Dry Processing for Copper Ore: Evaluation of a Rotary Classifier

Nawshad Haque, Isis Ignacio, Kurt Liffman

1CSIRO Mineral Resources, Private Bag 10, Clayton South, VIC 3169, Australia
2Formerly with CSIRO Manufacturing, Private Bag 10, Clayton South, VIC 3169, Australia
Nawshad.Haque@csiro.au

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There are concerns about water use, high costs of water, limited water supply and shortages in the mining and mineral processing industry, particularly in the arid parts of countries such as Chile in South America. Furthermore, declining ore grades and its potential environmental impact make dry processing of copper ore attractive for many companies. In order to address these concerns, CSIRO has developed a new technology known as the ‘Rotary Classifier’ (RC), which segregates granular materials by size or density using only their natural properties induced by shearing flow (Liffman, 2014). A new dry processing flowsheet for copper ores applying the RC was developed (Figure 1 in the next page) and compared with the conventional flowsheet. A number of assumptions were updated from a previous study (Haque et al., 2012).

Based on data from previous studies, it was possible to simulate the enrichment factor (or EF, which is the upgrade factor of the run-of-mine ore feed due to classification) of the RC when different feed recovery rates were assumed. Two cases were evaluated and compared against a base case: the first giving the lowest EF (RC Case 1) and the second giving the highest EF (RC Case 2). A techno-economic evaluation was undertaken to estimate the operating costs and water consumption for copper concentrate production. It was found that the operating cost increased by about 4% and 8% for RC Case 1 and RC Case 2, respectively, compared with the base case (Figure 2 in the next page). However, there was a reduction of 25% in water consumption for RC Case 1 and a reduction of 50% for RC case 2. Although RC technology did not increase the final copper product grade and also had higher operating costs, it warrants further investigation as an alternative option, especially if the environmental concerns of water usage are considered and water availability is a bottleneck for an operation.

References:
Figure 1: New proposed comminution flowsheet for Cu ore applying Rotary Classifier

Figure 2 – Comparison of operating cost contribution for base case and new processes using rotary classifier (RC Case 1 and RC Case 2)