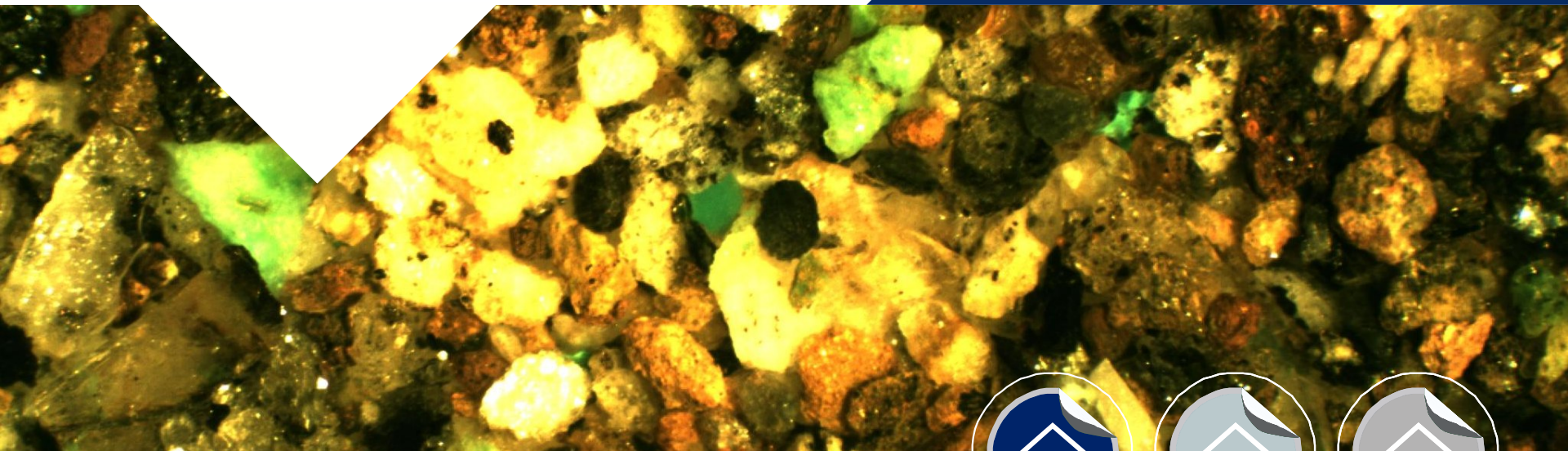


Performance of Oxide Reagent Suites on *YOUR* Ore Axis House R&D 2012



- » YOUR ORE
- » MILLING CURVES
- » FLOTATION TESTS
- » COPPER GRADE VS RECOVERY

AXIS HOUSE

Background



AXIS HOUSE received 20 kg of ore

- 20 Kg of ore was received.
- The head grade was determined to be 2.5% Cu.
- Visually the main copper mineral was Malachite & Chrysocolla.



AXIS HOUSE

Size Reduction (Milling Curve)



