

CASE STUDY

NEWCREST TELFER MINE, AUSTRALIA

Increase copper and gold recovery in a bulk flotation process with Pionera BioPolymers.

ABSTRACT

The presence of clay slime may complicate many mining operations by reducing recoveries in flotation processes or creating excess froth. At the Telfer mine in Australia, clay gangue minerals have shown to pose a deleterious effect on mineral flotation. Laboratory tests, full scale plant trials and use in daily operation show that Pionera F-100 mitigates the negative effect of clay minerals resulting in improved copper and gold flotation.



INTRODUCTION

The Telfer mine is a copper and gold operation located in the Pilbara region of Western Australia. Open pit ore, predominately chalcopyrite with some chalcocite, and underground ore, predominantly chalcopyrite, is treated in two parallel trains with an annual processing capacity of 21 million tons. The flotation process operates typically in two steps:

1. A gold-rich copper concentrate is produced where pyrite is depressed by the use of copper-selective collectors, pH control and the addition of sodium cyanide.
2. Following copper flotation, pyrite is recovered as a flotation concentrate which is then leached with cyanide in a CIL (carbon in leach) circuit. Pyrite in the copper rougher tails is recovered using sodium sulfide (Na_2S) as an activator and potassium amyl xanthate (PAX) as a collector.

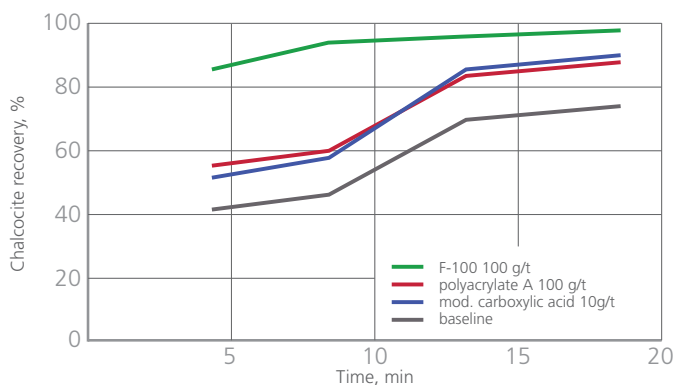
Some mine areas contain high levels of clay. High clay content causes excessive froth and slime coatings which reduce recovery and lowers the grade of the gold/copper concentrate.

Normally, operators reduce the solids content in the flotation circuit by ~5-10% and also reduce the rougher mass pull rates to maintain recoveries and control the frothing when processing problematic ore. A chemical solution was sought to reduce the impact of clay on the operation.

RESULTS

In the preliminary lab trials, important trends were observed. In the figures below, the first two points show the copper flotation and the last two points the pyrite flotation steps. The recovery of chalcocite and related cyanide soluble copper was improved. Reduction of the cyanide-soluble copper in the pyrite flotation steps is beneficial in the following leaching process of tails.

Figure 1: Flotation recovery of chalcocite in laboratory tests with different dispersants at their optimal dosage.



After the copper flotation steps, the activators, Na_2S or CuSO_4 , were added together with PAX as collector. Pionera F-100 also improved the pyrite recovery and the associate gold in the flotation process. It is believed this is the result of de-sliming of the ore particles by the biopolymer.

Figure 2: Flotation recovery in laboratory tests with different dispersants at their optimal dosage: gold

