

Case Study

Endeavor Mine

Improving plant performance using Pionera F-250



Abstract

At the Endeavor mine in Cobar, NSW, production volumes suggest that the amount of pyrite in the final concentrate increases with the silver content in the ore. While there are several ways to deal with pyrite in concentrates, reduced production volumes of concentrates leave traditional ore blending techniques unavailable to the mine. Evaluation of different depressants revealed that Pionera F-250 adequately depressed pyrite demonstrated in both laboratory tests and in plant trials. F-250 was selected for use in the process as it not only efficiently reduced pyrite in the final concentrate, but general handling and everyday use was easy and safe. Additional benefits could be realized during optimization. Finally, use of F-250 improved the grade of lead, silver and zinc concentrates produced.

Introduction

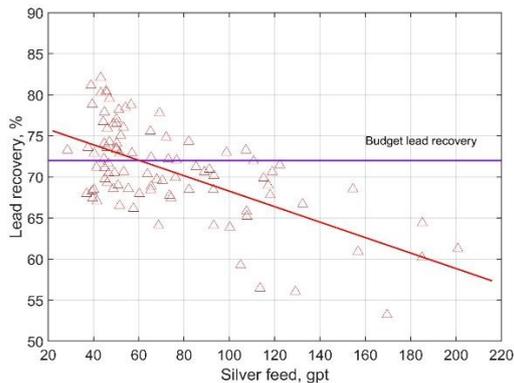
Control of the amount of pyrite present in sulfide ore concentrates, while maintaining economically viable recoveries. Galvanic interactions, either between sulfide minerals or between sulfide minerals and grind media, are important for understanding the flotation recovery in processes where pyrite is depressed. Essentially, pyrite in contact with less noble sulfide minerals will normally act as a cathode. This facilitates oxidation of the less noble sulfide minerals with an associated increase in hydrophilic oxidation products accumulating on the surface of the less noble sulfide mineral, reducing the flotation recovery. Steel grind media, depending upon the chrome content, can become oxidized and the iron

hydroxides produced may also adsorb onto the surface of the desired sulfide minerals.

The Endeavor mine is located in Cobar, Australia and operation started in 1983. The ore processed is part of a massive sulfide deposit consisting mostly of pyrite, galena, and sphalerite along with some non-sulfide gangue. Today, a lead concentrate with a tenor of silver along with a zinc concentrate are produced and sent offsite. Since the Endeavor mine is reaching end-of-life the available variation in ore is limited and this effectively curtail possibilities for blending concentrates. The remaining resources are considered complex to process and typically only allow production of acceptable grades by sacrificing recovery, see Figure 1, meaning that the existing flotation reagent suite was not selective enough. This situation motivated

an evaluation of alternative pyrite depressants to improve both grade and recovery.

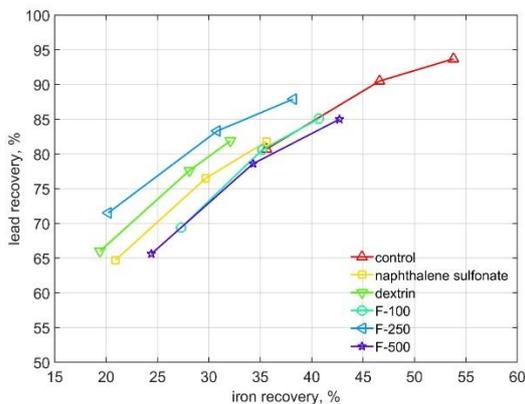
Figure 1: Lead recovery as a function of silver feed grade



Results

Laboratory floats evaluating alternative pyrite depressants were conducted. A complex ore sample of the flotation slurry was collected from the lead regrind mill discharge, i.e. the feed to the lead cleaner circuit. Figure 2 displays results from the laboratory results. Compared to the naphthalene sulfonate in use, both dextrin and F-250 give higher lead recovery at comparable iron recovery.