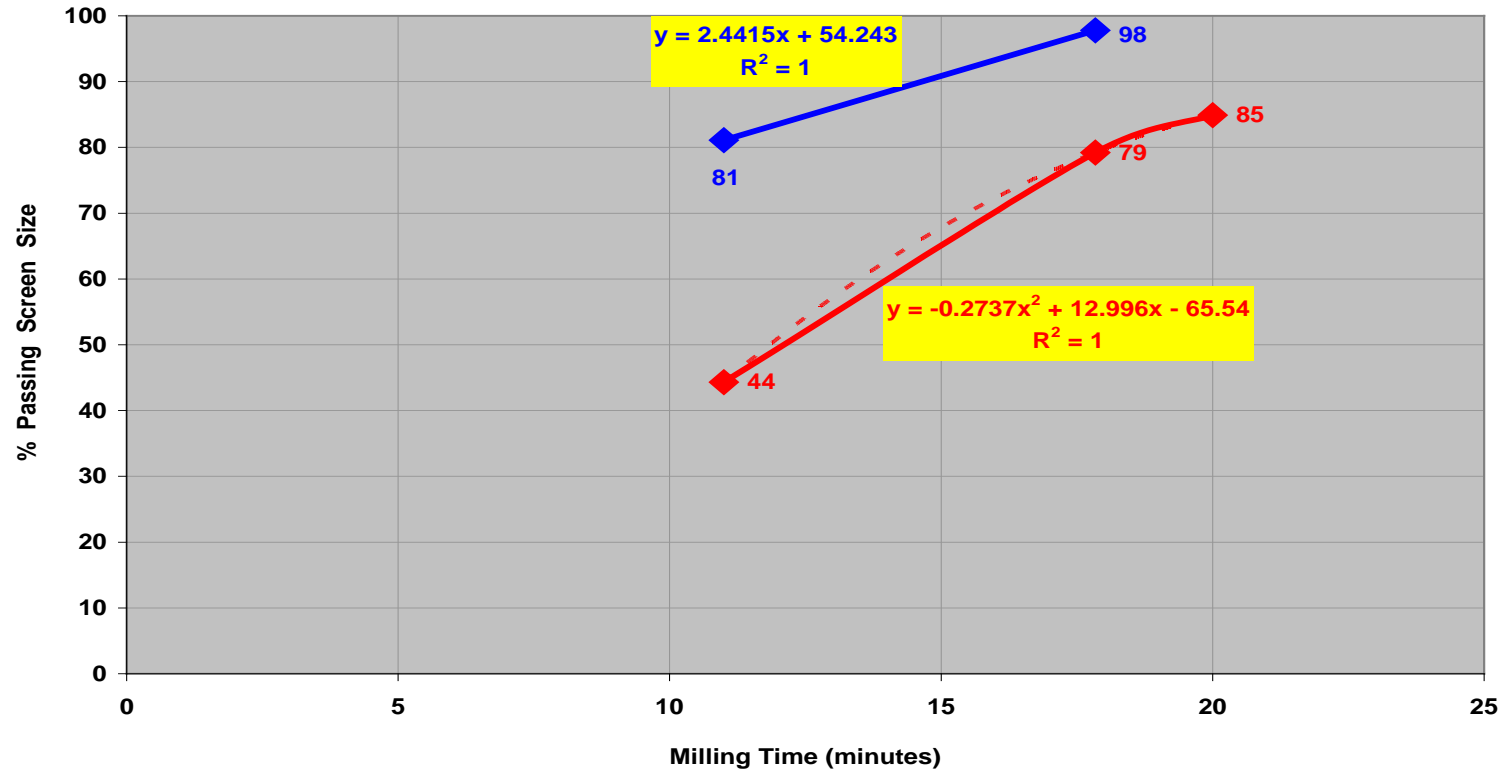
The ore was first crushed using a pressure cutter to reduce it to < 60 mm.

- Then a jaw crusher to reduce it to < 3 mm.
- The $+ 2$ mm was then crushed with a cone crusher to < 2 mm.
- After splitting the ore into 1 kg bags, the milling time required to mill it to 80% -150 μ m was determine using Axis House stainless steel rod mill.



