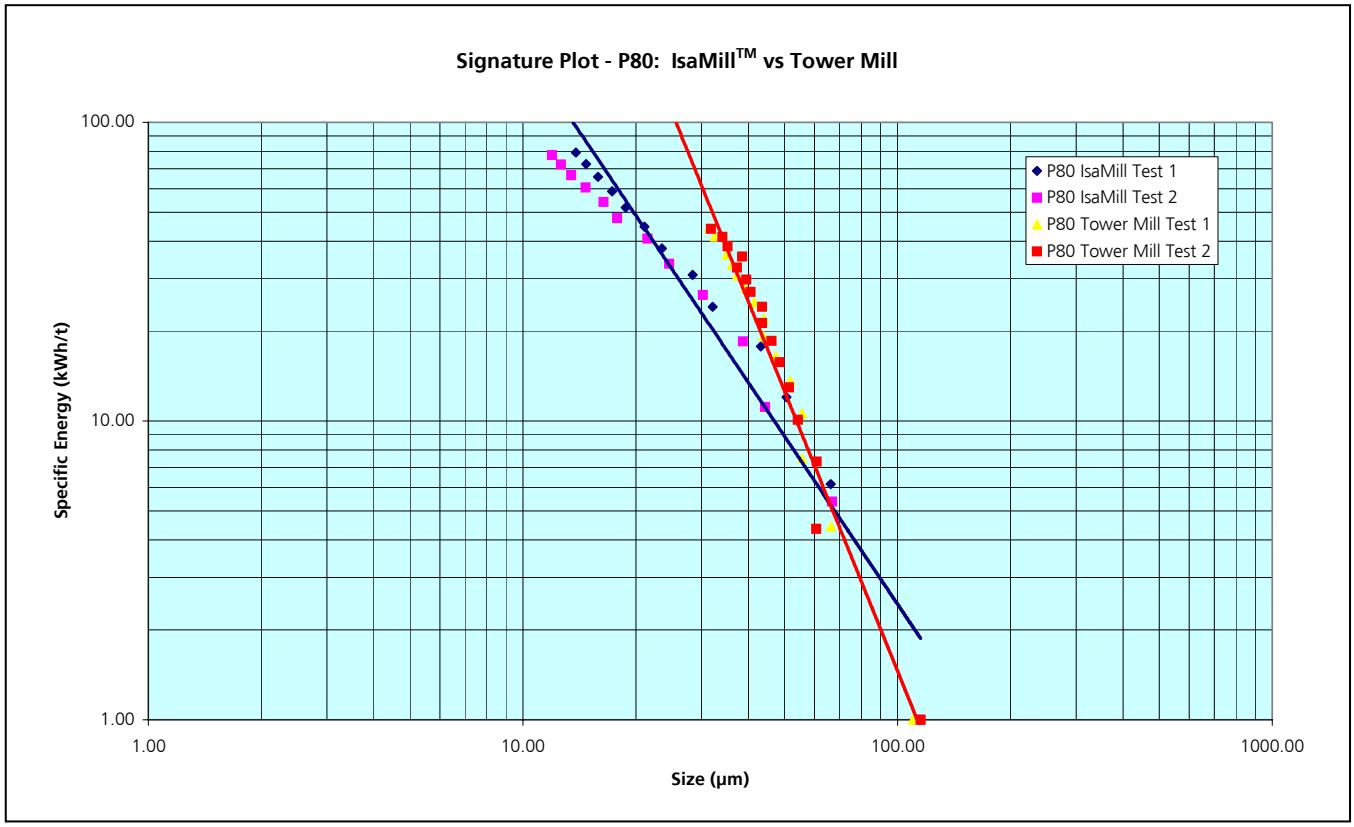
GRINDING COMPARISON TEST OF IsaMills™ WITH TOWER MILLS USING MAGNETITE

INTRODUCTION

IsaMills™ have been in fine grinding applications in base metal circuits since 1994. The IsaMill™ has been enabling technology, that has allowed these applications to be developed, due to its high energy efficiency and intense grinding action. Over the years the IsaMill™ has evolved from its initial design as an "ultra fine grinding mill" to its use in more traditional regrind duties following the increase in capacity of the units and the development of a ceramic media by Magotteaux – Keramax® MT1™. These developments have allowed the mill to treat coarser feed sizes at high energy efficiency compared to traditional grinding technologies. There is a range of models now available from the 500kW M1000, to the largest stirred mill currently available, a 3MW M10,000.

Today the mills undertake coarse grinding duties in PGM, copper/pyrite, and zinc/lead applications. While most of the work to date has been with base metals, there is no reason why the benefits of base metal operation cannot be transferred to other minerals.

RESULTS OF TESTWORK ON MAGNETITE RECENTLY CONDUCTED (SEE OVERLEAF)



TESTWORK

The current testwork compares the operation of a lab scale M4 IsaMill™, with a lab scale Tower Mill using Ernest Henry Mine tailings. The tailings are the result of the flotation process, where chalcopyrite has been recovered from the breccia host rock, which is comprised of strongly altered and replaced felsic volcanic fragments in a matrix assemblage of predominantly magnetite, chalcopyrite and carbonate minerals

The M4 IsaMill™ is a 4 litre mill, containing 6 to 9 discs, operating with 3.5mm ceramic Keramax® - MT1™ media. The Tower Mill is 40L capacity and operates using 12mm steel media.

Top: M4 IsaMill™ 4L unit, similar to the unit at CSIRO where testwork was conducted.

Right: Tower Mill – 40L capacity, operated at CSIRO for comparison testwork.

In each test, 20 to 21kg of sample is made into a slurry of 50% solids and pumped through each mill for a number of runs. The power used for each run is recorded, and a small sample of the discharge is taken to permit laser sizing. This procedure is carried out through each mill for a minimum of 12 times, or until there is no significant reduction in the sizing, i.e. the mill cannot reduce the sample any further. A log-log, P80 size versus the specific energy to obtain that size graph, is then drawn (signature plot).

The test was repeated for each mill twice.

DISCUSSION

The results of the two test for each grinding technology shows a good level of reproducibility.

Key findings were:

- The IsaMill™ was able to produce material down to 13µm from a feed size of 113µm. However the Tower Mill failed to produce material less than 31µm. The reason for the difference between the mills was the grinding media used in the IsaMill™ testwork was a lot smaller. However media selection was based upon what realistically a full scale plant can operate with. A full scale IsaMill™ can be supplied and operated with ceramic media from 1 to 3.5mm, however Tower Mills can only realistically operate with media 12mm and upwards, which means that they cannot achieve the grind sizes that a full size IsaMill™ can achieve.

- The IsaMill™ used less power to produce a product 65µm or smaller compared to the Tower Mill. This means for this magnetite feed, an operator targeting a product of 40µm with an IsaMill™ will need approximately 14 to 18Kwh/T, while a Tower Mill will need a lot more energy between 26 to 27Kwh/T. The implications for this is smaller installed power for an IsaMill™ circuit and the resultant lower installation cost due to it operating in open circuit without the need for cyclones, as well as having a smaller footprint. It may also result in less grinding units compared with a Tower Mill circuit when large power requirements are needed.

Testwork is ongoing to determine the energy efficiency of the IsaMill™ on other magnetite deposits.

For further information please contact:
Lindsay Clark, Mineral Processing Business Manager – Xstrata Technology
Telephone +61 7 3833 8500; Email LClark@xstratatech.com.au; Web www.isamill.com