



# IsaMill

## Mount Isa's fine grinding legacy

Global mining group Xstrata through its equipment technology division Xstrata Technology, XT, is delivering mineral processing solutions across the world through its various patented products. In South Africa, its fine-stirred grinding IsaMill, has proven to be well-suited for mineralogically complex PGM applications, and is highly regarded by the head of concentrator technology for Anglo Platinum, Chris Rule. Laura Cornish reports.

**The stirred milling or fine mainstream and ultra-fine grinding (UFG) technology market is gaining momentum rapidly in the South African mining industry, and currently remains largely dominated by IsaMill technology, whose concept originated in the 70s and 80s, and was commercially applied internally at Mt Isa Mines in a large scale in 1995, and then officially marketed in 1999, when it was available to the mining industry.**

It is installed across a variety of applications, including nickel, zinc, molybdenum, lead, gold and copper.

"Having recognised that its ore bodies were becoming more complex and required fine grinding, Mount Isa Mines, (later to become part of Xstrata), partnered with stirred milling specialist Netzsch-Feinmahltechnik GmbH in Germany, (Netzsch), which was already widely supplying

their technology in the pharmaceutical, chocolate, pigment, filler, chemical and even cosmetics sectors, to develop a large capacity mill, that would be capable of handling tough operating conditions with arduous ore types, and be more energy-efficient compared to other technologies available at the time," says Australia-based service manager for Xstrata Technology, Tim Shea.

After seven years of testwork and prototype creation at the Mount Isa Mines zinc-lead-silver concentrators in Australia, the IsaMill evolved, whose name carries tribute to the 'Isa' in Mount Isa.

Today, the IsaMill is the largest inert media, fine-grinding stirred mill, and is installed across many of Anglo Platinum's local concentrator operations.

"We have, since the beginning of 2010, had 22 IsaMills

in continuous operation – 18 as mainstream inert grinding (MIG) units and four as UFG or concentrate re-grind. This 64MW of capacity represents the largest stirred milling installation list in the metals mining industry,” says Chris Rule.

In 2009, Anglo Platinum commissioned 16 mills in eight months.

The first stirred mill – in a UFG application and using sand media, at Anglo Platinum was commissioned in 2003, this was the world’s first 10 000-litre IsaMill, having being scaled up in a collaborative project with XT and Netzsch. Previously the largest unit was 3000ℓ.

This was an important step as it permitted economic application of stirred inert media milling to mainstream large tonnage operations. The first MIG unit using ceramic grinding media began operation in 2006, followed by a further four MIG mills in 2007. Successful operation of these initial installations led to the rapid roll-out of the next 16 across the group’s mines.

According to Rule, Anglo Platinum’s PGM recoveries

## ANGLO PLATINUM ISAMILL INSTALLATIONS; (TARGET GRIND IN BRACKETS)

<b>WLTR</b>	1X UFG M10 000 (20 microns)
<b>Mogalakwena</b>	4 x MIG M10,000 (53 microns) and 1 x UFG M10 000 (20 microns)
<b>Waterval</b>	4 x MIG M10,000 (53 microns) and 1 x UFG M10 000 (20 microns)
<b>Waterval UG2</b>	2 x MIG M10,000 (53 microns)
<b>BRPM</b>	1 x MIG M10,000 (53 microns)
<b>Amandelbult</b>	4 x M10 000 (53 microns) and 1 x M3000 (15 microns)
<b>Mogalakwena South</b>	3 x MIG M10 000 (53 microns)

have improved by up to 5% and have also led to significant improvements in the product grade-recovery relationship on the sites which have implemented the technology.

“While a lot of vertical fine grinding mills have come onto the market recently, it remains a fact that a large horizontal mill is best suited, operationally and economically for

fine and ultra fine grinding applications. They are generally applied by the users, not as a mill replacement but rather as a recovery augments,” explains Xstrata Technology (SA) minerals processing manager, Cedric Walstra.

Chris Rule has led all the fine milling initiatives for Anglo Platinum since 2000, “Anglo Platinum chose IsaMill technology for energy-efficient inert media fine milling at the required unit scale; after a study of available stirred milling equipment. We had an overriding requirement for a large-scale machine to enable mainstream or MIG large tonnage applications, in contrast to the conventional intermediate flotation concentrate regrind units. To enable

Installation for Waterval Retrofit .



this we scaled up the mill in 2001-2003 and installed the first 10 000ℓ unit at our Western Limb Tailings Retreatment (WLTR) project.”

“The horizontal IsaMill reduces grinding energy costs, media costs and capital installation costs. The intense inert attrition improves downstream metallurgical performance compared with conventional steel media. It produces a steep particle size distribution in open circuit and does not produce large quantities of slimes, eliminating the need for internal screens or closed circuit cyclones.”

Although a proven product, Xstrata Technology is continuously making further developments and enhancements to the IsaMill.

“Most recently we have reversed the internals, so that the highest-wearing disks are in the front, making them easy to change,” says Shea.

The company is also constantly evaluating all of the wear components to improve their durability and efficiency, Walstra adds.

Ceramic beads have been established as the most competent grinding media, although IsaMill is efficient with all the available media products, including sand and slag.

“The technology has met and exceeded the original design requirements and is now delivering the metallurgical benefits. The operation and configuration of the technology has been significantly optimised in the last 12 months, with major improvements having been implemented, and these have delivered significantly better metallurgical and cost results,” Rule adds.

The potential for this product going forward in Africa is

unlimited, as companies pursue improvements in extraction efficiencies, no matter what minerals require processing or what grinding duties need to be undertaken, says Walstra; who, with his team, services clients throughout southern Africa..

## THE SPECS:

- The UFG spec IsaMill can grind to less than 10 microns;
- It is energy-efficient;
- Improved flotation/leach recovery;
- High intensity – leading to a smaller footprint, one tenth the size of an equivalent ball or tower mill. High intensity also means short residence times, preventing over-grinding and giving a sharp product size distribution;
- Open circuit configuration – feed is passed through eight consecutive grinding stages;
- Large scale – mills are available from 75kW to 8MW.

Says Rule: “We have a special relationship with Xstrata Technology; having worked with them closely since 2001 in our installation programme. Initially we did joint onsite testwork, and subsequently the IsaMill team was closely involved in our project roll-out – in parallel we have worked together to develop the technology for our needs. This was essential as we pioneered coarse, mainstream or MIG technology worldwide. As part of this collaboration we have a close maintenance relationship and XT provides a machine wear part monitoring service. This is essential to provide the data for ongoing optimisation of the operations at our different sites and applications.” ○

Installation at MSC A and B.