Axis House

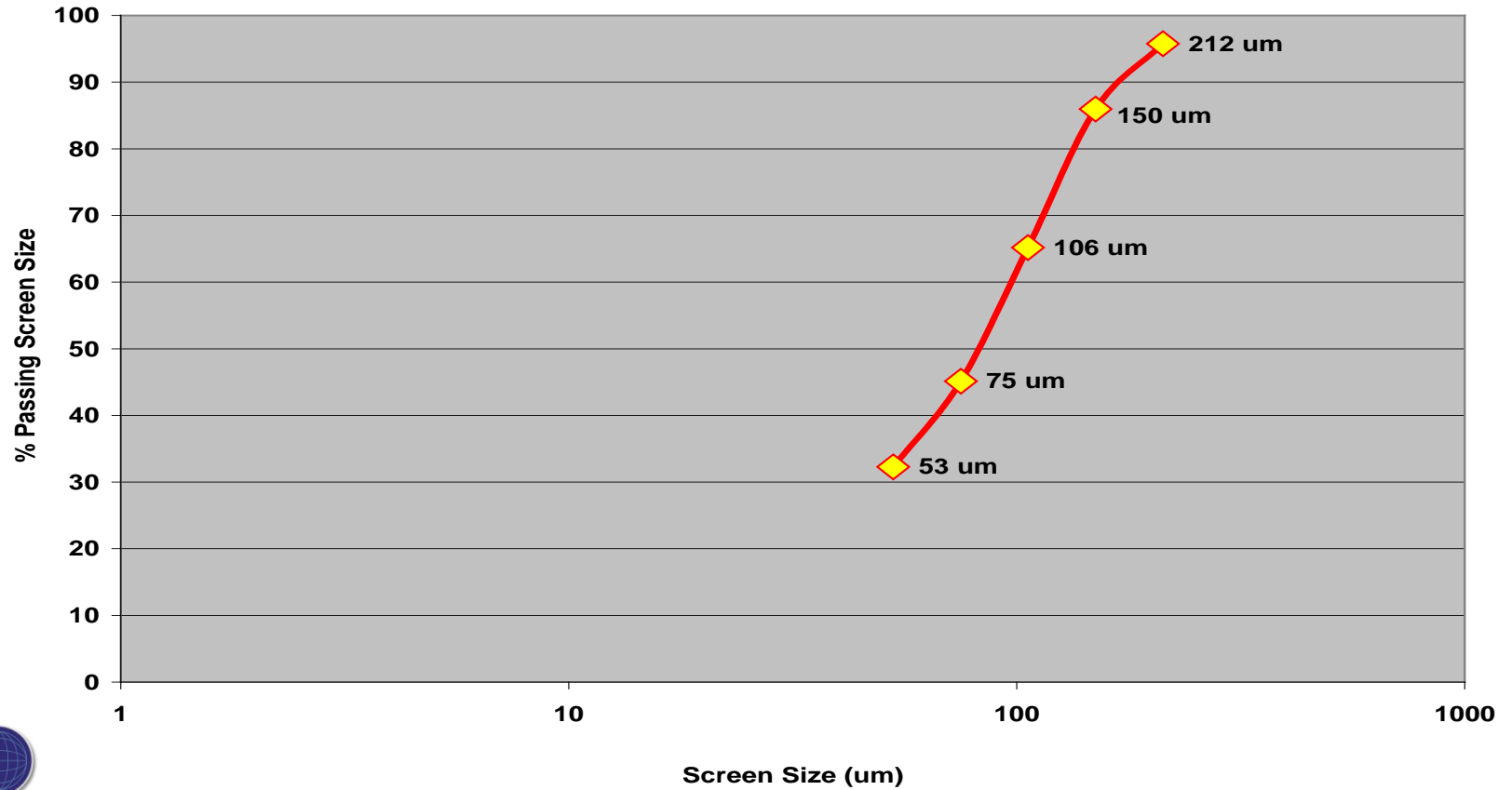
Milling Curve



—◆— Screen Size: 75 um —◆— Screen Size: 150 um

Axis House

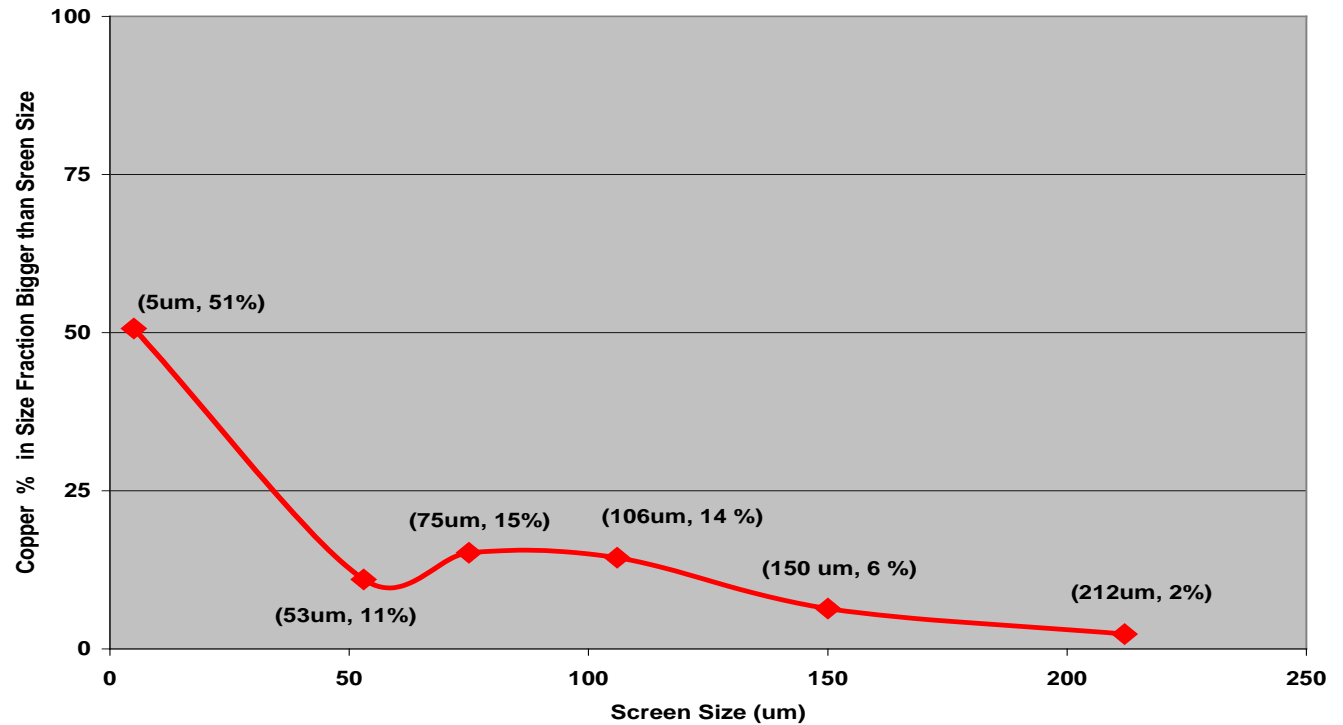
Size Distribution @ 80%- 150 μ m



Axis House

Copper Distribution @ 80%- 150 μ m

Most of the Copper was in the < 53 μ m size fraction.



