and planned feed blends containing up to 30% of these highly viscous materials. In the fiscal year 2023, St Ives processed over 1 million tonnes of oxide material, with an additional 2.5 million tonnes earmarked for processing in the subsequent fiscal years, 2024 and 2025.

The treatment of oxide and highly viscous clay ores poses significant challenges throughout the entire processing chain. These challenges commence with material handling on the run-of-mine (ROM) pads and transportation, extend to primary crushing and the single-stage SAG mill comminution circuit, all the way through to include trash screening, slurry pumping, and tailings thickener performance. In response, the St Ives team has undertaken a series of operational procedural adjustments, circuit and equipment upgrades and modification as well as test work programs and SAG mill comminution surveys and studies to ensure that the processing plant maintains its production targets despite the increased proportion of oxide ores in the feed blend.

This paper delves into the unique operational challenges faced by St Ives and provides an overview of the lessons learned so far, successful strategies implemented, and areas that require further attention.

**Keywords:** clay, oxide, viscous, material handling, comminution, screening, thickener, SAG mill