

CASE STUDY

MMG CENTURY MINE, AUSTRALIA

The use of BioPolymer flotation depressant to improve the recovery of zinc.

ABSTRACT

The Century mine produces around 500,000t of zinc concentrate per year in a combined lead and zinc flotation process with graphite and silica as the main gangue materials. Declining grades are projected until mine closure, forcing the need to optimise grade and recovery. Pionera F-100, a biopolymer, was evaluated as an alternative depressant to dextrin. Lab tests and several plant trials showed that using Pionera F-100 lowered graphite and silica content as well as improved zinc grades in the concentrate.



INTRODUCTION

The main focus in mineral processing in many operations has turned from expansion and capital investment to cost cutting and process improvements to maintain overall profitability. Process optimisation is gaining importance as most ore qualities are declining. A biopolymer, Pionera F-100, has been evaluated against dextrin as a depressant for carbonaceous material at the MMG Century mine.

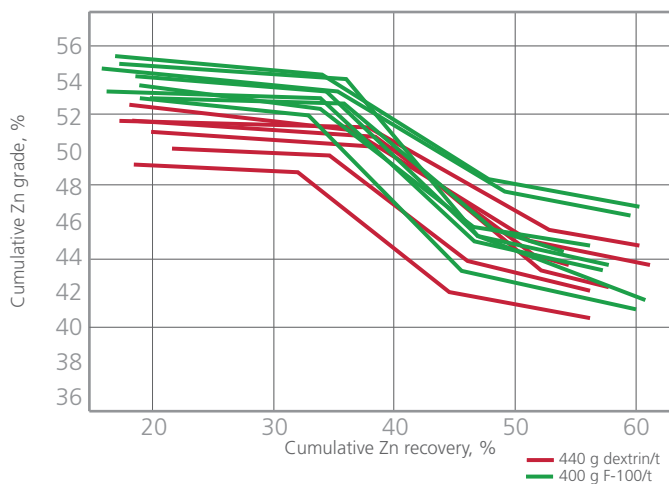
The MMG Century mine produces zinc and lead concentrates from a complex ore where carbonaceous material and silica constitutes the primary gangue materials. Dextrin was used as a depressant for the carbonaceous material both in the lead and zinc circuits.

RESULTS

Preliminary lab trials were performed simulating pre-flotation, zinc rougher and scavenger circuits. The results showed consistently higher zinc concentrate grade in the zinc rougher stage while the concentrate grade was somewhat lower in the zinc scavenger stage. Overall, the total recovery obtained with the two depressants was comparable. Although flotation kinetics seemed slower when using Pionera F-100, improvements in grade combined with similar recovery values would equate to a significant gain to overall production. It was further assumed that the slower flotation kinetics could be modified by adjusting plant flotation variables.

Based primarily on the consistent improvement in zinc rougher concentrate grade (Figure 1), it was decided to conduct a full plant trial with Pionera F-100 as a dextrin replacement in the lead and zinc circuits.

Figure 1: Zn grade vs recovery in the rougher for optimized dosages of dextrin and Pionera F-100



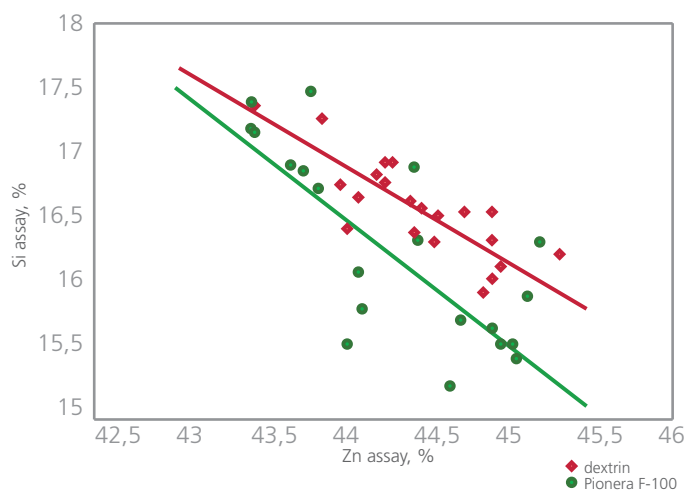
The first plant trial gave two important findings:

- A) Pionera F-100 performed well as a depressant of carbonaceous material.
- B) Pionera F-100 reduced silica and improved the zinc grade of the feed for ultrafine grinding.

Two more plant trials followed. While these showed some undesirable effects in the lead circuit, depression of carbonaceous material as well as silica were confirmed. In the case of silica depression, this was most pronounced in the ultrafine cleaner feed and as a result zinc recovery also increased. It was decided that dextrin would be used in the lead circuit while only Pionera F-100 would be used in the zinc circuit.

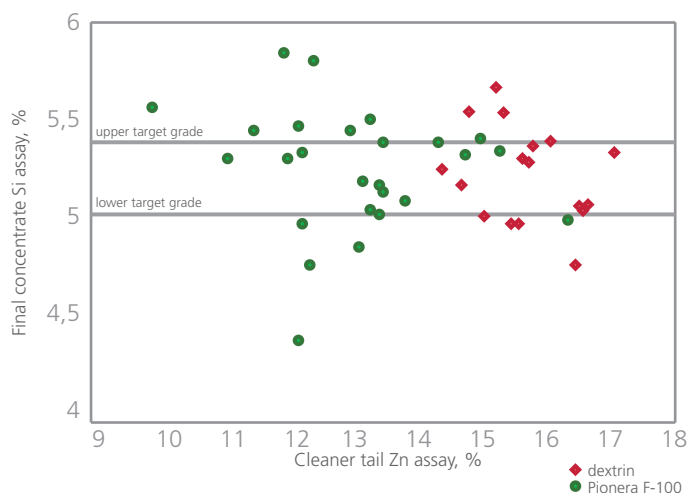
Regarding the ultrafine zinc circuit, the combined zinc rougher and scavenger cleaner concentrates are reground to a P80 of $\approx 6\mu\text{m}$ and then treated in the final zinc cleaners. This cleaning circuit has to remove sufficient silica such that final concentrate grade is below 5.2% silica. There is a trade-off between silica grade and zinc recovery. As shown in Figures 2 and 3, with Pionera F-100, silica is depressed more efficiently and less zinc reports to the final tailings. By targeting a set grade, recovery was increased by 2.0 percent with a 95 percent confidence level.

Figure 2: Composition of the ultrafine milling feed during the third plant trial when using dextrin and Pionera F-100.



In Figure 3 it is apparent that by maintaining the desired silica grade in the final concentrate a higher zinc recovery is achievable.

Figure 3: Final concentrate silica grades versus ultrafine cleaner tailings zinc grade, when using F-100 or dextrin



CONCLUSIONS

It has been established that replacing dextrin with Pionera F-100 in the zinc circuit improves silica depression and increases the zinc recovery at the Century concentrator. Economic analysis reveals that the use of Pionera F-100 delivers a significant Return On Investment at the Century operation provided the ore being processed continues to have a high zinc grade.

The permanent implementation of Pionera F-100 in the Century concentrator commenced on June 2014.

REFERENCE

“A Change in Graphite Depressant to Improve the Recovery of Zinc at MMG Century mine”
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