AXIS HOUSE

Flotation Tests



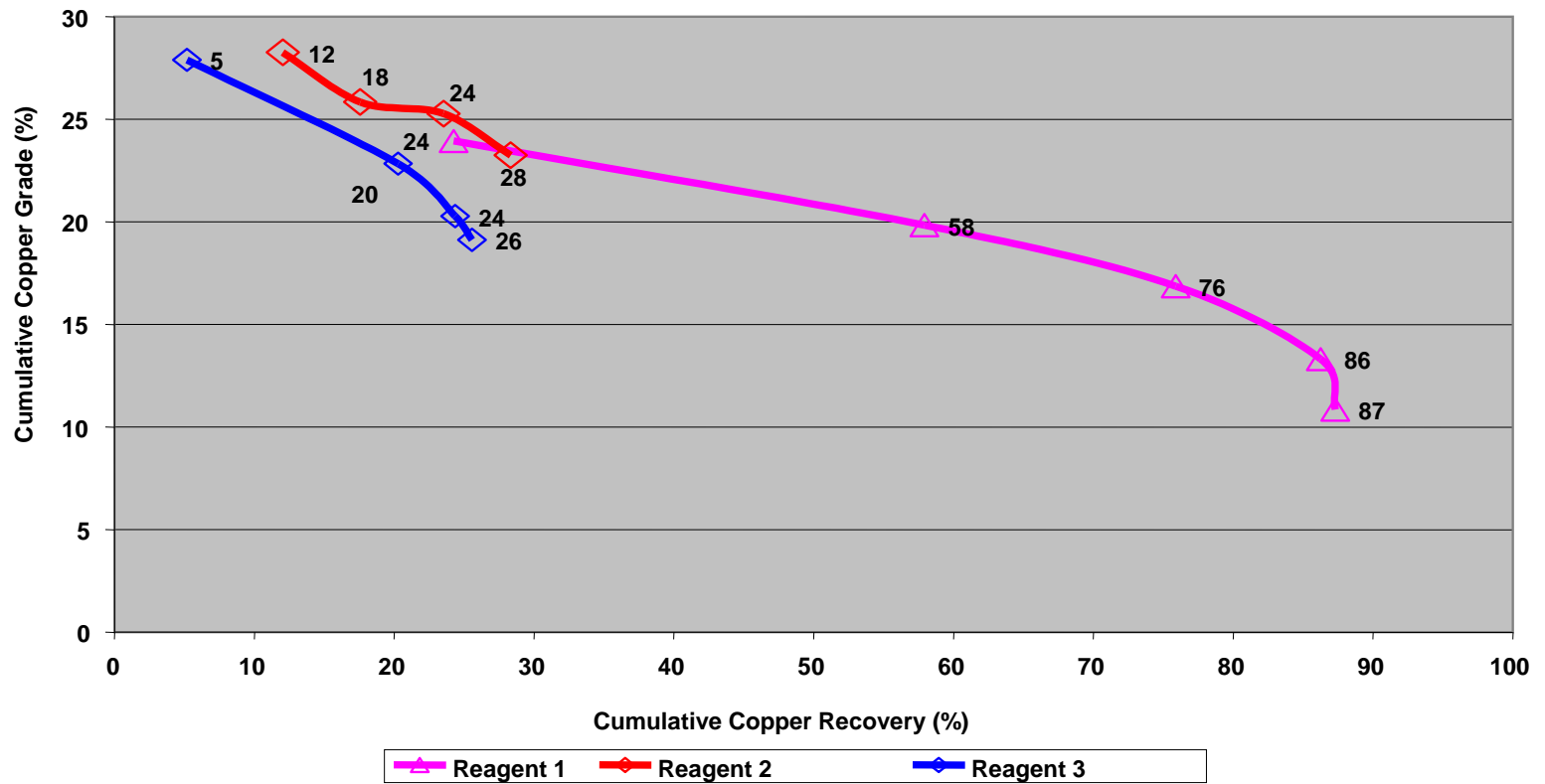
Two phases:

- Comparison of the performance of the three suites: Reagent 1, Reagent 2 and Reagent 3 Suite.
- Optimisation of the best performing suite.



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Copper Grade VS Recovery



AXIS HOUSE

Observations



Reagent 1 and Reagent 2 suite on the same grade vs recovery curve at below 28% recovery.

- Significant improvement in copper recovery obtained with Reagent 1 suite.
- Less Residence time was required with the Reagent 1 suite to achieve good flotation performance.
- Reagent 2 suite required more residence time.
- Reagent 2 and Reagent 3 had very slow flotation rates.
- At the same Reagent 1 dosages (Test 12 and 13) increasing milling time, to 90% passing 150 μ m, resulted in an overall increase in grade but no increase in recovery.



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Conclusion

At the same Reagent 1 dosages (Test 12 and 13) increasing milling time, to 90% passing 150µm, resulted in an overall increase in grade but no increase in recovery.

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Future Test Work



BENCHMARK TEST WORK on the 9 samples from Mintek using Reagent 1.

- Benchmark testwork on the currently available stockpile samples from the plant using Reagent 1 and suggested standards.
- Further development of Reagent 3 Reagents which may provide a more economical suite.



Recommendations

Axis House Research & Development



- *The information as set out above indicates that Reagent 1 will improve on previously achieved target grades and recoveries.*
- *This performance needs to be quantified at plant scale.*
- *The Reagent 1 reagent suite would be more expensive to run than previously suggested suites.*
- *The benefit needs to be quantified in order for plant management to evaluate the economics.*
- *Dosages of Reagent 1 might be substantially lower on the plant.*
- *Reagent 1 = USD x /ton*
- *The implementation of the Reagent 1 reagent would be attended by a team from Axis House and will include three chemists and two metallurgist.*
- *For March delivery we would need to have orders placed by the xx at the latest.*