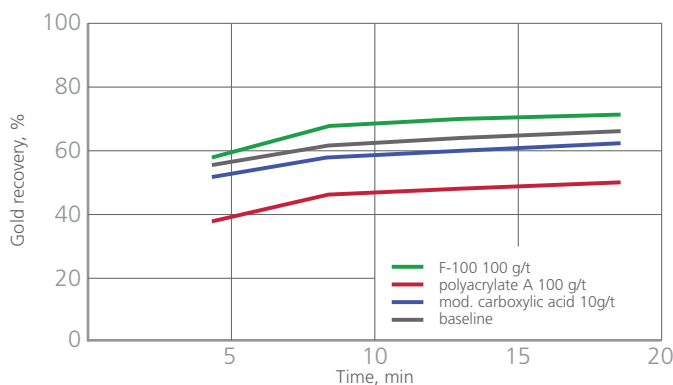
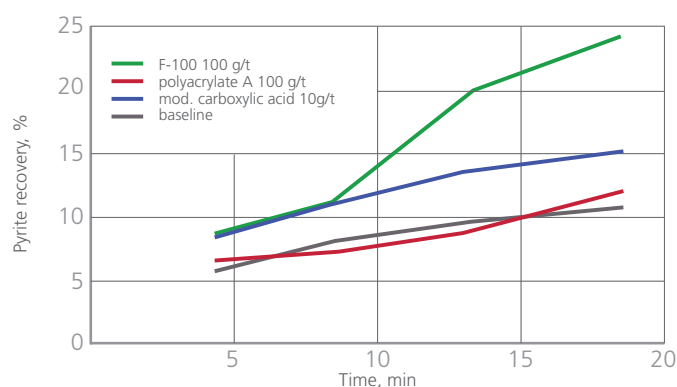


Figure 3: Flotation recovery in laboratory tests with different dispersants at their optimal dosage: pyrite

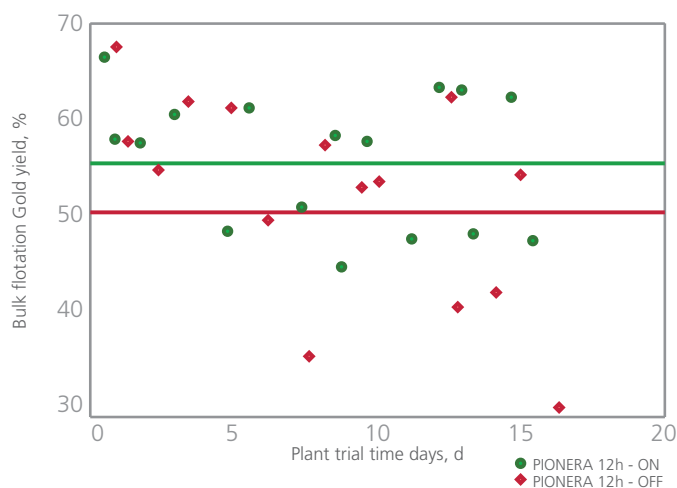


These positive results led to the planning of a plant trial with the Pionera F-100 to determine its effect on gold/copper recovery and clay. The product was tested at random over the course of 3 months.

When added, it was used for 12 hours at a dosage rate between 75-100 g/ton. Pionera F-100 was added directly to the ball mill discharge of mill #2.

Gold and copper recovery data were collected and filtered. Data was rejected when mill run time was less than 95 per cent or when the dosing of the reagent was problematic.

Figure 4: Summarized results of Au concentrate assays



The results of the on-off trial are shown in figure 4. Over the plant trial period, a 5% increase of gold in the bulk concentrate was measured which translated into a significant increase in overall gold production.

CONCLUSIONS

The processing of ore containing primarily chalcocite and an increased amount of clay at the Telfer mine has been investigated. The clay-rich ore is difficult to process.

Preferential adsorption of Pionera F-100 onto the clay minerals suggests a scenario where the added dispersants prevent coating of the secondary copper sulfide chalcocite. Elimination of the slime coating increases the efficacy of the flotation reagent suite.

Pionera F-100 showed in the plant trial and later in industrial use to be capable of effectively dispersing clay to improve copper and gold recovery in the Telfer flotation circuits. The use of Pionera F-100 provided a significant benefit and an excellent Return On Investment to the Newcrest Telfer operation.

REFERENCE

Usage of anionic dispersants to reduce the impact of clay particles in flotation of copper and gold at the Telfer Mine,

Seaman, D. R., Lauten, R. A., Kluck, G. and Stoitis, N., 2012. In Proceedings 11th AusIMM Mill Operators' Conference, pp 207-214