

WORK PACKAGE 2: ENHANCED PERFORMANCE FLOTATION PROCESS

OBJECTIVES

To develop enhanced flotation techniques including energy efficient comminution and more specific reagents.

To raise base metals extraction efficiency through bulk flotation in comparison to conventional selective flotation, allowing at least the next increment in recovery rates: +20% Pb, +15% Cu and +10% Zn. The global objective will be to recover over 90% of the valuable metals.

Development and implementation at pilot plant scale of process flowsheets and flotation protocols aiming to maximise valuable metals recovery and obtaining concentrates containing Cu, Zn, Pb, Ag,

Provide pilot scale bulk and low-grade concentrates for continuous treatment by hydrometallurgical methods in the Work Packages WP3, 4 and 5.

MAIN RESULTS

TASK 2.1 – ENERGY EFFICIENT COMMINUTION

Work by BRGM focussed on improving comminution efficiency through pre-treatment of ores.

Microwave pre-treatment was evaluated on ores from partner mines, with detailed investigation into the effect on grinding power requirements and improved liberation of minerals in the ore. Results showed that microwave treatment was not effective and the study will continue into the use of Electro Pulse Fragmentation to improve grinding efficiency on the target ores.

TASK 2.2 – REAGENTS FOR ENHANCED FLOTATION PROCESSES

OUTOTEC studied laboratory scale flotation on partner ores using a variety of grinding technologies, flotation layouts and reagent regimes.

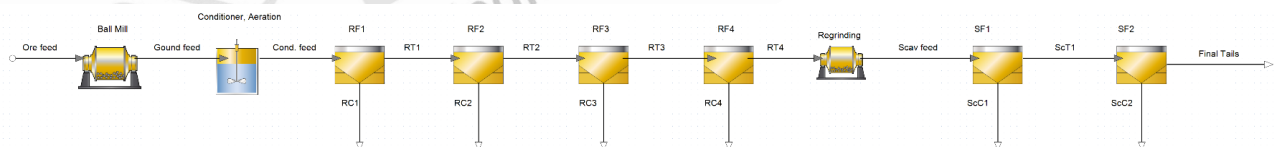


FIGURE 1 - KINETIC BATCH FLOTATION TESTS WITH REGRINDING BEFORE SCAVENGER FLOTATION

At CLC a secondary regrind stage was defined prior to scavenger flotation. Flotation reagent regime was optimised after studying multiple alternate suppliers and products.

Testwork on polymetallic ore from the Bor mine showed that selective flotation was not a viable option. Reducing the ore grain size to the concentrate grain size class, it would represent a low grade polymetallic concentrate suitable for whole-ore leaching in the following work packages of the INTMET project

Also at the Mining and Metallurgy Institute Bor, testwork was carried out to optimise production of pyrite concentrates for hydrometallurgical treatment.

At SOMINCOR, a major finding was the rapid oxidation of the Pb mineral galena during flotation. This limits recovery of the value mineral to flotation concentrate. Implementation of the INTMET hydrometallurgical processes to treat low-grade bulk concentrates will simplify flotation circuits and reduce residence time, thus limiting oxidation and improving overall recovery of the value metals to 80 – 85% in the case of Pb and Cu.

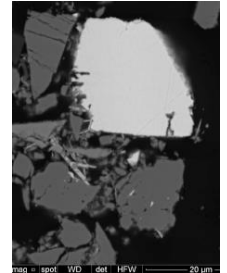


FIGURE 2 - DISSOLUTION HALO ON GALENA GRAIN AT SOMINCOR

SOMINCOR will produce a bulk Pb-Zn-Cu product for hydrometallurgical testing.

TASK 2.3 and 2.4– FLOTATION PILOT FACILITIES ARRANGEMENT AND OPERATION

For the CLC pilot plant, the material balance and process flow sheet was developed to produce information for equipment procurement. Safety and control philosophy was developed to create safe and an efficient material processing facilities. Commissioning was performed in July and August 2016



FIGURE 3 - CLC FLOTATION PILOT PLANT INSTALLATION

Bulk concentrate was produced during CLC pilot plant operation with an overall grade (Cu+Zn+Pb) between 9 % - 14 %, which is acceptable for further hydrometallurgical processing. In terms of metals recovery, high efficiencies, varying from 85%- to 95% were achieved.

At the Bor Institute the existing pilot plant was extensively refurbished to allow production of pyrite concentrates for further hydrometallurgical testwork.



FIGURE 4 - RECONSTRUCTED FLOTATION PILOT PLANT FOR PYRITE CONCENTRATE PRODUCTION AT BOR INSTITUTE