Figure 2: Results from laboratory floats with dextrin and different PIONERA biopolymers



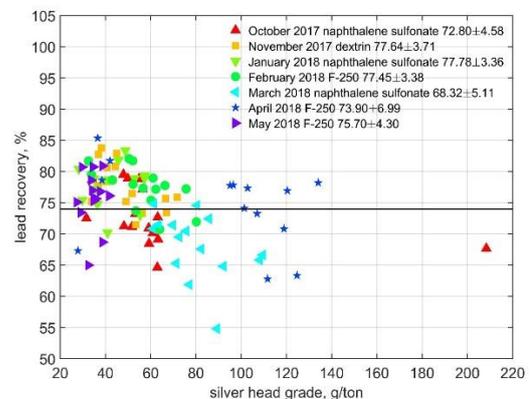
Plant trials were scheduled using either dextrin or F-250. As mentioned above, the Endeavor mine is

reaching end of mine and flotation is done in campaigns. It was decided to use one depressant for the duration of one campaign. Similar to the addition of naphthalene sulfonate, dextrin and F-250 were added to the first lead cleaner feed conditioner. Results from seven different campaigns processing complex ore are shown in Figure 3 where the lead recovery is displayed as a function of the silver feed grade. The budgetary demands were reached more often using F-250, with the emphasis on the importance of the silver feed grade.

During one of the plant trials (April 2018) it was realized that if Pionera F-250 was overdosed, frothing was completely suppressed. The addition point was changed to the second lead cleaner to mitigate this risk. It was then realized that addition of Pionera F-250 in the second cleaner led to additional benefits:

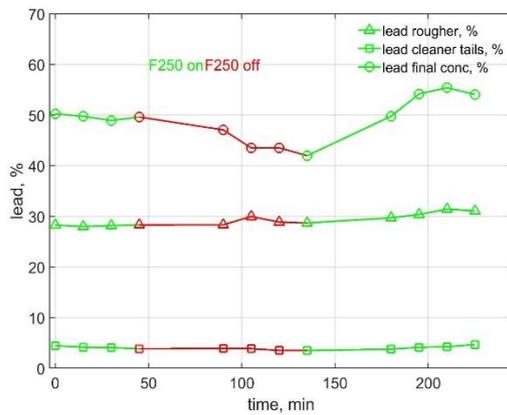
- Overall lower mass pull in the second lead cleaner reduced the dosage of F-250 added to the circuit.
- The response time for plant operators is faster since only about 30 minutes is required to evaluate the effect of F-250 addition when added to the second lead cleaner.
- More efficient use of the Pionera F-250 since fast floating galena is collected in the first cleaner and in the second cleaner Pionera F-250 interacts directly with the pyrite found difficult to depress without use of F-250.

Figure 3: Variation in the lead recovery as a function of silver feed grade during several plant trials utilising different depressants.



Everyday use revealed that the pyrite depressant Pionera F-250 made it possible to add less lime, reducing the pH from 9.0-9.5 gradually to 8.0-8.5. Further, it was possible to substitute the Aerophine 3418A by a more economic Xanthate collector.

Figure 4: Results from an on-off trial.



An on-off trial was completed to demonstrate how responsive the lead circuit became after implementation of all changes (reduced pH, F-250 and Xanthate collector) and the results are illustrated in Figure 4. There is an almost immediate drop in the lead final concentrate grade after 45 minutes roughly representing the time when the F-250 is assumed to be washed out of the system.

Conclusions

Comparison of different flotation depressants reveals that Pionera F-250 is a more efficient flotation depressant than a dextrin or the previously used naphthalene sulfonate.

Endeavour mine changed the depressant to Pionera F-250 for continuous use.

Reference

“Improving plant performance at the Endeavor mine using Pionera F-250”

Vanegas, C, Sithole, M, Lauten, R A, 2020 *Proceedings 15th AusIMM Mill Operators’ Conference 2020* (The Australasian Institute of Mining and Metallurgy: Melbourne).